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Main Part

Appendix

Examples of domestic and oversea scenario analysis: domestic list by sector (1/2)

Regarding the 3 steps in scenario analysis with different disclosures depending on the sector, 40 domestic and 15 oversea (in total of 55) examples aere introduced in the following slides

Sector	Company	STEP3. Identify and define range of scenarios	STEP4. Evaluate business impacts	STEP5. Identify potential responses
Financial	Sompo Holdings, Inc. Securities Report		●	●
	Dai-ichi Life Holdings, Inc.		●	
	The Norinchukin Bank	●	●	●
	Mizuho Financial Group, Inc.	●	●	●
Energy	J-POWER	●	●	
	The Chugoku Electric Power Company, Inc.		●	●
Transportation	Mitsui O.S.K. Lines, Ltd.	●	●	●
	East Japan Railway Company		●	
	Nishi-Nippon Railroad Co.,Ltd			●
Materials, Buildings	Sekisui House, Ltd.		●	
	Tokyu Fudosan Holdings Corporation	●		
	MITSUI MINING & SMELTING CO.,LTD.			●
	KH Neochem Co., Ltd.		●	
	JFE Holdings, Inc.	●		
	TODA CORPORATION	●	●	●
	LIXIL Corporation		●	●
Agriculture, Food, and Forest Products	Sumitomo Forestry Co., Ltd.			●
	Asahi Group Holdings, Ltd.		●	
	Kameda Seika Co., Ltd.	●	●	
	Kirin Holdings Company, Limited Securities Report		●	
	FUJI OIL HOLDINGS INC.		●	●

Examples of domestic and oversea scenario analysis: domestic list by sector (2/2)

Regarding the 3 steps in scenario analysis with different disclosures depending on the sector, 40 domestic and 15 oversea (in total of 55) examples are introduced in the following slides

Sector	Company	STEP3. Identify and define range of scenarios	STEP4. Evaluate business impacts	STEP5. Identify potential responses
Trading, Retail	J. Front Retailing Co., Ltd.		●	●
	Isetan Mitsukoshi Holdings Ltd. Securities Report	●		
	Mitsubishi Corporation			●
	ITOCHU Corporation			●
	ASKUL Corporation	●		
Electricity, Machinery, Communication	KDDI CORPORATION			●
	NTT DATA Corporation		●	●
	Ricoh Company, Ltd.		●	
	TEIJIN LIMITED			●
	Ebara Corporation Securities Report	●		●
	Seiko Epson Corporation		●	●
	NEC Corporation	●	●	
	Panasonic Holdings Corporation	●		●
Consumer Discretionary, Pharmaceutical or Food	Kao Corporation		●	
	Shiseido Company, Limited		●	●
	SEKISUI CHEMICAL CO., LTD.	●	●	●
	Nichirei Corporation		●	●
Service (other)	Members Co., Ltd. Securities Report		●	
	Recruit Holdings Co., Ltd. Securities Report		●	

Examples of domestic and oversea scenario analysis: Overseas list by sector

Regarding the 3 steps in scenario analysis with different disclosures depending on the sector, 40 domestic and 15 oversea (in total of 55) examples aere introduced in the following slides

Sector	Company	STEP3. Identify and define range of scenarios	STEP4. Evaluate business impacts	STEP5. Identify potential responses
Energy	NRG Energy Inc (US)	●		●
	Shell plc (UK)		●	
	Woodside Energy Limited (Australia)		●	●
Transportation	Canadian National Railway（Canada）		●	
	FirstGroup plc (UK)	●	●	
	Ford Motor Company (US)			●
Materials, Buildings	The Dow Chemical Company (US)			●
	Freeport-McMoRan Inc (US)	●		●
	Newmont Corporation (US)	●		●
Agriculture, Food, and Forest Products	J Sainsbury Plc (UK)		●	
	Mondi Group (UK)		●	
Electricity, Machinery, Communication	Eaton Corporation plc (US)	●		●
	Schneider Electric SE (France)			●
Consumer Discretionary, Pharmaceutical	Burberry Group PLC (UK)		●	
	Unilever plc (UK)	●	●	

Example of Securities Report：Sompo Holdings, Inc.（Financial, 1/2）

Quantitatively discloses the impact of “policy risk” and “technological opportunities” on current asset management portfolio

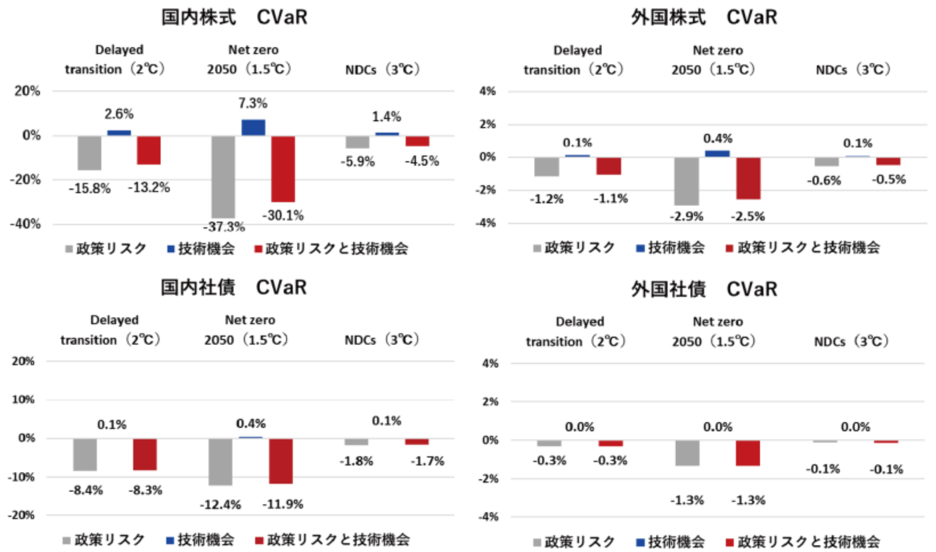
イ．移行リスク

脱炭素社会への移行が短期・中期・長期それぞれにおいて、当社に及ぼすインパクトを把握するため、下表のＮＧＦＳシナリオ※3を前提に、脱炭素社会への転換に向けた法規制の強化や世界経済の変化が企業に及ぼす「政策リスク」と気候変動の緩和や適応に向けた取組みによる「技術機会」についてMSCI社が提供するClimate Value-at-Risk（CVaR）※4を用いて、当社グループの保有資産に及ぼす影響を分析しております。詳細は、以下「a. Climate Value-at-Risk（CVaR）」をご参照ください。

加えて、移行リスク削減に向け、脱炭素化への取組みが進んでいない企業への働きかけを促進することが重要であることから、同社が提供するImplied Temperature Rise（ＩＴＲ）※5を用いて、当社の投資先企業が2100年度までに1.5℃の温暖化に抑える目標と整合的なＧＨＧ排出量削減目標を設定しているのかを定量的に分析しております。詳細は、以下「b. Implied Temperature Rise（ＩＴＲ）」をご参照ください。

※4 Climate Value-at-Risk (CVaR)
・気候変動に伴う政策の変化や災害による企業価値への影響を測定する手法の一つ。
・気候変動関連のリスクと機会から生じるコストと利益の将来価値を現在価値に割り引いたものであり、当社グループの資産運用ポートフォリオにおける各銘柄の保有時価ウェイトを考慮し、2023年3月末時点における影響度を算出。

<ＳＯＭＰＯグループ　資産別・ＮＧＦＳシナリオ別　政策リスクと技術機会のCVaR分析結果>



・政策リスク：ＧＨＧ削減目標を達成するために必要となる費用をスコープ1、2、3と段階ごとに算出した数値
・技術機会　：低炭素経済への移行を背景に、企業が保有する環境関連技術が生み出す事業機会のポテンシャルを算出した数値

- **The impact of risks and opportunities on holding assets (Domestic stocks, domestic corporate bonds, foreign stocks, foreign corporate bonds) is disclosed by each scenario.**

Described the method in which the impact of each risks and opportunities were calculated

- Policy risk：The cost needed to achieve the GHG reduction target is calculated by Scope 1,2,3 in steps
- Technological opportunity：A numerical calculation of the potential business opportunities created by companies' environmental procurement technologies in the context of the transition to a low-carbon economy

Source : Sompo Holdings, Inc., *Securities Report*, https://www.sompo-hd.com/-/media/hd/files/doc/pdf/report/2023/2023q4_report.pdf?la=ja-JP (As of January 2025)

Example of Securities Report：Sompo Holdings, Inc.（Financial, 2/2）

Reviewing asset portfolio and developing/providing climate risk consulting services to improve resilience

③　レジリエンス向上の取組み

ア．リスクへの対応

＜物理的リスク＞

損害保険契約や再保険契約は短期契約が中心であり、激甚化する気象災害の発生傾向をふまえた保険引受条件や再保険方針の見直しによって、保険金支払が想定以上となるリスクの抑制が可能です。また、グローバルな地理的分散や短期・中期の気候予測に基づく定量化、長期的なシナリオ分析による重大リスクの特定・評価などの多角的なアプローチにより、物理的リスクに対するレジリエンスの確保を図っております。

＜移行リスク＞

自社のＧＨＧ排出量削減については、スコープ1、2、3（投融資除く）で2030年60%削減（2017年比）※1、2050年実質排出ゼロにする目標を掲げております。その実現に向け、ＧＨＧ排出において特に占める割合の大きい電力に関して、LED化等の省エネへの取組みに加え、「2030年までに再生可能エネルギー導入率70%」の目標を掲げ、所有ビルの電力を再生可能エネルギー由来に切り替えるなど、目標達成に向けたロードマップに沿って着実に取組みを進めております。

※1 パリ協定の1.5℃目標水準（毎年4.2%以上削減）に整合する科学的根拠に基づく目標

投融資については、公社債の満期償還時にＧＨＧ高排出セクターから低排出セクターへの入れ替え促進や、株式保有先のうちＧＨＧ高排出の上位20社を中心とするエンゲージメントの強化により、資産運用ポートフォリオにおけるＧＨＧ排出量を2025年までに2019年比で25%削減する目標を掲げ、移行リスク軽減に取り組んでおります。

イ．機会への対応

当社グループは、気候リスクコンサルティングサービスの開発・提供、保険商品・サービスを通じた自然災害レジリエンスの向上に取り組むほか、再生可能エネルギーの普及や取引先との協業によるカーボンニュートラルに貢献する保険商品・サービスの開発・提供に取り組んでおります。

保険引受については、ソリューションプロバイダーとして社会のグリーン移行へ貢献することを目的に2024年度に脱炭素に資する保険商品を対象としたトランジション保険目標を新たに掲げました。また、2022年11月にPCAF（金融向け炭素会計パートナーシップ）が開発した企業保険分野のＧＨＧ排出量を計測する手法を用いて、保険引受先でＧＨＧ排出量（スコープ1、2）を開示している企業のデータを活用し、保険引受におけるＧＨＧ排出量の算定を行っております。

また、日本版スチュワードシップ・コードの趣旨に則り、株式を保有する企業の企業価値向上および持続的成長に関する取組方針および状況を確認するために、損保ジャパンでは毎年ESGアンケート（「ESG/サステナビリティへの取組みに関する調査」）を実施しております。2023年度は株式を保有する1,446社にアンケートを送付し、318社から回答が得られ、議決権行使のほか、各企業側のニーズの把握・協業の機会につなげ、脱炭素を含めたサステナビリティへの取組みを支援しております。

さらに、ネットゼロ社会の実現に向けて、世界の様々なイニシアティブや団体等において、規制やガイダンス策定等の議論が活発に行われております。当社グループでは、これらのルールメイキングに対して積極的に関与しリードすることにより、社会のトランスフォーメーションに貢献するとともに、これらの取組みを通じた知見の蓄積やレピュテーションの向上によってパートナーを呼び込むなどグループのビジネス機会の創出・拡大を図ってまいります。

Response to Risks

✓ **Physical Risks**

- **Review of underwriting conditions and reinsurance policies**
  ⇒ Mitigation of the risk of insurance payouts exceeding expectations
- **Analysis of physical risks**
  ⇒Quantification of risks based on short-term and mid-term climate forecasts
  ⇒Identification and evaluation of significant risks through scenario analysis

✓ **Transition Risks**

- **Response in line with the company's reduction targets and roadmap**
  ⇒60% reduction by 2030 (compared to FY 2017 levels)
  ⇒Net-zero emissions by 2050
- **Review of asset management portfolio**
  ⇒ Aiming for a 25% reduction in GHG emissions from the asset management portfolio by 2025 compared to FY 2019 levels

Opportunities

- **Development and provision of climate risk consulting services**

Source : Sompo Holdings, Inc., *Securities Report*, https://www.sompo-hd.com/-/media/hd/files/doc/pdf/report/2023/2023q4_report.pdf?la=ja-JP (As of January 2025)

Domestic Disclosure Examples：Dai-ichi Life Holdings, Inc. (Financial, 1/1)

Analysis of policy risk and opportunity and physical risk is conducted using CVaR, and the impact in each scenario is quantitatively presented in terms of "impact amount / subject asset amount

Scenario analysis

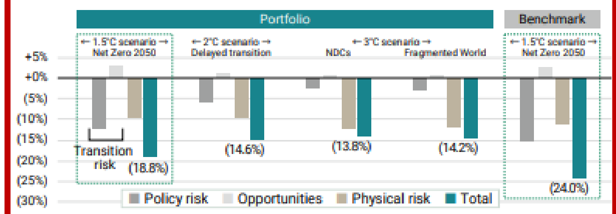
Climate change risks are expected to have a wide range of spillover pathways and could materialize over various time frames. Based on the TCFD recommendations, the Group recognizes climate change risks by classifying them into physical risks*[16] and transition risks*[17] and sorting them out by risk category. The Group assumes the examples shown in the table on the right as climate change risks that could materialize over a time frame of about three years in the short term and more than 10 years in the long term, and conducts scenario analyses for underwriting risks and market/credit risks.

As part of our efforts to understand risks related to claims and benefit payments, we have been analyzing the relationship between temperature and Dai-ichi Life's claims and benefits since FY2020, in cooperation with Mizuho-DL Financial Technology Co., Ltd. Please refer to the Sustainability Report published in the autumn of 2024 for details.

In addition, we use MSCI's CVaR methodology for analyzing those market and credit risks that constitute physical and transition risks for invested assets. The aggregated CVaR was (13.8%) for the NDCs scenario*[18] with the highest physical risk and (18.8%) for the Net Zero 2050 scenario with the highest transition risk. In comparison to the benchmark, superior results were shown in the Net Zero 2050 scenario in terms of both transition and physical risks. In addition, the implied temperature rise (ITR)*[19] of the Group's portfolio was 2.3°C.

Risk categories	Examples of major physical and transition risks
Underwriting risk	**[Physical risk]** Risk of an increase in insurance claims and benefits paid due to an increase in mortality, etc., caused by the spread of heat stroke and infectious diseases resulting from rising temperatures
Market/credit risk	**[Physical risk]** Risk of deterioration in the financial condition of a credit recipient due to damage to business facilities caused by extreme weather or disruption of supply chains in the manufacturing industry **[Transition risk]** Risk that the prices of assets held will decline as businesses are affected by decarbonization and as society increasingly chooses to invest in decarbonization
Liquidity risk	**[Physical risk]** Risk of increased insurance payouts due to extreme weather conditions and risk of inability to conduct sufficient market transactions due to market disruptions caused by natural disasters
Operational risk	**[Physical risk]** Risk of damage to data centers, business offices, and other locations necessary for operations due to extreme weather conditions, resulting in the suspension of operations **[Transition risk]** Risk of financial losses due to fines, lawsuits, etc., stemming from inadequate measures to address climate change
Reputational risk	**[Transition risk]** Risk that our business will be negatively impacted by being evaluated as inappropriate by stakeholders (due to our inadequate climate change initiatives), continued relationships with business partners that are insufficiently environmentally conscious, or other factors.

CVaR (impact/amount of subject assets)



Subject assets are Dai-ichi Life's equities and corporate bonds and Dai-ichi Frontier Life's corporate bonds, totaling approximately ¥10 trillion. Benchmarks are NOMURA-BPI corporate bonds (for domestic corporate bonds), Barclays Global Corporate Bond Index (for foreign corporate bonds), TOPIX (for domestic equities), and MSCI ACWI (for foreign equities). Data: As of March 31, 2024
Source: Reproduced by permission of MSCI ESG Research LLC
Physical risk is measured using the RCP 8.5 scenario and transition risk using the NGFS scenario.

For details, see our Sustainability Report published in the autumn of 2024
https://www.dai-ichi-life-hd.com/en/sustainability/report/index.html

- ✓ **Insurance Underwriting Risk**
  - **Analysis of the relationship between temperature and Dai-ichi Life's insurance payouts and benefits**
- ✓ **Analyzed physical risks and transition risks of investment assets using the CVaR (Climate Value-at-Risk) method**
  - **The impact of each scenario on asset holdings is shown as "Impact / Total Assets"**
  - **The analysis shows that the impact of transition risk is small, while physical risk is large in the 3°C scenario**

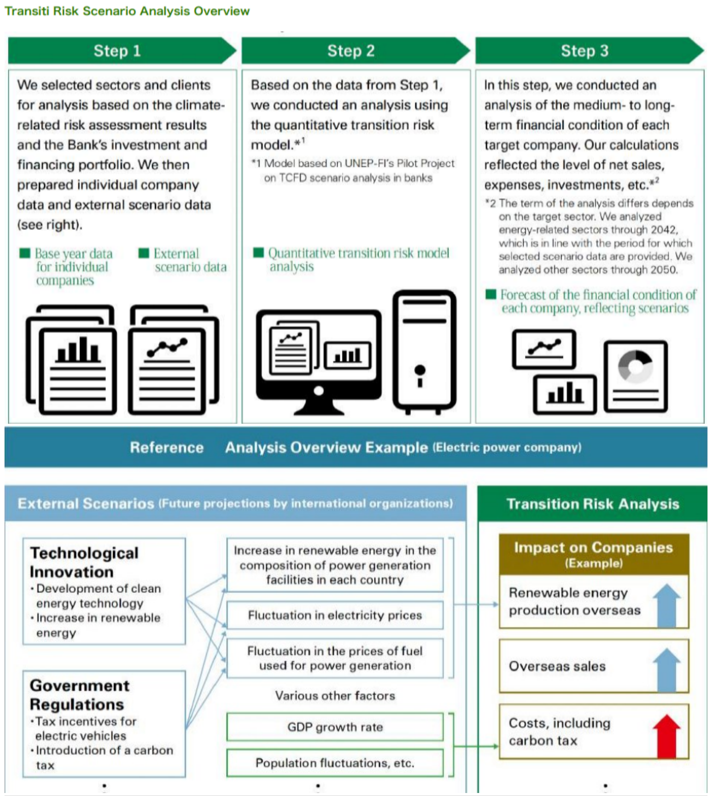
Source：Dai-ichi Life Holdings, Inc., *INTEGRATED REPORT 2024*, https://www.dai-ichi-life-hd.com/en/investor/library/annual_report/2024/pdf/index_001.pdf (As of January 2025)

Domestic Disclosure Examples：The Norinchukin Bank (Financial, 1/5)

Six unique scenarios were developed by referencing multiple external scenarios for each analytical targets

✓ **Scenarios are divided into two axes of "Dynamic" and "Static" for each temperature zone scenario of "NZE50", "Delayed Transition" and "Current Policies" and illustrated in 6 patterns**

✓ **The external scenarios referred to for each analysis are also clearly indicated**



Analysis Target	Selection Scenario	Complementary Scenario
Energy (Electricity, Oil-Gas-Coal)	NGFS ●Current Policies ●Delayed Transition ●Net Zero 2050	IEA World Energy Outlook 2021—SDS、STEPS ●SDS stands for Sustainable Development Scenario ●STEPS stands for Stated Policies Scenario
Food and agriculture, beverages		FAO Food and agriculture projections to 2050—TSS, BAU ●TSS stands for Towards Sustainability Scenario ●BAU stands for Business As Usual
Chemicals		IEA Energy Technology Perspectives 2022—STEP、SSDS IEA Ammonia Technology Roadmap October 2021 —STEPS、SDS

Six-Way Scenario Analysis

	Dynamic Approach (An approach reflecting new capital investments in response to market demand)	Static Approach (An approach reflecting the status quo without additional capital investment)
Current Policies (a scenario that assumes that only policies currently in place will be retained)	Current Policies × Dynamic	Current Policies × Static
Delayed Transition (Scenario in which annual GHG emissions do not decline by 2030, followed by strong emissions reduction policies)	Delayed Transition × Dynamic	Delayed Transition × Static
Net Zero 2050 (a scenario that limits global warming to 1.5°C through rigorous climate policy and technological innovation, achieving net zero global CO_2 emissions in or around the year 2050)	Net Zero 2050 × Dynamic	Net Zero 2050 × Static

Six original scenarios are set up for each temperature range and approach to new capital investment

About the NGFS Scenario Used in Analysis

●Our transition risk scenario analysis adopts version 2 of the NGFS scenario published in 2021. Of the three NGFS models, we analyze scenarios using the values of the REMIND-MAgPIE model. These values were also used in the Pilot Scenario Analysis Exercise on Climate-Related Risks Based on Common Scenarios by the Financial Services Agency and the Bank of Japan, the results of which were published in August 2022.

Overview of NGFS Scenarios Analyzed

	NetZero 2050	Delayed Transition	Current Policies
Overview	Limits rise in global temperatures to 1.5°C through strict climate policies and technological innovation, reaching net zero CO_2 emissions by 2050	Assumes annual CO_2 emissions will not decrease until 2030, followed by strict policies	Assumes that only current policies will be retained
Rise in temperature (by 2100)	Less than 1.5°C	Approx. 1.8°C	Approx. 3°C

Source：The Norinchukin Bank, *SUSTAINABILITY REPORT 2024,* https://www.nochubank.or.jp/en/sustainability/pdf/2024/all_en.pdf (As of January 2025)

Domestic Disclosure Examples：The Norinchukin Bank (Financial, 2/5)

Quantitative disclosure of the results of each scenario for transition risk and physical risk, with detailed description of the analysis steps

- ✓ **Quantitative analysis by sector**
- ✓ **The impact of transition risk on the credit portfolio is described as limited**

Transition Risk Scenario Analysis Results

●Electricity and Oil-Gas-Coal Sectors

In every scenario, greater demand for renewable energy and stricter regulations on carbon emissions in various countries would result in stranded fossil fuels and reduced market demand. Business whose profits depend on fossil fuel prices will likely see declining performance. On the other hand, companies that view renewable energy as a climate change opportunity tend to increase revenues through capital investment.

●Food and Agriculture and Beverages Sectors

In every scenario, the global demand for food will increase due to global population growth and other factors. This demand will lead to increased production and increased profits for companies engaged in global business activities. On the other hand, companies whose operations are limited to a specific region may see revenues increase or decrease depending on the characteristics of the region (changes in food culture, population increase or decrease, etc.), and the results of the analysis are mixed.

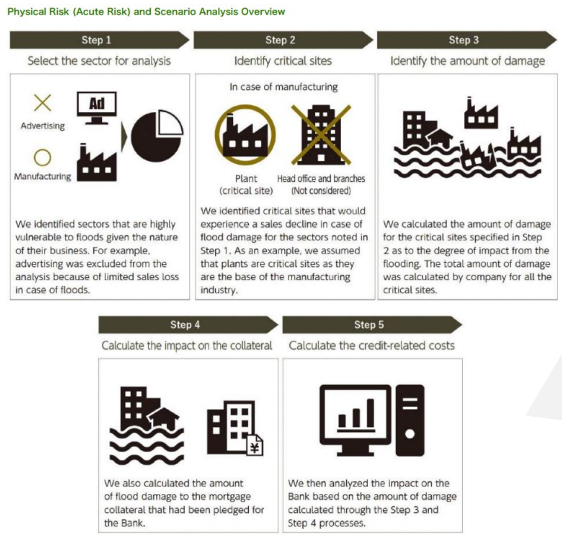
●Chemicals Sector

Results varied depending on the chemical products manufactured and the region in which the company operates. The Delayed Transition Scenario toward decarbonization and the Net Zero 2050 scenario resulted in slower economic growth. These scenarios revealed relatively lower demand for each chemical product compared to the Current Policies Scenario, with the exception of certain products. On the other hand, demand for hydrogen and ammonia as fuels that do not emit CO2 directly is likely to increase. Demand for functional chemical products used as battery materials is also likely to increase with the wider adoption of electric vehicles; however, price shifts to products should be limited in nature.

●Impact on Credit Portfolio

The total impact of transition risk in the three aforementioned sectors could increase the cost of credit by between 3 billion yen to 22 billion yen per year through the year 2050 (the range is the difference between the Dynamic and Static approaches). The impact on our credit portfolio would be limited.

- ✓ **Calculate the credit costs and asset impairment amounts for the group due to physical risk**



Detailed description of analysis steps

- STEP1: Narrow down the industries
- STEP2: Identify critical business sites
- STEP3: Identify the amount of damages
- STEP4: Calculate impact on collateral
- STEP5: Calculate credit-related expenses

Physical Risk (Acute Risk) Analysis Overview

Subject of Analysis	(1) Key domestic and overseas locations of borrowers expected to be affected by flooding (2) Real estate collateral pledged to the Bank (3) Assets at the Bank Group domestic and overseas locations (buildings and fixtures)
Not Subjected to Analysis	Industries where flood damage is not expected (e.g., advertising, publishing, finance, etc.)
Analysis Scenario	IPCC RCP2.6 and RCP8.5
Measurement Results	Cumulative additional losses of approximately ¥23 billion through the year 2100 (credit costs plus damage to Bank Group assets)

Source : The Norinchukin Bank, *SUSTAINABILITY REPORT 2024,* https://www.nochubank.or.jp/en/sustainability/pdf/2024/all_en.pdf (As of January 2025)

Domestic Disclosure Examples：The Norinchukin Bank (Financial, 3/5)

Quantitative analysis of the impact of physical risks on the income of rice, milk, and beef cattle producers in the agricultural sector, separately indicated for cases where measures were taken into deal with rising temperatures and cases where no measures were taken

✓ **Conducted a scenario analysis of chronic risks to the agricultural sector that may have an impact on business continuity. Quantitative analysis of the impact on producers' income, despite the lack of analytical methodology, insufficient data, and model complexity**

Physical Risk (Chronic Risk) Analysis

The Norinchukin Bank is committed to achieving Net Zero by 2050 across our investees and borrowers. In conjunction, we pursue an increase in the income of farmers, fishermen and foresters as a 2030 medium- to long-term goal in support of sustainable agriculture, fishery and forestry industries and local communities. Given that the agriculture, fishery and forestry industries are vulnerable to the effects of climate change, we endeavor to analyze the impact of climate change on the incomes of participants in these industries.
For chronic risk, we selected agriculture and fisheries as sectors to analyze. These industries are important to the Bank, which serves the agriculture, fishery and forestry industries. We chose rice cultivation, livestock production (raw milk and beef cattle), and ocean fisheries (bonito) as target commodities to analyze. Our analyses addressed the impact of climate change, including increases in air and ocean surface temperatures, on producer and fisher income, as well as adaptive measures.
This analysis estimated the change in revenue as of the end of the 21st century compared to the end of the 20th century in two scenarios: (1) one in which no measures are taken to adapt to rising temperatures and (2) one in which measures are taken to adapt to rising temperatures. We adopted the IPCC RCP 2.6 and RCP 8.5 scenarios ("2°C increase" and "4°C increase," respectively) for analysis, conducting a total of four analyses.

Step 1
Estimate the impacton production volume
We analyzed the change in production volume due to climate change. We considered the impact of climate change, for example, higher air temperatures and the precipitation variations regarding rice cultivation.

Step 2
Estimate the impact on prices
We estimated the impact on product prices due to variability in quality or other factors caused by climate change.

Step 3
Provisionally estimate the impact on revenue
We analyzed the impact on revenue for producers considering the analysis in Steps 1 and 2.

Analysis method: Rate of change in production volume + Rate of change in product prices = Rate of change in revenue

The following provides a summary of the results of chronic risk analysis for the agricultural sector. The results indicate a decline in income due to the effects of climate change. However, it may be possible to achieve flat income levels through adaptive measures.

	Scenario	Production Volumes	Price	Income Without Adaptive Measures	Income Introduction of Adaptative Measures
Rice Crop	4°C rise	-6.4%	+1.4%	-5.0%	+3.5%
	2°C rise	+3.3%	-1.6%	+1.7%	-
Raw Milk	4°C rise	-1.1%	+0.9%	-0.1%	±0.0%
	2°C rise	-0.2%	+0.2%	±0.0%	-
Beef Cattle	4°C rise	-1.2%	+0.6%	-0.6%	±0.0%
	2°C rise	-0.3%	+0.2%	-0.2%	-

The following provides a summary of the results of chronic risk analysis for the fisheries sector. The results indicate regional variances in income due to the effects of climate change. However, it may be possible to limit income declines through adaptive measures.

	Scenario	Production Volumes	Price	Income Without Adaptive Measures	Income Introduction of Adaptative Measures
Ocean fishing (bonito)	4°C rise	-9.2% ～+4.7%	-0.6% ～+1.3%	-8.0% ～+4.0%	-7.6% ～+4.0%
	2°C rise	-9.2% ～+9.5%	-1.2% ～+1.3%	-8.0% ～+8.1%	-6.1% ～+4.0%

Our analysis includes several assumptions and hypotheses due to the many limitations in scenario analysis models for the agriculture and fisheries sectors. These limitations include 1) a lack of available methodologies established globally, 2) incomplete data, and 3) diversified and complicated impact channels. Note that impacts may differ from the actual impact on agriculture and fisheries management, as our analysis targets revenue, not income (i.e., the amount after deducting expenses, etc., from revenue).

These limitations include
1) available methodologies established globally
2) Incomplete data
3) Diversified and complicated impact channels

Source : The Norinchukin Bank, *SUSTAINABILITY REPORT 2024,* https://www.nochubank.or.jp/en/sustainability/pdf/2024/all_en.pdf (As of January 2025)

Domestic Disclosure Examples：The Norinchukin Bank (Financial, 4/5)

For transition risk, the company plans on upgrading scenario analysis through expansion of target sectors and additional analysis of 1.5°C scenarios. Publishing future projections for investments and loans considering climate change risks

✓ **Assuming the impact of transition risk and carbon neutrality in 2050, upgrading of scenario analysis is underway through expansion of target sectors and analysis using the 1.5°C scenario**

Methodology for Transition Risk Scenario Analysis

■ Targets and sectors analyzed

Based on the results of our qualitative assessment of climate change-related risks, we selected the electricity, oil-gas-coal, food and agriculture, and beverage sectors as targets for transition risk scenario analysis. The electricity and oil-gas-coal sectors have been identified in the final TCFD report and SASB as sectors having high carbon emissions and highly vulnerable to transition risks. Our selection was based on initiatives consistent with these global views. We selected the food and agriculture and beverages sectors based on the results of our climate change qualitative assessment, as well as the fact that these two sectors form the foundation of the Bank. Given our investment and loan portfolio, the analysis covers not only domestic and overseas borrowers, but also our investees in corporate bonds.

■ Analysis scenario data

We use three scenarios published by the NGFS. Specifically, we adopted three future scenarios for our analysis. We used the *Current Policies* scenario, which assumes that only the policies currently in place are maintained, and the assumption that annual greenhouse gas (GHG) emissions will not decrease by the year 2030. We then used the *Delayed Transition* scenario, in which strong policies are implemented to limit global warming to 1.5°C through rigorous climate policy and technological innovation. And last, we used the *Net Zero 2050* scenario, which assumes net zero global CO_2 emissions will be achieved in or around the year 2050. We predicted the impact on the Bank's investees and borrowers , while also analyzing the increase or decrease in credit costs. We formed our predictions by combining the Dynamic approach, in which companies make new capital investments in response to climate change, and the Static approach, in which companies do not make additional capital investments in response to climate change.

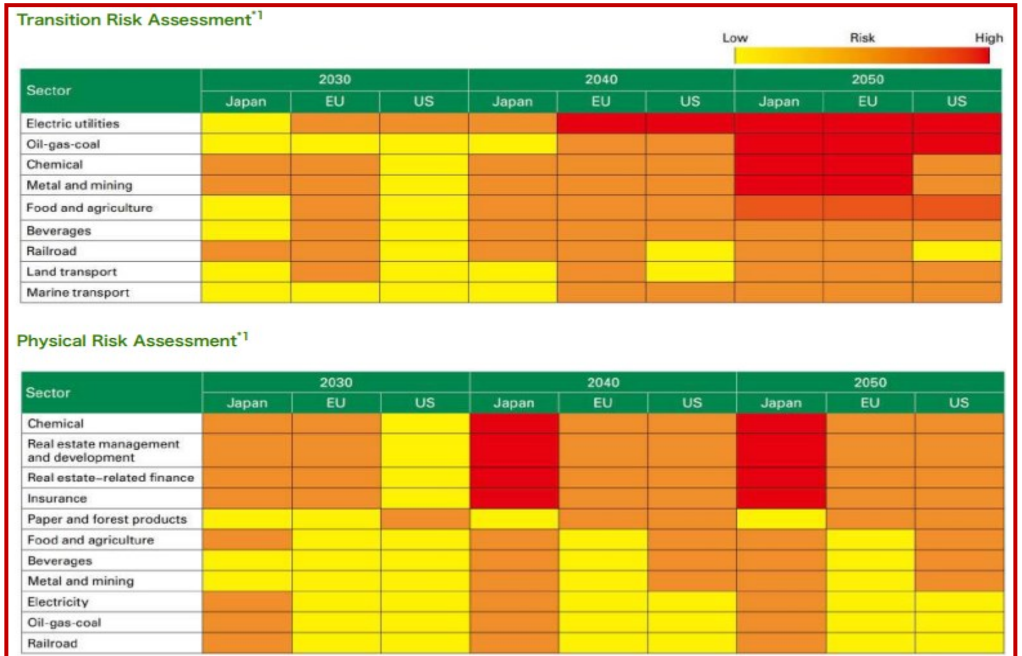
- In connection with the NGFS scenario for which we lacked sufficient data, our analysis of the electricity and oilgas- coal sectors incorporated various forecast data from the IEA World Energy Outlook 2021, which is widely used both in Japan and internationally. Data was taken from the Sustainable Development Scenario (SDS), which is a set of measures consistent with achieving the 2°C target of the Paris Agreement, the Stated Policies Scenario (STEPS), which incorporates currently announced policies and targets, and the *Net Zero Emissions by 2050 Scenario*.
- In connection with insufficient data for the analysis of the chemical sector, we referred in part to the IEA's Energy Technology Perspectives 2022 and the STEPS and SDS scenario data contained in the IEA's Ammonia Technology Roadmap October 2021.
- For the food and agriculture and beverage sectors, we used as complementary data various FAO forecast data, Toward Sustainability Systems (TSS) Scenario in which where positive change is required to establish sustainable food and agriculture systems, and Business As Usual (BAU) Scenario, in which past trends and policy directions are maintained as the status quo.

■ Efforts to increase the sophistication of scenario analysis models

- We began disclosing the results of our scenario analysis with our Sustainability Report 2021. We also strive to improve the sophistication of our models to utilize analysis results to better explanation of our position and conducting engagement (constructive dialogue).
- As an example, we made improvements by replacing parameters (variables) in the analysis model to make the analysis results more precise and consistent with real-world perspectives. We will continue to refine the results of our analysis by upgrading our models as necessary.

Climate Change-Related Risk Assessment by Sector

The impact of climate change will become even more apparent over the medium- to long-term, and will vary depending on the sector in which our investees and borrowers operate. Therefore, we evaluated where and when transition and physical risks would occur in the targeting sectors and other areas defined by the TCFD recommendations.
The occurrence of risks associated with climate change is caused by various external factors, environments, and spillover channels. We created the table below after identifying these risks and factors. The table shows (in chronological order) the impact of these risks on the sectors in which the Bank has most financial exposure. Our analysis also reflects the effects of climate change occurring at different times according to region, geographic conditions, and legal regulations. As one example, transition risks in the EU are expected to occur early due to environmental regulations being adopted ahead of the rest of the world.



*1 Transition risks are assessed based on a 2°C scenario in which policy measures mitigate climate change, while physical risks are assessed based on a 4°C scenario in which global warming advances.

Source：The Norinchukin Bank, *SUSTAINABILITY REPORT 2024,* https://www.nochubank.or.jp/en/sustainability/pdf/2024/all_en.pdf (As of January 2025)

Domestic Disclosure Examples：The Norinchukin Bank (Financial, 5/5)

As for expanding opportunities, the company sets mid to long-term target of 10 trillion yen in new sustainable finance in 2030. Aiming to integrate business strategies with environmental and social responses, including climate change

✓ **Based on the impact of climate change on the agriculture, forestry, and fisheries industries, such as stranded assets in the portfolio and wind and flood damage, the plan describes investment and financing plans that lead to the development of the agriculture, forestry, and fisheries industries from an environmental and social perspective, on the premise of securing earnings through the acquisition of business opportunities.**

The Norinchukin Bank Sustainable Finance

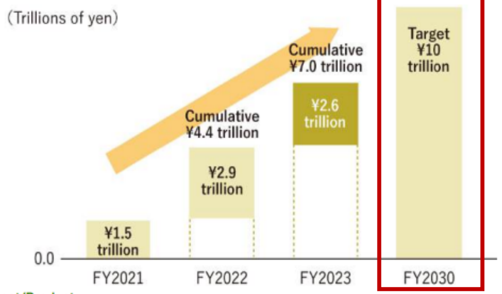
As a member of a cooperative organization supporting agriculture, fishery and forestry industries, the Norinchukin Bank understands that our businesses are part of the life, natural environment, and the affluent lives of community members sustained through these industries. As such, we aim to resolve environmental and social issues through sustainable finance.
We set a target ¥10 trillion in new finance between fiscal 2021 to 2030.

Our sustainable finance refers to the following:
- Investment and finance with ESG-related third-party certification
- Investment and finance that integrate ESG/SDGs factors into investment strategy and decision-making
- Investment and finance for environmental and social businesses
- Procuring sustainability related financing

Sustainable finance includes loans originated through our group company the Norinchukin Trust & Banking Co., Ltd., external management contracts of ESG funds managed by Norinchukin Zenkyoren Asset Management Co., Ltd., as well as investment and finance through Norinchukin Australia Pty Limited and Norinchukin Bank Europe N.V.

Results

The Bank financed a cumulative ¥7.0 trillion in new sustainable finance by fiscal 2023.



Breakdown by Asset/Product

Investment and loan	Marketable assets, etc.	Approx. ¥4.3 trillion
	Project finance	Approx. ¥1.5 trillion
	ESG-linked loans	Approx. ¥1.0 trillion
	Investment and finance total	Approx. ¥6.7 trillion
Procurement	Green bonds and green deposits	Approx. ¥0.3 trillion

Investment and Finance for the Resolution of Environmental and Social Issues

Investing in European Investment Bank Sustainability Awareness Bonds

The Bank invested a total of A$300 million in sustainable awareness bonds (the "Bonds") issued by the European Investment Bank. We plan to use these Bonds, which focus on natural disasters and risk management, for global activities and projects that help create a sustainable environment and society. The importance of measures for climate change natural disaster adaptation increases each day as climate change has caused increasingly severe natural disasters around the world in recent years. The Bank is committed to investing in bonds to contribute to safe and sustainable urban development, providing funds for infrastructure development and contributing to natural disaster risk management.

> Resolving Social Issues Through Finance

Worldwide Action in Project Finance

In our investment business, we are fully engaged in project finance. Unlike corporate finance, which provides loans according to the creditworthiness of the corporation receiving the loan, project finance targets a specific business/project and then evaluates its profitability before financing.

Project Finance Case Studies

Environmental Sector

Loan balance: ¥1,120 billion

The Bank provides financial support for renewable energy projects such as offshore wind and submarine transmission lines in the UK and continental Europe, as well as solar power generation in the Middle East and Japan.

Social Sector

Loan balance: ¥1,266.4 billion

The Bank provides financial support for water treatment projects in Australia and the Middle East, as well as other social infrastructure projects such as schools, hospitals, and other public facilities in Australia, the UK, and the Middle East.

Source：The Norinchukin Bank, *SUSTAINABILITY REPORT 2024,* https://www.nochubank.or.jp/en/sustainability/pdf/2024/all_en.pdf (As of January 2025)

Domestic Disclosure Examples：Mizuho Financial Group (Financial, 1/3)

Worldview is quantitatively described for each sector and scenario

- **Specify the referenced external scenario and describe the worldview based on the reference scenario quantitatively and qualitatively for each business to be analyzed**

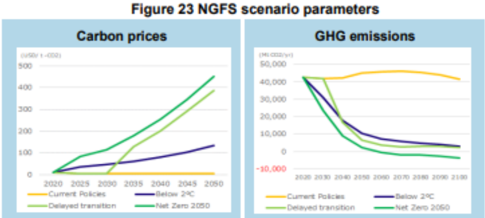
(4) Scenario analyses

Mizuho conducts scenario analyses for both transition risks and physical risks in order to understand the future impact of climate change on our Group's portfolio. The analyses use four NGFS scenarios, including the 1.5°C scenario, to increase the flexibility of plans and the resilience of strategies in anticipation of various future climate change-related outcomes.

i. Scenario assumptions and implications for Mizuho

Scenario		Current Policies	Below 2℃	Delayed Transition	Net Zero 2050
Scenario narrative		This scenario assumes that current policies are maintained.	This scenario assumes that climate-related policies gradually become more stringent and the rise in the average global temperature is limited to below 2°C. Policy responses proceed quickly and smoothly, but technological innovation is gradual.	This scenario assumes that annual emissions do not decline until 2030 and very tough policy responses are needed to keep the temperature increase below 2°C. Rapid progress is made in developing more stringent policy responses and in technological innovation.	This scenario assumes CO_2 emissions reach net zero around 2050 due to smooth and quick policy responses and rapid technological innovation.
Main assumptions	Temperature increase by 2100	+3.0℃	+1.8℃	+1.8℃	+1.5℃
	GHG emissions	Net zero not achieved even in 2100	Net zero not achieved even in 2100	Net zero not achieved even in 2100	Net zero achieved by the 2050s
	Carbon pricing	Levels are nearly zero	Rises from the outset	Rises from 2030 on	Rises rapidly from the outset
	Business structural transformations	Almost none expected	Progress from the outset	Progress made from 2030 on	Rapid progress from the outset
Implications for Mizuho	Transition risks	Low			High
	Physical risks	High			Low
	Opportunities	Low			High
	Summary	The impact of physical risks will be substantial, as the severity of disasters increases along with rapid temperature increases. Although the impact of transition risks will be limited, because almost no business structural transformations are expected, associated demand for financing by clients will be low.	Although the impact of transition risks will be limited, demand for financing associated with next-generation technology and decarbonization measures may be relatively low because clients use their own funds.	Attention must be given to risk management, because the impact of transition risks may cause client business performance to deteriorate. There will be demand for financing from clients from 2030 onward for next-generation technology and decarbonization measures to keep temperature increases to below 1.8°C.	Compared to the other scenarios, the impact of physical risks will be limited, but attention must be given to risk management, because the impact of transition risks may cause client business performance to deteriorate. Demand for financing from clients will increase from current levels for next-generation technology and decarbonization measures to keep temperature increases to below 1.5°C.

Figure 23 NGFS scenario parameters

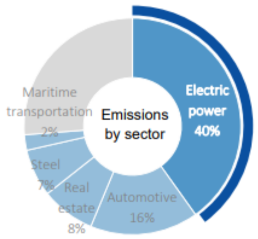


Source: NGFS Scenarios (Phase III) (all figures on a global basis)

Referring to NGFS scenarios and provide an overview of each scenario

a. Outlook for the electric power sector

Global CO_2 emissions
(End energy consuming sectors)



Source: IEA WEO 2023

Key points from scenarios and policies looking ahead to 2030 / 2050

Key points from the IEA NZE scenario
- Global demand for electric power will rise significantly by 2050 (increase by 150% from 2022 levels in 2050) due to population and income growth and the electrification of end-user applications.
- Electric power generation from low emission sources (renewable energy, nuclear, fossil fuels with CCS, hydrogen and ammonia generation) will increase 7-fold by 2050, covering almost 100% of global electric power generation.
- Renewable energy installations capacity will triple by 2030, mainly from solar and wind power.
- Share of coal-fired power generation without emission reduction measures will be less than 15% in 2030.
- Natural gas-fired power generation will peak before 2030 and be completely phased out by 2050.

Key points from Japan's policies
- Spread usage of renewable energy and make it the major source of electric power (FY2030 target as a percentage of all power sources: 36% to 38%).
- Make maximum use of nuclear power (FY2030 target as a percentage of all power sources: 20% to 22%).
- Establish electricity market for carbon neutrality (ensure supply and adjustment capacities and protect electric power consumers).

Technology road map toward decarbonization

		Short term (through 2025)	Medium term (through 2030)	Long term (through 2050)
Carbon-free power sources	Renewable energy / Nuclear power	Expansion of solar and onshore wind farms	**Maximize use of renewables and nuclear power** Installation of large offshore wind farms	Next-generation solar power Floating offshore wind farms Innovative next-generation reactors
	Hydrogen and ammonia power generation / CCUS, etc.	Mixed fuel pilot projects CC(U)S pilot projects	**Incentives to decarbonize thermal power generation** Mixed fuel implementation Single fuel pilot projects CC(U)S pilot projects	Single fuel implementation CC(U)S implementation
Shutdown and abolition of thermal power generation		**Shutdown and abolition of existing thermal power generation**		
Enhancements and improvements to power transmission and distribution grids		**Enhancements to power transmission and distribution grids**		

Source: Prepared by the Mizuho Financial Group with reference to the *IEA World Energy Outlook 2023*, the Ministry of Economy, Trade and Industry's Transition Finance Roadmap (Power Sector), the *Basic Policy for the Realization of GX*, and other publicly available materials

Expressing quantitative and qualitative description of the worldview under the reference scenario for each target project(Besides electricity, it spans a wide range of industries such as coal, steel, and others)

Source：Mizuho Financial Group, *Climate & Nature-related Report 2024*, https://www.mizuhogroup.com/binaries/content/assets/pdf/mizuhoglobal/sustainability/overview/report/climate_nature_report_2024.pdf (As of January 2025)

Domestic Disclosure Examples：Mizuho Financial Group (Financial, 2/3)

When assessing business impact, credit costs are quantitatively analyzed for each scenario as well as resilience to climate change is expressed as "financial impact is limited"

- ✓ **Quantitatively describes the financial impact of risks and shows trial calculation results of credit costs by scenarios**
- ✓ **By stating that the financial impact is limited, it also states the company is resilient to risks**

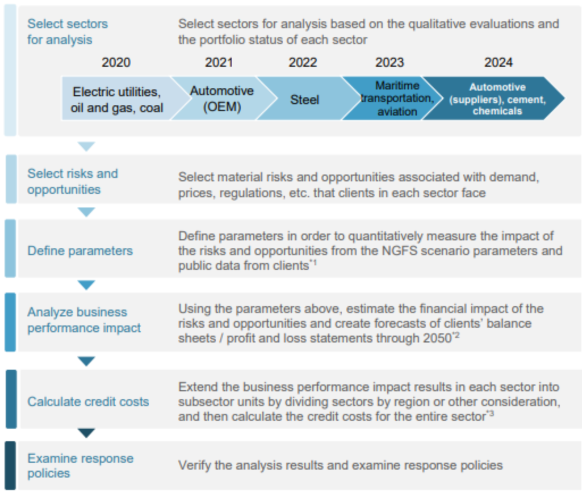
ii. Transition risk scenario analyses

The scenario analyses for transition risks are used to evaluate the impact on client businesses caused by regulatory, technological, market, and other changes and to analyze the increase in credit costs. The automotive (suppliers), cement, and chemical sectors were added this time to the sectors subject to analysis.

Table 7 Overview of transition risk analyses (changes from previous report are underlined)

Reported value	Cumulative increase in credit costs through 2050 caused by the impact of transition risks
Scenarios	NGFS Current Policies, Below 2°C, Delayed Transition, and Net Zero 2050 scenarios
Targeted regions	Japan and overseas
Targeted sectors	Electric utilities, oil and gas, coal, steel, automotive (OEM and suppliers), maritime transportation, aviation, cement, and chemical sectors
Analysis scope	Total of loans, foreign exchange, acceptances and guarantees, commitment lines, etc. (as of March 31, 2024)
Analysis details	Credit costs associated with deteriorating client business performance

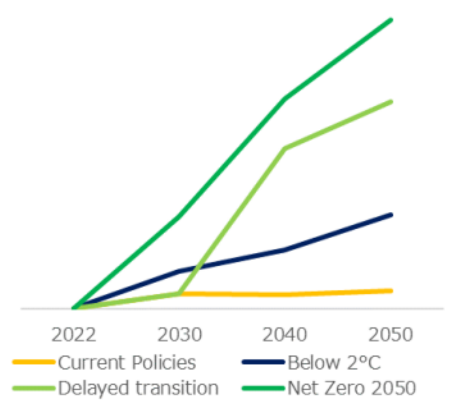
a. Analysis process



*1. The analysis used parameters from the NGFS scenarios (Phase III) and for parameters not accounted for in the NGFS scenarios, we referred to IEA and other references and supplemented the parameters with conservative assumptions.
*2. Please refer to Appendix p. 105 – 108 for sector-specific risks and opportunities, an overview of the analysis, and a synopsis of the scenarios.
*3. Exposure as of March 31, 2024 is assumed to remain constant through 2050.

b. Scenario analysis results

Figure 24 Changes in cumulative credit cost increases by scenario



Scenario	Cumulative increase in credit cost through 2050 (difference from the Current Policies scenario)
Net Zero 2050	Approx. JPY 1,910.0 billion
Delayed transition	Approx. JPY 1,330.0 billion
Below 2°C	Approx. JPY 530.0 billion

While Mizuho may experience some financial impact over the medium to long term, any impact on its short-term financial soundness is limited.

Credit costs increase sharply from the outset in the Net Zero 2050 scenario, and after 2030 in the Delayed Transition scenario. A breakdown by sector shows that the main contributors to the increase in credit costs are the steel and oil and gas sectors. According to the NGFS and other parameters, these sectors increase credit costs because of the considerable investments required for their business structural transformations and because of their large carbon costs, as GHG emissions, will still be present even in 2050. In all sectors, not just the steel and oil and gas sectors, credit costs may increase significantly in the phase when carbon prices shoot up while client measures to reduce GHG emissions are not fully implemented. From this, we confirmed the importance of promoting business structural transformations as early as possible, prior to the materialization of medium and long term risks, through in-depth engagement with clients.

In both the Below 2°C scenario, which assumes a quick and smooth response to climate change (an orderly transition), and the Delayed Transition scenario, which assumes an initial delayed response to climate change and a rapid transition from 2030 onward (a disorderly transition), the global average temperature increase is kept below 2°C. However, the credit costs are much smaller in the Below 2°C scenario, which confirms the importance of making an orderly transition.

Source：Mizuho Financial Group, *Climate & Nature-related Report 2024*, https://www.mizuhogroup.com/binaries/content/assets/pdf/mizuhoglobal/sustainability/overview/report/climate_nature_report_2024.pdf (As of January 2025)

Domestic Disclosure Examples：Mizuho Financial Group (Financial, 3/3)

Demonstrates increasing resilience to climate change by providing solutions tailored to engagement and customer segments

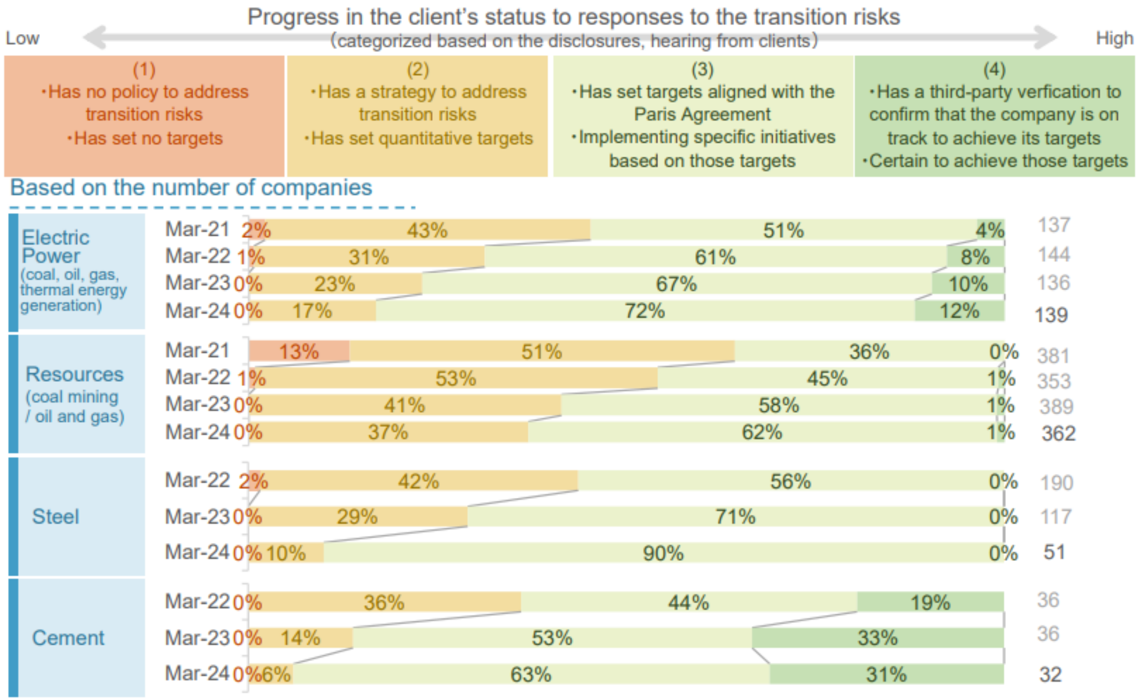
✓ **Clarifies that Mizuho intends to increase resilience of both its business partners and Mizuho themselves by tightening engagement and providing solutions**

iii. Client progress on transition risk responses

Mizuho confirms the status of client transition risk responses through engagement and supports transition responses in a phased manner. We saw steady progress by clients in all sectors on responding to transition risks compared to the previous year (Figure 41).

We will continue to practice engagement and provide financial and non-financial solutions to facilitate our clients' progress on decarbonization initiatives and on responding to transition risks. In this way, we will improve climate change resilience for both Mizuho and our clients. We will also continue to monitor the status of clients' transition risk responses after enhancing the evaluation criteria as described on p.66.

Figure 41 Client progress on transition risk responses*



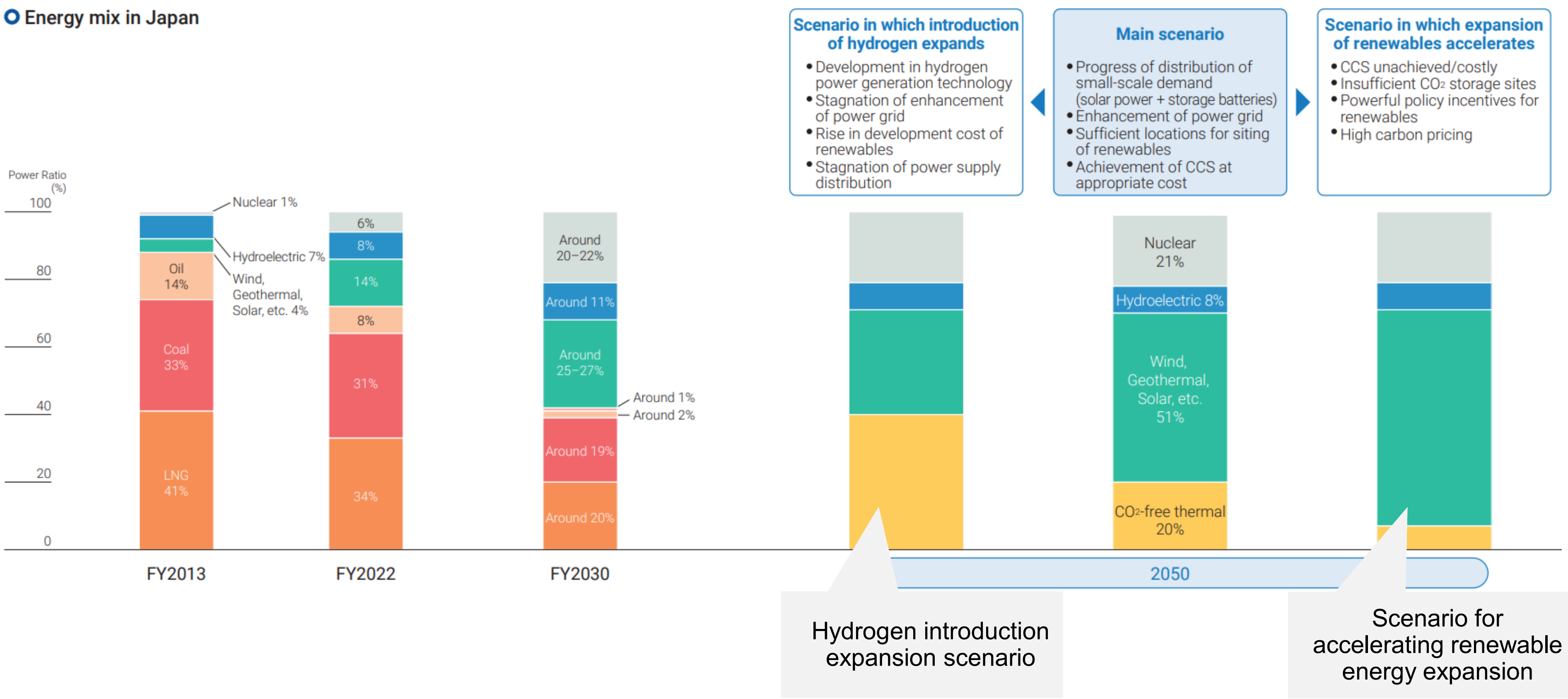
Source : Mizuho Financial Group, *Climate & Nature-related Report 2024*, https://www.mizuhogroup.com/binaries/content/assets/pdf/mizuhoglobal/sustainability/overview/report/climate_nature_report_2024.pdf (As of January 2025)

Domestic Disclosure Examples ：J-POWER（Energy, 1/2）

Conducted scenario analysis for 2030 and 2050, including Japanese government's NDC (National Reduction Target) for 2030, and a 1.5℃ scenario for 2050

✓ **In the 2050 scenario analysis, selecting the APS scenario as the main scenario as well as referring to Japan's 2050 power mix in the APS scenario**

✓ **Considering large impact on the group, the group created its own scenarios for cases when assumptions of renewable energy and thermal power generation are varied, and applied them in the analysis**



Source : J-POWER Group, *J-POWER Group Integrated Report 2024*, https://www.jpower.co.jp/english/ir/library/pdf/2024/jpower_integrated2024_e_all.pdf (As of January 2025)

Domestic Disclosure Examples ：J-POWER（Energy, 2/2）

In the 2030 scenario analysis, financial impact on thermal power and renewable energy businesses is calculated and quantitatively disclosed

✓ Estimating financial impact on thermal power and renewable energy businesses in 2030 scenario analysis

Strategy: 2030 Scenario Analysis—Estimated Financial Impact—

As a result of several steps—the implementation of carbon pricing, support for the development and introduction of CO_2 emission reduction measures, and more—to reach carbon neutrality in 2050, it is anticipated that Japan's energy costs would rise in the future. Although the estimated financial impact contains information that will result in higher expenses, the J-POWER Group will work to control rising energy bills using methods that are economically sound.

○ Financial impact in 2030: According to our reduction target (46% reduction; reduction of 22.5 million tons) (1/2)

	Factors	Calculation details	Impact in value
Thermal power	Phase-out of inefficient coal-fired thermal power plants	• An estimated 10 billion yen decrease in ordinary profit mainly due to the closure of inefficient coal-fired thermal power plants *In cases where such coal-fired plants are maintained as standby power sources, no additional impact was assumed based on the assumption that institutional support will be provided.	Decrease in profits of approx. 10 billion yen
Thermal power	Carbon pricing (CP)	• Calculated assuming a carbon price of \$40/t in 2030, based on our internal carbon pricing (ICP) standard scenario; Increase in costs of approx. 150 billion yen • Predicting the precise impact is challenging due to the expected rise in non-fossil value and associated revenue from CO_2-free power sources and the potential for part of the cost to be passed on to power charges • Impact on carbon pricing will be regularly reconsidered paying close attention to Japan's energy policies to achieve green transformation (Exchange rate: 1US\$=142 yen) Impact on CP = CP (\$40-tCO_2) × CO_2 emissions (26.30 million t-CO_2)	–
Thermal power	Biomass/ammonia mixed combustion Introduction of CCS	• When reducing CO_2 emissions, the application of decarbonization options is deemed beneficial if the following formula holds. • Reduction measures to be applied to CO_2 emissions around 3 million tons: **CO_2 reduction cost** is assumed at 12–54 billion yen. • Reduce impact using policy support, etc. Work to make the CO_2 reduction cost to be lower than the CO_2 cost. CO_2 price > CO_2 reduction cost − Support system Biomass/ammonia mixed combustion: 2030 CP (yen/tCO_2) × CO_2 reduction achieved by using carbon-neutral fuel > Power generation volume (kWh) using carbon-neutral fuel × (Cost of mixed combustion with carbon-neutral fuel (yen/kWh) − Power generation cost using coal only (yen/kWh)) − Policy support Introduction of CCS: CP in 2030 (yen/tCO_2) > Separation and capture expenses (yen/tCO_2) + Transportation expenses (yen/tCO_2) + Storage expenses (yen/tCO_2) − Policy support	–
Thermal power	GENESIS Matsushima Plan	• By adding gasification facilities and other equipment to the existing Matsushima Thermal Power Plant and "upcycling" it, we aim to reduce CO_2 emissions by 10% as soon as possible while contributing to a stable supply. We will pursue CO_2-free hydrogen power generation in the future. • Use the Long-Term Decarbonization Power Source Auction to recoup capital expenditures and other fixed costs.	0
Thermal power	Reduction in coal-fired thermal power repair expenses and renewal investment	• Constraining repair expenses and renewal investment for coal-fired thermal power plants prior to reduction of operations anticipated from 2030. • Actual repair costs for, as well as investments to replace, coal-fired thermal power will require about 45 billion yen per year, while investment for renewal will require about 20 billion yen per year. We will work to reduce some of these expenses.	+α

	Factors	Calculation details	Impact in value
CO_2-free power sources	New development of renewable energies	• Estimated from the power generation value from new development of renewable energy and non-fossil value Power generation volume of renewable energies: FY2022 → +4.0 billion kWh → FY2030	Profit increase of 10 billion yen and above
CO_2-free power sources	Expansion of revenues for existing renewable energy	• Enhance the non-fossil value of existing renewables (10 billion kWh)	
CO_2-free power sources	Ohma Nuclear Power Station (under construction)	• The impact of the project has not been included in the financial impact estimation as it is currently under review based on the new regulatory criteria.	–

✓ **For the impact on thermal power, estimates a decrease in profit of approximately 10 billion yen due to a decrease in sales volume**

✓ **Listing prerequisites based on the assumed worldview.**
- Carbon price: 700~3,000 yen/tCO2

Source : J-POWER Group, *J-POWER Group Integrated Report 2024*, https://www.jpower.co.jp/english/ir/library/pdf/2024/jpower_integrated2024_e_all.pdf (As of January 2025)

Domestic Disclosure Examples ：The Chugoku Electric Power（Energy）

Quantitatively evaluates its financial impact of climate change risks and opportunities. Ensuring that the business has resilience for both 1.5°C and 4°C scenarios

✓ **Quantitative description of the financial impact of each risk/opportunity**

Climate change risks and opportunities

Changes in business environment (main impacts on our business)			Group risks and opportunities (■: Risks ■: See p. 66 for financial impact of opportunities)	Timeline (Medium term)	Timeline (Long term)	Major impact on business*1
1.5°C Scenario	✓Tightening of GHG emission regulations (Act on GX Promotion, Act on Rationalizing Energy Use, Act on Sophisticated Methods of Energy Supply Structures, etc.)	Transition risks (Policy)	◆Increase in costs in line with tightened regulations 1 ◆Lost revenue from a decrease in market competitiveness and the utilization rate of power generation using fossil fuels ◆Drop in electricity sales due to increasing customer withdrawal	○	○	○
	✓Increasing needs for non-fossil energy sources ✓Increasing needs for highly efficient/ decarbonized thermal power generation ✓Greater investment in decarbonization technologies	Opportunities (Energy sources)	◆Proactive adoption of hydro, solar, and wind power 9	○	○	○
			◆Use of nuclear power with safety as top priority 2 3 4 9 ◆Examination and utilization of advanced nuclear power technologies	○	○	○
			◆Utilization of high-efficiency coal-fired thermal power and biomass power 9 ◆Utilization of carbon-free power sources (hydrogen/ammonia power generation, IGFC+CCUS/Carbon recycling, etc.)	○	○	○
			◆Expansion of international business (renewable energy projects)	○	○	○
	✓Rapid adoption of renewable energy due to technological advancements	Transition risks (Technologies)	◆Increase in grid countermeasure costs 10	○	○	○
	✓Heightened social awareness of decarbonization ✓Promotion of electrification for decarbonization ✓Increasing needs among customers for energy-saving and decarbonization measures in their business activities	Transition risks (Technologies)	◆Drop in prospect of utilization of existing intellectual property due to rapid technological changes and a drop in competitive/growth capabilities due to insufficient acquisition of new intellectual property	○	○	
		Transition risks (Reputation/ market)	◆Potential impact on market share and fund procurement if our decarbonization initiatives are deemed insufficient and our reputation for reliability and corporate image suffers 5	○	○	○
		Opportunities (Market)	◆Promotion of electrification, DR,*2 and Solar PPA,*3 etc. 6	○	○	○
			◆Development of carbon recycling technologies (CO_2-TriCOM, Gas-to-Lipids)*4	○	○	
4°C Scenario	✓Increasing severity of natural disasters (cloudbursts, typhoons, etc.) ✓Changing rainfall patterns	Physical risks (Acute)	◆Increase in recovery and countermeasure costs in line with facility damage 7 ◆Increase in costs due to enhanced resilience measures (facility countermeasures to prepare for disasters, creation of coordinated systems to ensure early recovery)	○	○	○
			◆Decreasing water flow rates (Decreasing hydropower) 8	○	○	
	✓Rising average temperatures and rising sea levels	Physical risks (Chronic)	◆Adverse impact on business activities		○	

Main financial impacts of climate change-related risks and opportunities

The main financial impacts from the Group's climate-related risks and opportunities, shown in the table on the previous page, are as below.

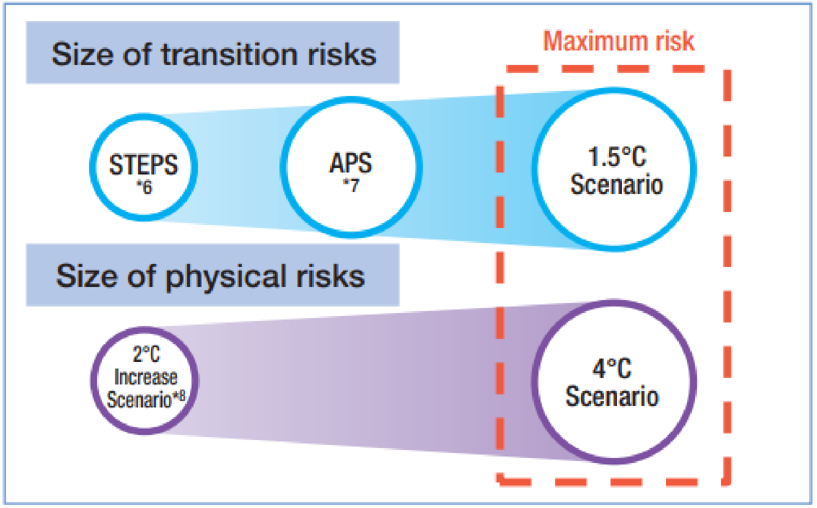
■ : Risks ■ : Opportunities

No.	Item	Financial impact
1	Cost increases in the event GHG emissions are not reduced*1	Approx. 108.0 billion yen/year
2	Cost decreases in line with reduced CO_2 emissions from the startup of Shimane Unit 2*1	Approx. 49.0 billion yen/year
3	Cost decreases in line with reduced CO_2 emissions from the startup of Shimane Unit 3*1	Approx. 79.0 billion yen/year
4	Benefits from fuel cost reductions in line with startup of Shimane Unit 2*2	Approx. 80.0 billion yen/year
5	Impact on interest expenses in the event interest rates fluctuate by 0.1%*3	Approx. 0.8 billion yen/year
6	Increase in income from electricity rates in the event electricity sales increase by 1% due to an increase in electrification rates*3	Approx. 10.0 billion yen/year
7	Damage costs*4 (Impact of the heavy rainfall disaster in July 2018)	Approx. 3.7 billion yen/year
8	Financial impact on raw materials due to decreasing water flow rates*4 (figures from FY2024)	Approx. 0.5 billion yen/ 1% water flow rate
9	Investments associated with the decarbonization of energy sources (FY2025–FY2031 total)*5	Approx. 700.0 billion yen
10	Investments associated with the decarbonization of the transmission and distribution business (FY2025–FY2031 total)	Approx. 600.0 billion yen

*1 Emissions calculated based on FY2024 achievements. For carbon prices, we have referred to the NZE Scenario and Advanced Economies (Net-zero Commitments) section from the IEA's World Energy Outlook 2023, basing the calculations on \$140/tCO_2.
*2 Calculated based on average utilization rate over past 10 years
*3 Calculated based on FY2024 achievements. Values are not definitive and fluctuate based on the achievements of the fiscal year used for calculation.
*4 Actual expenses as an indicator of future financial impact.
*5 A breakdown of investments associated with the decarbonization of energy sources can be found on p. 67

✓ **Emphasizes business resilience as being able to respond to either scenario**

By working on measures that assume the main scenarios will come to fruition, we will be able to respond to both scenarios and engage in business with our resilience assured.
We believe that transition risks and opportunities are one and the same.

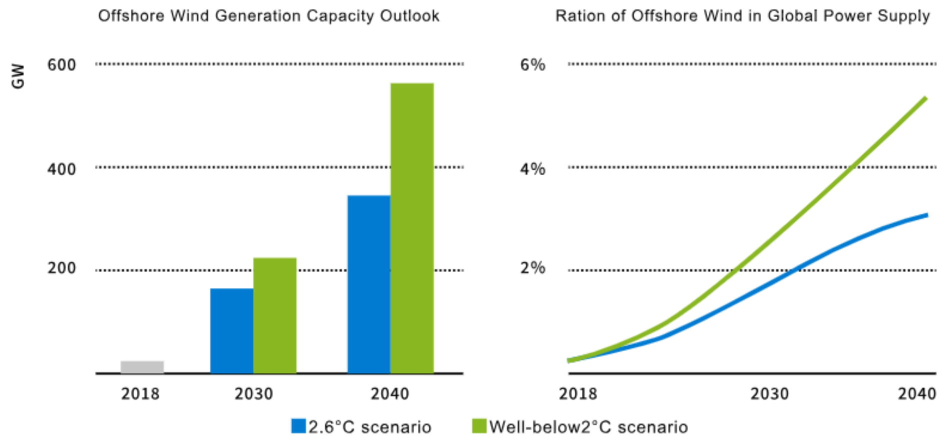


Source : The Chugoku Electric Power, *Integrated Report 2024*, https://www.energia.co.jp/e/ir/report/pdf/integrated-01.pdf (As of January 2025)

Domestic Disclosure Examples ：Mitsui O.S.K. Lines （Transportation, 1/4）

In line with the company's business model, they quantitatively discloses its worldview under multiple scenarios. Quantitative information is also used to estimate business impact

- ✓ **Quantitatively and qualitatively describe the worldview under each scenario according to your company's business model**
- ✓ **Quantitative worldview is shown as a parameter in the calculation of business impact evaluation**



(Source: IEA "Offshore Wind Outlook 2019")

We estimated based on the assumptions used in scenario analysis that by maintaining such comprehensive initiatives, the following profitopportunities can be expected in the offshore wind power-related business field as a whole (as of 2050).

(Billion yen)	2.6° C	Well-below 2° C	1.5° C
Offshore wind power-related business	9.0	17.0	24.0

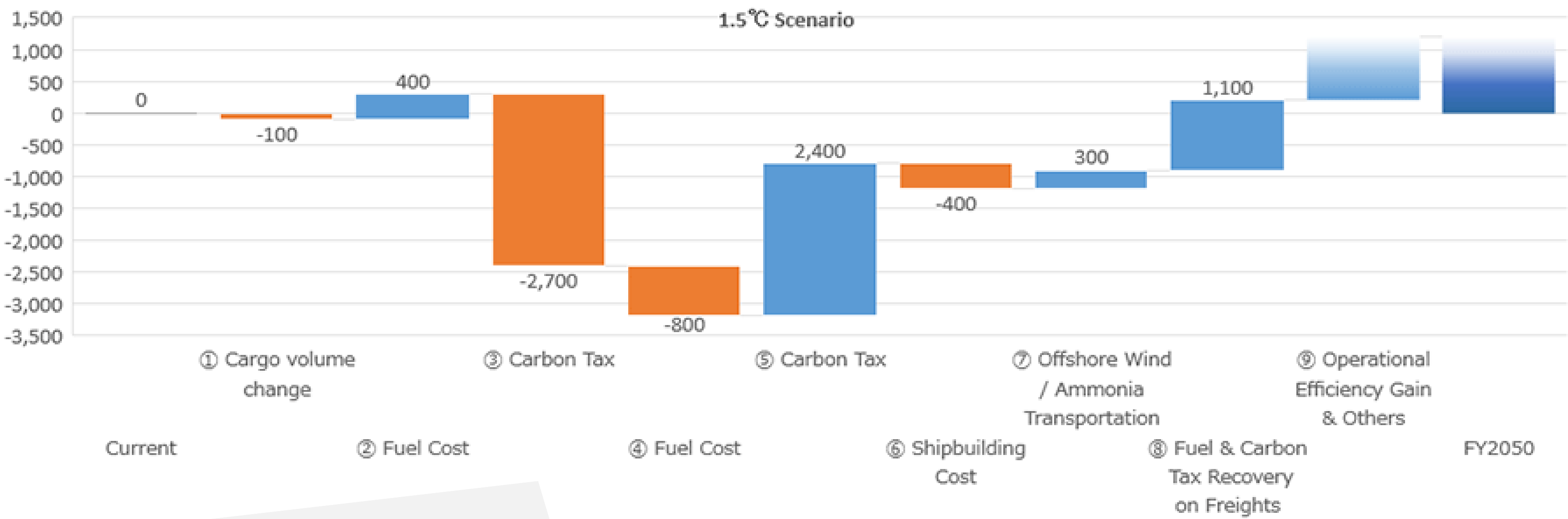
Source : Mitsui O.S.K. Lines, *Task Force on Climate-related Financial Disclosures (TCFD)* , https://www.mol.co.jp/en/sustainability/environment/tcfd/ (As of January 2025)

Domestic Disclosure Examples : Mitsui O.S.K. Lines (Transportation, 2/4)

Setting multiple scenarios (1.5°C / 2°C or less / 2.6°C) . Quantitatively and narratively discloses business impact in 2050 by scenarios.

✓ **In the business impact evaluation, the following factors are thought to have an impact on the business: (1) changes in cargo volume change, (2) fuel costs, (3) carbon tax, (4) introduction of alternative fuel vessels, and (5) new business opportunities, and illustrate quantitative impact for each scenario in a waterfall charts**

- Factors affecting profit/loss from now to 2050 (1.5°C scenario, unit: JPY 100 million, single-year basis)



Stating Quantitatively and narratively that the profit level in 2050 is resilient based on the risk of cost increases, cost reductions through risk mitigation measures, sales opportunities, etc

- **Carbon tax will be a major factor in deteriorating profits (▲270 billion yen)**
- **Significantly reduce carbon tax by introducing next-generation fuel vessels (+240 billion yen)**
- **Expansion of new business opportunities in the clean energy business field (+30 billion yen)**
- **Efforts to pass on the cost increase due to carbon tax to prices (+110 billion yen)**
- **Take appropriate measures in the form of efficient operations and other new businesses**

Source : Mitsui O.S.K. Lines, *Task Force on Climate-related Financial Disclosures (TCFD)* , https://www.mol.co.jp/en/sustainability/environment/tcfd/ (As of January 2025)

Domestic Disclosure Examples ： Mitsui O.S.K. Lines （Transportation, 3/4）

Responding to climate change risks, the company changed their investment policy for the next three years, announcing new investment plans in addition to the environmental investments that have already been decided.

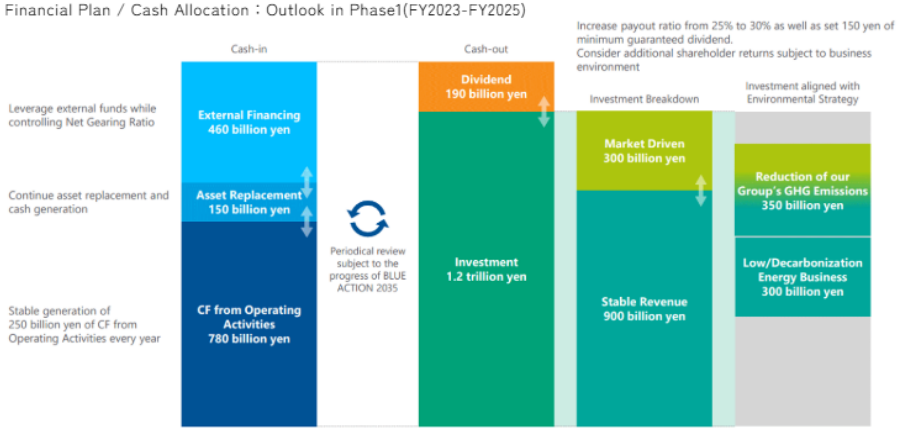
- ✓ **Based on the scenario analysis results, investment policy was significantly changed as a climate change countermeasure**
- ✓ **A new environmental investment of 270 billion yen has been decided for 2023-2025, and a breakdown of the investment is also listed**

(3) Investments related to climate change risks

To address climate change risk, MOL plans to make investment of around 650 billion yen in the low-carbon and decarbonization field over the three years from 2023 to 2025 (with plans for 380 billion yen of new investment in addition to the 270 billion yen of investment already decided). For details, please refer to BLUE ACTION 2035 (management plan).

The Group's major future capital investments will be made in line with its long-term GHG emission reduction target (to achieve net zero emissions by 2050). In addition, investments in carbon-intensive assets and products, such as fossil fuel-powered ships, will be phased out in favor of investments in clean energy and other decarbonized assets and products.

- Positioning of environmental investment in BLUE ACTION 2035 (management plan)
  Financial Plan / Cash Allocation：Outlook in Phase1(FY2023-FY2025)



- Excerpt from "Environmental Strategy" page of BLUE ACTION 2035 (management plan)
  Investments in Phase 1 aligned with Environmental Strategy
  (Cash out basis)

(billions of yen)	Already Decided	New	Subtotal
Reduction of our Group's GHG Emissions	190.0	160.0	350.0
Low/Decarbonization Energy Business	190.0	110.0	300.0
Total	**380.0**	**270.0**	**650.0**

Announcing new investment policy of 270 billion yen as environmental investment

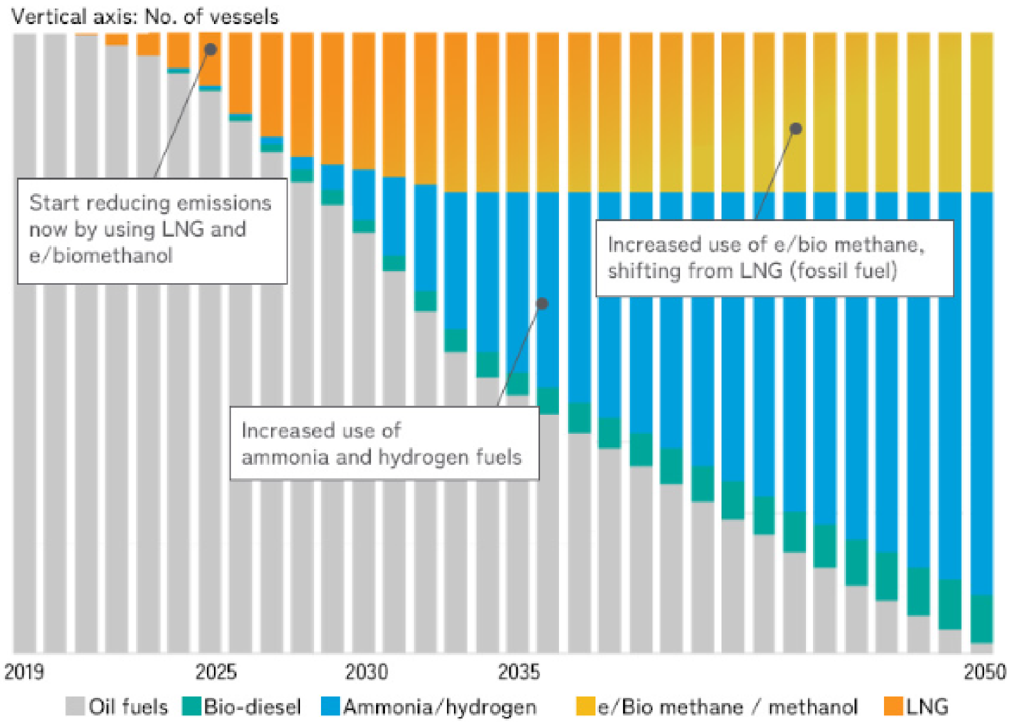
Source : Mitsui O.S.K. Lines, *Task Force on Climate-related Financial Disclosures (TCFD)* , https://www.mol.co.jp/en/sustainability/environment/tcfd/ (As of January 2025)

Domestic Disclosure Examples ： Mitsui O.S.K. Lines （Transportation, 4/4）

The company illustrates five strategies and transition paths for specific GHG emissions reductions

✓ **In addition to investment goals, the transition plan for achieving net zero in 2050 is also illustrated**

MOL has established an interim target of a 45% reduction in GHG emission intensity from transport by 2035 and indicated a specific pathway for achieving net zero GHG emissions by 2050.
We have established five specific actions for reducing GHG emissions, including the adoption of clean energy, enhancement of energy-saving technologies, and expanding decarbonization projects and have set a target of investing around 650 billion yen in the decarbonization field over the three years from 2023 to 2025 (reduction of our own GHG emissions: 350 billion yen; contribution to reduction of society's GHG emissions: 300 billion yen).



Composition of MOL's Ocean-Going Fleet by Fuel Type

Source : Mitsui O.S.K. Lines, *Task Force on Climate-related Financial Disclosures (TCFD)* , https://www.mol.co.jp/en/sustainability/environment/tcfd/ (As of January 2025)

Domestic Disclosure Examples ： East Japan Railway Company （Transportation）

The financial impact of population changes and river flooding on the transportation service business is estimated. The calculation basis is also clearly stated, quantitatively evaluated and disclosed

- ✓ **Conducted scenario analysis using socio-economic scenario (SSP) for transportation service business**
- ✓ **Disclosed quantitative analysis results regarding impact on passenger revenue**

(2) Details of Scenario Analysis (Physical Risks)

In the Transportation business, future passenger volume is expected to decrease due to Japan's declining birthrate and aging population, and the impact is expected to be particularly significant in rural areas. In order to ascertain the financial impact of these factors and to verify the appropriateness of our business and environmental strategies, we conducted the following scenario analysis for fiscal 2051.

Scenario Analysis Methodology (Overview)

(1) Estimated Change in Future Passenger Revenue Trends Based on Business Area Demographic Projections + (2) Estimated Financial Impact of Severe Weather Disasters = (3) Financial Impact

(1) Estimated Change in Future Passenger Revenue Trends Based on Business Area Demographic Projections

We have estimated changes in passenger revenue up to fiscal 2051 based on data such as population and gross domestic product (GDP)*5 from the Japan Shared Socioeconomic Pathways (SSPs)*4, which are quantitative scenarios for future socio-economic conditions.

*4 Japan Shared Socio-economic Pathways (SSP) population scenarios by city, ward, town, and village (2nd edition).

*5 Population trend data is from Japan SSP's population estimates by city, ward, town, and village, National Institute for Environmental Studies and GDP data is from Global dataset of gridded population and GDP scenarios, International Institute for Applied Systems Analysis (IIASA's).

- ✓ **Quantitatively evaluates the expected financial impact in the event of flooding due to planned scale rainfall for the rivers selected for evaluation**
- ✓ **The calculation method is based on the asset value of major railway lines, planned suspension of service due to the disaster, loss of passenger revenue depending on the period required for restoration, and restoration costs for railway assets such as stations and tracks**

(2) Estimated Financial Impact of Severe Weather Disasters

Up until now, we have conducted scenario analyses assuming flooding of Class A rivers flowing through the Kanto region, focusing on the Tokyo metropolitan area and its surrounding areas, where major railway assets and lines are concentrated. The following disclosure, however, describes two newly conducted scenario analyses.

I. Flooding Due to Overflowing of Class A Rivers Whose Drainage Basins Are Home to Shinkansen Rolling Stock Centers in the Nagano, Niigata, and Tohoku Areas

The results of scenario analyses we have conducted to date show that the financial impact of more extreme weather disasters would be particularly heavy if Shinkansen trains parked in rolling stock centers were affected. Therefore, in terms of scenario analysis outside the Kanto region, we have chosen the potential flooding of rolling stock centers, due to the overflowing of the Class A rivers in whose drainage basins they are situated, in the Nagano (Hokuriku Shinkansen), Niigata (Joetsu Shinkansen), and Tohoku (Tohoku Shinkansen) areas.

II. Kawasaki Thermal Power Plant Flooded by Storm Surge

It is expected that rising sea levels due to climate change will increase the depth of flooding caused by storm surges. Therefore, in terms of facilities that could suffer heavy storm-surge damage, we have selected potential typhoon-driven storm surges (assuming both current conditions as well as elevated sea levels) affecting the Kawasaki Thermal Power Plant for scenario analysis.

The results of the quantitative evaluation performed using the above procedure are as follows.

Regarding I, in the Nagano area (flooding of the Chikuma River), the financial impacts of climate change in 2050 are greater under RCP8.5 (4°C increase) than under RCP2.6 (2°C increase), and the cumulative financial impact is expected to increase by approximately ¥14.6 billion from 2021 to 2050 (without inundation measures). We found that inundation measures yield a loss reduction effect of approximately ¥14.4 billion, and that vehicle evacuation and flood prevention measures at the Nagano Shinkansen Rolling Stock Center have a significant loss reduction effect.

Meanwhile, regarding the Niigata and Tohoku areas, as a result of studies conducted based on flood risk maps and projected amounts of rainfall, we found that the Shinkansen rolling stock centers are not expected to be affected by flooding. We therefore conducted quantitative assessments of scenarios that anticipate a certain degree of financial impact, including flooding of the Shinano River for the Niigata area and the Iwai River (a tributary of the Kitakami River) for the Tohoku area. We found that the financial impacts in these areas would be smaller than those in the Nagano area.

Based on the results of these assessments of the financial impact of climate change, we will continue to implement natural disaster countermeasures from both tangible and intangible perspectives in accordance with the degree of importance of facilities, mainly in flood-prone areas that are susceptible to heavy impacts.

I. Estimated Financial Impact Due to Flooding of Class A Rivers Whose Basins Are Home to Shinkansen Rolling Stock Centers in the Nagano, Niigata, and Tohoku Areas

Climate Change Scenarios	Flood Control Measures (Physical Facilities and Human Responses)	Nagano Area (Hokuriku Shinkansen, Chikuma River flooding) Increase in Financial Impact (Loss) (Billions of Yen)		Niigata Area (Joetsu Shinkansen, Shinano River flooding) Increase in Financial Impact (Loss) (Billions of Yen)		Tohoku Area (Tohoku Shinkansen, Iwai River flooding) Increase in Financial Impact (Loss) (Billions of Yen)	
		FY2051	FY2022–FY2051 Cumulative Total	FY2051	FY2022–FY2051 Cumulative Total	FY2051	FY2022–FY2051 Cumulative Total
RCP2.6 (2°C increase)	No countermeasures	0.79	11.82	0.02	0.27	0.02	0.25
	With countermeasures	0.01	0.20	0.01	0.21	0.01	0.22
	Loss reduction effects of countermeasures	–0.77	–11.62	0.00	–0.06	0.00	–0.03
RCP8.5 (4°C increase)	No countermeasures	0.97	14.62	0.04	–0.53	0.01	0.17
	With countermeasures	0.01	0.20	0.03	–0.42	0.01	0.14
	Loss reduction effects of countermeasures	–0.96	–14.42	–0.01	–0.11	0.00	–0.03

* "0.00" in this table indicates that the amount of the increase in loss (or loss reduction effect) is insignificant (less than 0.005 billion).

Source : East Japan Railway Company, *Integrated Report 2024,* https://www.jreast.co.jp/e/environment/pdf_2024/all.pdf (As of January 2025)

Domestic Disclosure Examples：Nishi-Nippon Railroad Co., Ltd.（Transportation）

As for transition plan, reduction targets and response measures are shown on the roadmap, indicating its linkage to the reduction target settings in the mid-term management plan

- ✓ **Show the transition plan as a roadmap and separate measures that need to be taken to reduce CO2 and become carbon neutral.**
- ✓ **The target values of the roadmap are also reflected in the setting of reduction targets in the three-year medium-term management plan.**

Indicators and Targets

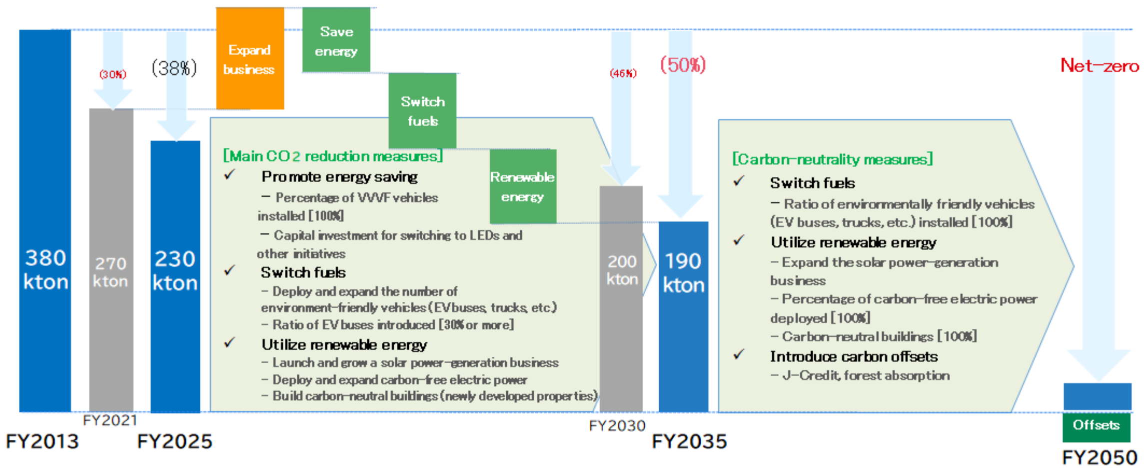
In November 2022, the Nishitetsu Group formulated its long-term vision "NNR Group CYD Vision 2035: Growing in harmony with you" with the target year of FY2035, and clearly stated the roadmap "Toward Carbon Neutrality (2050)." In addition, reduction targets in the 16th Medium-term Management Plan (FY2023-FY2025) have been set in line with the roadmap.

CO2 reduction targets:

- FY2025: 38% reduction from the FY2013 (16th Medium-term Management Plan)
- FY2035: 50% reduction from the FY2013 level (Long-term Vision)

We are aiming to achieve the national target of a 46% reduction in CO2 emissions in fiscal 2030 compared to fiscal 2013, with the entire Group aiming to become carbon neutral (by 2050).

— **Toward Carbon Neutrality (2050)**



Source：Nishi-Nippon Railway Co., Ltd., *Disclosure Based on TCFD Recommendations*, https://www.nishitetsu.co.jp/en/sustainability/management_promotion/disclosure_based_on_TCFD_recommendations.html（As of January 2025）

Domestic Disclosure Examples : Tokyu Fudosan Holdings（Material, Buildings）

Setting multiple scenarios (1.5°C / 3°C / 4°C) and disclosing financial impact in 2030 and 2050 by each scenario and business

- ✓ **Extracts risks and opportunities by scenario (1.5°C / 3°C / 4°C) and links them to strategies**
- ✓ **Showing the medium- to long-term financial impact of each business and explaining resilience through countermeasures**

■ 1.5℃ scenario

Category		Content of Risks and Opportunities	Our Group's Strategy
【Transition Risks】 Policy/Regulatory / Market/Reputation Technology 【Opportunities】 Energy / Products and Services / Market	Risk	Increased costs for new construction and renovations due to the strengthening of energy conservation laws and the mandatory	Promoting the ZEB and ZEH conversion of new buildings, updating facilities existing operational facilities, and achieving differentiation through the early adoption of renewable energy.
	Risk	Introduction of a carbon pricing system leading to an increase in construction and operational costs.	Collaborating with general contractors to reduce CO_2 emissions during the construction phase and mitigate the impact of carbon pricing.
	Risk / Opportunities	Growing demand from tenants for ZEB (Zero Energy Building) properties, impacting rent and vacancy rates.	Promoting the decarbonization of each business through the introduction of internal carbon pricing and mitigating the impact of carbon pricing.
	Risk / Opportunities	Growing demand for Zero Emission Houses (ZEH) from homebuyers, intensifying competition among	Expanding the business in response to increased demand.
	Opportunities	Significant increase in demand for renewable energy	Utilizing local renewable energy sources.

Financial Impact	Medium Term	Long Term	Impact Overview
Urban	Hight	Somewhat Low	In the medium term, the impact is "high" due to the increase in building investment. However, in the long term, the impact is "somewhat low" as the increase in rental income after the completion of ZEB conversion offsets it.
Housing	Somewhat Low	Low	By responding effectively to market needs, the impact is "somewhat low."
Leisure	Somewhat Low	Low	The impact is "somewhat low" due to the introduction of renewable energy.
Renewable Energy	Hight	Low	As needs gradually increase, the positive impact is "high."

Category		Content of Risks and Opportunities	Our Group's Strategy
【Physical Risks】 Acute / Chronic 【Opportunities】 Resilience	Risk	Gradual Increase in Facility Damage Due to Natural Disasters	Ensuring revenue through the off-season utilization of facilities.
	Risk	Shortening of Ski Resort Operating Period Due to Rising Temperatures	
	Risk / Opportunities	The demand for Business Continuity Plans (BCP) for facilities by tenants has increased, impacting rent and vacancy rates.	Differentiation is achieved through enhanced BCP and LCP through strategic location selection and collaboration with tenants and residents.
	Risk / Opportunities	The demand for Life Continuity Plans (LCP) by homebuyers is increasing, intensifying competition between regions and products.	

Financial Impact	Medium Term	Long Term	Impact Overview
Urban	Low	Somewhat Low	While the amount of investment in building repairs and renovations is increasing, the impact is considered "somewhat low" due to revenue assurance through differentiation.
Housing	Low	Somewhat Low	
Leisure	Low	Somewhat Low	
Renewable Energy	Low	Somewhat Low	

■ 3℃ scenario

Category		Content of Risks and Opportunities	Our Group's Strategy
【Transition Risks】 Policy / Regulatory / Market / Reputation / Technology 【Opportunities】 Energy / Products and Services / Market	Risk	Increased costs for new construction and renovations due to the strengthening of energy conservation laws and the mandatory implementation of ZEB and ZEH.	Promoting the ZEB and ZEH conversion of new buildings, updating facilities in existing operational facilities, and achieving differentiation through the early adoption of renewable energy.
	Risk	Increased costs for new construction and renovations due to the strengthening of energy conservation laws and the mandatory implementation of ZEB and ZEH.	Collaborating with general contractors to reduce CO_2 emissions during the construction phase and mitigate the impact of carbon pricing.
	Risk / Opportunities	Growing demand from tenants for ZEB (Zero Energy Building) properties, impacting rent and vacancy rates.	Promoting the decarbonization of each business through the introduction of internal carbon pricing and mitigating the impact of carbon pricing.
	Risk / Opportunities	Growing demand for Zero Emission Houses (ZEH) from homebuyers, intensifying competition among products.	Expanding the business in response to increased demand.
	Opportunities	Significant increase in demand for renewable energy.	Utilizing local renewable energy sources.
	Opportunities	The demand for tenant office space is shrinking due to the widespread adoption of telecommuting, impacting rent and vacancy rates. There is an increase in demand for satellite offices.	Deployment of satellite offices anticipating widespread adoption.

Financial Impact	Medium Term	Long Term	Impact Overview
Urban	Somewhat Hight	Somewhat Hight	The slow pace of ZEB conversion and the moderate to high impact of increased building investment costs in the medium to long term.
Housing	Somewhat Low	Somewhat Low	The impact is "somewhat low" due to accurate responses to market needs.
Leisure	Somewhat Low	Somewhat Low	The impact is "somewhat low" due to the introduction of renewable energy.
Renewable Energy	Somewhat Hight	Somewhat Hight	As needs gradually increase, the positive impact is "somewhat high."

Category		Content of Risks and Opportunities	Our Group's Strategy
【Physical Risks】 Acute / Chronic 【Opportunities】 Resilience	Risk	Gradual Increase in Facility Damage Due to Natural Disasters	Differentiating through off-season facility utilization, concentrated investment in ski resorts in high-latitude areas with heavy snowfall, and golf course management using heat-resistant turf.
	Risk	Shortening of Ski Resort Operating Period Due to Rising Temperatures	
	Risk / Opportunities	The demand for Business Continuity Plans (BCP) for facilities by tenants has increased, impacting rent and	Differentiating through enhanced BCP andLCP through strategic location selection and collaboration with tenants and residents.
	Risk / Opportunities	The demand for Life Continuity Plans (LCP) by homebuyers is increasing, intensifying competition	

Financial Impact	Medium Term	Long Term	Impact Overview
Urban	Low	Somewhat Low	The increase in building repair and renovation investment leads to a "somewhat low" impact, as revenue is secured through differentiation. Although there is significant revenue reduction due to shortened operating periods and area reduction, strategic location selection and differentiation from competing facilities result in a "moderate" impact (Leisure).
Housing	Low	Somewhat Low	
Leisure	Low	Moderate	
Renewable Energy	Low	Somewhat Low	

■ 4℃ scenario

Category		Content of Risks and Opportunities	Our Group's Strategy
【Transition Risks】 Policy / Regulatory / Market / ReputationTechnology 【Opportunities】 Energy / Products and Services / Market	Risk	Rising temperatures lead to increased construction costs for general contractors and higher air conditioning expenses during operations.	Actively promoting the enhancement of new buildings' performance and the update of facilities in existing operational facilities, differentiating through the early adoption of renewable energy.
	Risk / Opportunities	In response to rising temperatures, there is an increasing demand from homebuyers for high-performance homes.	Expanding the business in response to increased demand.
	Risk / Opportunities	Renewable energy faces weak policy support, and the market trends are unclear.	Proposing new leisure lifestyles, such as "workation."
	Opportunities	With the widespread adoption of telecommuting, there is a shrinking demand for tenant office space, impacting rent and vacancy rates. There is an increase in demand for satellite offices.	Deployment of satellite offices in anticipation of widespread adoption.

Financial Impact	Medium Term	Long Term	Impact Overview
Urban	Low	Low	By covering the reduction in tenant office needs with satellite offices, there is a "low" positive impact.
Housing	Low	Somewhat Low	The impact is "somewhat low" due to accurate responses to market needs.
Leisure	Low	Moderate	The introduction of renewable energy results in a "moderate" level of impact.
Renewable Energy	Low	Low	Due to the uncertainty in the trend of needs, there is a possibility of a "low" positive impact.

Category		Content of Risks and Opportunities	Our Group's Strategy
【Physical Risks】 Acute / Chronic 【Opportunities】 Resilience	Risk	The impact of rising sea levels is increasing, leading to a sharp increase in facility damage due to natural disasters.	Differentiating through off-season facility utilization, concentrated investment in ski resorts in high-latitude areas with heavy snowfall, and golf course management using heat-resistant turf to distinguish from competing facilities.
	Risk	Rising temperatures result in a shortened operating period	
	Risk / Opportunities	Increasing demand from tenants for Business Continuity Plans (BCP) for facilities, impacting rent and vacancy rates.	Differentiating through enhanced BCP and LCP through strategic location selection and collaboration with tenants and residents.
	Risk / Opportunities	The demand from homebuyers for Life Continuity Plans (LCP) is increasing, leading to intensified competition between products and selective choices in regions.	Differentiating through infrastructure enhancement measures for the local community, including the introduction of energy storage systems.

Financial Impact	Medium Term	Long Term	Impact Overview
Urban	Low	Moderate	The increase in investment for building repairs and renovations is mitigated by revenue assurance through differentiation, resulting in a "moderate" level of impact. The shortening of operating periods and the reduction in the area lead to a "somewhat high" impact (leisure).
Housing	Low	Moderate	
Leisure	Low	Somewhat High	
Renewable Energy	Low	Moderate	

	Medium Term	Long Term	Impact Overview
Urban	Low	Somewhat Low	While the amount of investment in building repairs and renovations is increasing, the impact is considered "somewhat low" due to revenue assurance through differentiation.
Housing	Low	Somewhat Low	
Leisure	Low	Somewhat Low	
Renewable Energy	Low	Somewhat Low	

For each scenario, medium- to long-term financial impacts and countermeasures are listed for each business (city/housing/leisure/renewable energy).

Source : Tokyu Fudosan Holdings, *TCFD disclosure*, https://tokyu-fudosan-hd-csr.disclosure.site/en/environment/tcfd/detail (As of January 2025)

Domestic Disclosure Examples ： Mitsui Mining & Smelting（Material, Buildings）

Extracts risks and defines measures for each trial calculation item. Disclosure also describes the process of incorporation into the final strategy along with managing response status

- ✓ **Extract risks and define countermeasures for each impact calculation item in the main businesses: Metal Business, Functional Materials Business and Mobility Business**
- ✓ **Also describes the process of incorporating countermeasures into medium-term management plans and business strategies and the situation of management**

Summary of scenario analysis results for Metals Business

Impact estimation items	Risks	Opportunities	4℃	1.5℃	Countermeasures
Sales	・Rising market prices of products due to higher costs of mining raw materials and smelting, leading to accelerated substitution of our products and lower sales ・Preference for environmentally-friendly companies	・Increased demand for non-ferrous metals due to electrification drive and rising energy storage technologies ・Increased market value due to accelerated decarbonization of products	Loss ▼▼▼	Profit ▲▲▲	・Monitor market conditions and ensure stable operations, while considering measures to cope with increased demand ・Accelerate measures to improve recycling rates and reduce CO2 emissions
Carbon taxes	・Increased production and logistics costs due to introduction of carbon taxes	—		▼▼▼	・Reduce fossil fuel use, develop fuel conversion technologies, introduce renewable electricity and promote electrification of manufacturing facilities.
Energy prices	・Increased manufacturing and logistics costs due to rising prices for coal, electricity and other energy sources	—	▲▲	▲▲	・Reduce electricity costs by strengthening demand response measures ・Energy consumption reductions
Raw material prices **Raw materials**	・Sales decline due to accelerated substitution of our products caused by rising zinc and lead ore prices	—	▲▲▲	▼▼▼	・Accelerate shift to high-margin raw materials, such as recycled raw materials and difficult-to-process ones
Sub-materials	・Higher prices for chemicals and materials due to increased energy and carbon costs	—	▼	▲	・Reduce chemical use per production unit ・Diversify procurement sources

＊ Financial impact (4℃/1.5℃)
No indication ± less than 100 million yen　▲▼ ±100million – less than 1 billion yen　▲▲▼▼ ± 1 billion – less than 10 billion yen　▲▲▲▼▼▼ ±10 billion yen or more

Impact estimation items	Risks	Opportunities	4℃	1.5℃	Countermeasures
Sales	・Sales decline for low-carbon products due to cost focus over environmental benefits (4℃ scenario) ・Sales decline due to emerging competing technologies	・Increase in sales of electronic components and related materials due to growth in demand for EVs ・Growth in recycled products and related markets due to increased recycling awareness	Loss ▼▼▼	Loss ▼▼▼	・Expand sales to users in Japan and overseas ・Enhance productivity and boost sales of products with high production efficiency ・Promote renewable energy according to customers' policies ・Promote low GHG emission production and gain customer confidence ・Develop products that reduce CO2 emissions ・Strengthen response to market needs, such as requests for recycling and reuse ・Consolidate production sites and optimize raw material stock levels
Carbon taxes & Energy prices	・Significant cost increases due to carbon taxes ・Higher operating costs due to higher energy prices ・Cost increase due to purchase of non-fossil certificates/environmental value	・Increasing sales of CO2-free products	▼	▼▼	・Identify policy trends of local countries and their impact on our budgets ・Improve production efficiency through yield improvement ・Reduce electricity intensity by introducing energy-saving equipment and technologies ・Consider introducing renewable energies like photovoltaic power generation and promoting waste heat use ・Long-term fixation of electricity prices through Power Purchase Agreements (PPAs) ・Promote electrification of fossil fuel facilities ・Use carbon credits
Raw material prices	・Higher costs due to higher prices for chemicals and materials in line with higher energy prices, and higher metal prices	—	▼▼	▼▼▼	・Incorporate changes in raw material prices into selling prices ・Apply recycled raw materials, increase the recycled ratio and reduce materials used in products ・Multi-source raw materials
Losses due to extreme weather conditions	・Suspension due to drought (Taiwan) ・Shutdown due to guerrilla rains (Malaysia)	—	▼		・Investment in extreme weather measures ・Secure backup power supply ・Monitor local long-term climatic conditions

Summary of scenario analysis results for Mobility Business

Impact estimation items	Risks	Opportunities	4℃	1.5℃	Countermeasures
Sales	・Decline in demand for exhaust gas purification catalyst due to lower sales of internal combustion engine vehicles (ICEVs) as a result of stricter fuel efficiency regulations ・Decline in door lock market share due to shift to EVs ・Order lost due to stricter environmental requirements from customers	・Increasing demand for products used in HEVs, PHEVs, etc. ・Growth in market for new catalyst-related products for decarbonization-related applications ・Market expansion through development of lightweight door lock products	Profit ▲	Loss ▼▼	・Shift to development and supply of catalyst products optimized for HEVs, PHEVs, etc. ・Accelerate development of door lock products for EVs ・Marketing and PR activities for door lock products aimed at EVs
Raw material prices	・Raw material costs and supply instability caused by increased demand for renewable energy-related materials ・Increased competition due to demand for lower weight of raw materials	・Early introduction of technologies to reduce raw material weight and cost reductions to gain an advantage		Difficult to quantify	・Reduce precious metals in products
Changes in customer reputation/ needs	・Increased operating costs due to demand for lower carbon emissions in manufacturing processes ・Shunning products deemed to have a high GHG emissions impact	—		▼	・Introduce renewable energy equipment and utilize green electricity ・Introduce energy-saving equipment. ・Equipment improvements to reduce waste heat loss

Incorporating countermeasures into medium-term management plans and business strategies, the review of response status and implementation of reexamination

Risk Management Process / Integration of scenario analysis and business strategy

❶ Identification of key risks and opportunities, and consideration of countermeasures
・Information gathering on climate change
・Business analysis and identification/assessment of risks and opportunities
・Consideration of climate-related group-wide direction and business strategies
・Consideration of group-wide direction for physical risk response

❷ Implementation of countermeasures
・Incorporate countermeasures into the medium-term management plan and business strategies
・Formulate and promote group-wide BCP in response to physical risks

❸ Review of countermeasure implementation
・Confirm the results and enhancements of the medium-term management plan and business strategies
・Review of response to physical risks

❹ Review key risks and opportunities, and reconsider countermeasures
・Update climate-related information
・Review risks and opportunities
・Revise group-wide direction and business strategies as necessary
・Improve group-wide BCP

(Important issues at each step are determined by the Executive Council.)

Source : Mitsui Mining & Smelting, *Integrated Report 2024*, https://www.mitsui-kinzoku.com/Portals/0/CSR/integrated_report/2024/EN1/integrated_report2024.pdf (As of January 2025)

Domestic Disclosure Examples ： Sekisui House（Material, Buildings）

The expected timing and financial impact of major risks and opportunities are shown qualitatively and quantitatively. It also specifically describes measures to be taken regarding financial impacts

- ✓ **Describes the financial impact of major risks and opportunities qualitatively (large, medium, small) and quantitatively**
- ✓ **Categorizes the expected timing into three stages (short-term, medium-term, long-term), and specifically describe the period when the financial impact will be significant and countermeasures**

Table 2. Major Risks, Potential Financial Impacts, and Responses

		Financial impact	Assumed time
Transition risk: Introduction of carbon pricing			
Impact	Carbon pricing has been widely adopted around the world. In Japan, the government is considering the introduction of a carbon tax, and it may be introduced relatively soon.	High	Medium-term
Response	The Group as a whole and its suppliers have a long way to go in order to decarbonize their business activities in the medium term, and if a carbon tax or emissions trading unit price of around 10,000 yen/t-CO_2 is imposed, the impact will be significant. We have already started a variety of initiatives throughout the value chain, including promotion of RE100, energy conservation in offices and production facilities, and reduction of CO_2 emissions in the building materials manufacturing stage through collaborative efforts such as questionnaires and seminars with suppliers, and we intend to reduce this impact as quickly as possible.		
Transition risk: Rising housing prices and a shrinking market			
Impact	In the long term, the new construction market itself may shrink as housing prices soar due to the need to comply with stricter regulations required for carbon neutrality, and as the number of houses with poor energy efficiency and seismic resistance decreases, and more high-quality housing stock is being circulated in the market.	High	Long-term
Response	Because our efforts are ahead of the curve, the impact on regulatory tightening in the short to medium term is expected to be small. However, in response to further regulatory tightening in the long term, we will need to work systematically on the development of cost-competitive decarbonized housing. In addition, we intend to strengthen our supplied housing business, in preparation for the contraction of the new construction market.		
Transition risk: Decline in rental business revenues due to market changes			
Impact	Managed properties that do not have sufficient decarbonization performance will lose competitiveness, leading to lower occupancy rates and rents.	High	Long-term
Response	We will strive to increase the ratio of ZEH units in managed properties and promote decarbonization remodeling of non-ZEH units in order to maintain and increase the value of rental housing that appeals to renters.		
Transition risk: Decline in rental business revenues from managed properties with higher disaster risk			
Impact	Managed properties in disaster-prone areas will have lower occupancy rates and rents due to the increase in climate change-related disasters (floods due to rivers overflowing, landslides, etc.).	High	Long-term
Response	We recognize this as an issue, and are continuing to study this issue by checking government hazard maps and understanding the hazards in areas where construction is planned.		
Transition risk: Costs required to decarbonize business activities			
Impact	In order to decarbonize our business activities, various costs will be incurred, such as converting business locations to ZEB, electrifying Company vehicles, and making production facilities energy-efficient.	Low	Medium-term
Response	The Company is systematically promoting decarbonization in all of its business activities, and the risk of incurring major costs that would affect its business is low at this point.		

Mentioning countermeasures during periods of high financial impact

Also clearly states the thresholds for large, medium, and small financial impact

The financial impact and assumed time period are defined as follows.
Financial impact—Large: ¥20 billion yen or more; medium: ¥10 billion or more; small: less than ¥10 billion yen
Assumed time period—Short term: up to 3 years from the present; medium term: up to 2030; long term: up to 2050

Source : Sekisui House, *Value Report 2024*, https://www.sekisuihouse.co.jp/company/financial/library/ir_document/2024/_162556/12E_ALL_Value+Report+2024.pdf(As of January 2025)

Domestic Disclosure Examples：KH Neochem Co., Ltd.（Materials, Buildings）

In the business impact evaluation, quantitative analysis was conducted referencing to the carbon price in 2030, assuming the introduction of carbon pricing

- ✓ **Quantitatively evaluates the business impact of some risks and opportunities as a financial burden in a decarbonized society**
- ✓ **Disclosure of estimated financial impact results are based on carbon price as of 2030**

KH Neochem's climate change-related risks and opportunities

Category	Risks/Opportunities		Key Countermeasures
Physical risks (4 °C warming scenario)	Impact on operations due to abnormal weather	There is a risk of an increasing impact on operations from increasingly frequent abnormal weather events resulting from climate change, such as high tides, heavy rain, floods, and typhoons.	・Conducting drills to increase understanding and improve effectiveness of BCM/BCPs ▶P73
Transition risks (1.5 °C warming scenario)	Introduction of carbon pricing	There is a risk of an increasing financial burden from the introduction of carbon taxes and other carbon pricing. Assuming CO_2 emissions on the same level as 2023 (approx. 378 kt) and a carbon tax of 130 USD/1t-CO_2 in 2030 (1 USD = 140 yen), the financial burden could increase by 6.88 bn yen per year.	・Promoting energy-saving and the introduction of new technologies to achieve carbon neutrality by 2050 ・Achieving the target of reducing greenhouse gas emissions by 30% by 2030 (compared to 2017) ▶P11, 28, and 80 ・Using CO_2 as raw material for products ▶P17 ・Introduction of internal carbon pricing (10,000 yen/t-CO_2) ・Introduction of renewable energy electricity ▶P80
	Problems procuring certain raw materials	There is a risk to the procurement of raw materials from oil refineries as oil refiners reduce the number of refineries in response to decarbonization trends.	・Promoting purchasing from multiple suppliers
	Impact of switching to raw materials obtained from biomass	There is a risk of quality problems and increased procurement costs due to switching from oil-based to biomass-based raw materials.	・Maintaining and improving quality assurance ▶P77
	Delayed response to ESG investment	There is a risk of divestments and falling share prices due to increasing criticism received for using large quantities of fossil fuels.	・Promoting energy-saving and the introduction of new technologies to achieve carbon neutrality by 2050 ・Achieving the target of reducing greenhouse gas emissions by 30% by 2030 (compared to 2017)
Opportunities (4 °C warming scenario)	Increased need for adaptive products	There is a possibility that the increasingly negative effects of climate change will cause rising demand for products that can mitigate those effects (such as heat stroke) and help people adapt to climate change.	・Supplying more refrigeration lubricant raw materials, which are indispensable for heat stroke-preventing air conditioners ▶P23
Opportunities (1.5 °C warming scenario)	Increased need for decarbonizing products	As people become increasingly environmentally conscious, there is a possibility of rising demand for products with a smaller carbon footprint.	・As the transition toward environmentally friendly air conditioners accelerates across the world, expanding the provision of refrigeration lubricant raw materials compatible with the refrigerants used in such air conditioners ▶P23 ・Using CO_2 as raw material for products

Source：KH Neochem, *KH Neochem Report 2024*, https://www.khneochem.co.jp/en/sustainability/annual-report/pdf/khneochem_report_2024_en.pdf (As of January 2025)

Domestic Disclosure Examples ： JFE Holdings（Material, Buildings）

The company could be significantly affected by climate change considering its business model. The company claims to work on improving on sophisticating scenario analysis by expanding the scope to include a 1.5°C scenario in FY2022

- ✓ **Analyzes based on the International Energy Agency scenario and assuming that a common carbon price will be introduced in major emitters**
- ✓ **Regarding long-term scenario analysis, in addition to achieving the 2°C scenario in steel manufacturing, it conducted a risk assessment in light of the need for ultra-innovative technology for the 1.5°C scenario (IPCC 1.5°C Special Report)**

Analysis Results

	Changes in Society	Risks/Opportunities		Expectations and Concerns of Stakeholders for the JFE Group	Strategies/Initiatives	Financial Impact (Estimate for 2030)* Details	Financial Impact (Estimate for 2030)* Amount/Scale
1.5/2°C Scenario Key Factor ① Decarbonization of Iron and Steelmaking Process	Increasing social demand for decarbonized iron and steelmaking process	Implement innovative technology to realize decarbonization at a large scale	Opportunity	JFE will lead in the business of supplying steel materials with high environmental value by implementing innovative technologies such as electric arc furnaces	• Deploy existing low-carbon technologies • Introduce large-scale electric arc furnaces capable of manufacturing high-quality steel • Increase use of low-carbon direct reduced iron • Develop and implement innovative technologies • Conduct studies for the practical application of CCUS • Expand supply capacity for JGreeX™ • Lobby to create demand for steel materials with high environmental value • Collaborate with companies in the JISF to promote steel materials with high environmental value	Increased sales of steel materials for their environmental added value	+120 to 150 billion yen per year
			Transition risk	More investment will be needed to implement innovative technologies	• Strengthen the revenue base • Secure funds for investment/technological development • Lobby for government support • Expand sales of JGreeX™	GX-related investment amount between 2023–2030	Approx. –700 billion yen
		Introduction of carbon pricing	Transition risk	• Financial burden will increase due to carbon pricing • Emission reduction targets will be more aggressive and stricter due to environmental changes	• Establish reliable CN technologies • Engage with policymakers to achieve CN	Increased carbon pricing burden	For every 1% reduction in emissions not achieved –10 billion yen per year
1.5/2°C Scenario Key Factor ② Increased Needs for Effective Utilization of Steel Scrap	Increasing interest for electric arc furnace method for its lower CO_2 emissions	Higher competition and prices for cold iron sources (scrap and reduced iron)	Transition risk	The cost of purchasing cold iron sources will increase	• Collaborate with customers/users to collect scraps • Establish technologies for using low-grade/difficult-to-use scrap • Participate in the reduced iron supply chain project • Expand scrap trading volume • Reduce manufacturing cost • Pass the cost to steel product prices	Increased cost of purchasing cold iron sources	Up to approx. –50 billion yen per year
		Increased electricity demand due to switching from blast furnace process to electric arc furnace process	Transition risk	Manufacturing cost will rise due to increased electricity usage (using more electricity and generating less by-product gas)	• Reduce manufacturing cost • Pass the cost to sale prices • Secure a stable supply of electricity • Lobby for steel product prices	Increased manufacturing cost due to switching processes (increase in electricity usage is equivalent to 0.5 nuclear power plant output)	Confidential for business reasons
1.5/2°C Scenario Key Factor ③ Change in Demand for Automotive Steel	Shift in demand for automobiles	Changes in the product mix due to EV production, etc.	Opportunity	Sales will increase for electrical steel sheets used in EV motors	• Strengthen production capacity for electrical steel sheets • Establish processing bases and supply chain structure for steel sheets globally	Increased sales of electrical steel sheets	Confidential for business reasons
			Opportunity	Sales will increase for high-tensile steel due to improved collision safety performance	• Increase production capacity for high-tensile steel sheets	Increased sales of high-tensile steel sheets	
			Transition risk	Sales will decrease for steel materials due to a shift away from internal combustion engines and a shift toward using multi materials	• Develop high-performance products	Decreased sales of steel sheets for automobiles	Minimal impact
1.5/2°C Scenario Key Factor ④ Increase in Demand for Solutions to Enhance Decarbonization	Transition to decarbonized society	Increase in demand for decarbonization solutions businesses	Opportunity	Renewable energy-related businesses will expand	• Expand the business undertaking the entire construction and operation of renewable energy power plants (biomass, geothermal, solar, offshore wind, etc.)	Sales of JFE Engineering's CN-related business	Approx. 200 billion yen per year
			Opportunity	Business of disseminating eco solutions (advanced energy-saving technologies developed and applied in Japan) to developing countries will expand	• Solutions business for low-carbon steelmaking technologies	Increased sales of overseas solutions business	Under assessment

Long term (2050)

In the long term, we will develop carbon-recycling blast furnaces (CR blast furnaces), hydrogen steelmaking, and electric arc furnaces while striving to achieve carbon neutrality by 2050, as stated in the JFE Group Environmental Vision for 2050. In particular, we have been focusing on a technology that combines a CR blast furnace with CCU. This is an ultra-innovative technology that targets net zero CO_2 emissions by drastically reducing CO_2 emissions from the blast furnace process, maximizing its ability to efficiently produce high-grade steel in mass volume, and enabling CO_2 reuse in the blast furnace. The remaining CO_2 that cannot be fully reused in the furnace will be further reduced by manufacturing basic chemicals such as methanol.

Long term (2050)

International expectations have been rising for organizations to seek pathways for achieving the 1.5°C scenario. We believe the necessary actions are not significantly different from the 2°C scenario. In the 1.5°C scenario, however, the development and implementation of decarbonizing technologies would need to further accelerate, requiring significantly more R&D costs and capital investment. A public infrastructure capable of supplying cheap and ample green hydrogen and electricity would also need to be in place. We believe that addressing these issues will require more support from the government and collaboration across society, including a mechanism for broadly sharing the financial burden and a long-term government strategy for supplying green hydrogen and electricity.

FOCUS Important factor ① Decarbonization of steel processes

- Taking into account the 1.5℃ scenario, the company will support the transition bond and the GX League Basic Concept to maintain a financial base that can withstand huge R&D and capital investment costs due to the introduction of ultra-innovative technology and promote decarbonization efforts. , promote government support and collaboration with society

Source : JFE, *JFE GROUP SUSTAINABILITY REPORT 2024*, https://www.jfe-holdings.co.jp/en/common/pdf/sustainability/data/2024/2024_04_03_02.pdf(As of January 2025)

Domestic Disclosure Examples ： Toda Corporation（Material, Buildings, 1/3）

Disclose the key parameters used in the scenario analysis

✓ **Disclose the parameters used in the scenario analysis for the below 2°C (1.5°C) and 4°C scenarios**

Carbon tax

Labor productivity decline rate

Number of heatstroke patients transported

ZEB targets

Building energy demand

Solar and wind power generation (excluding rooftop installations)

Offshore wind power generation

Flood damage to urban areas

シナリオ分析に使用した主要なパラメータ

		現在	2030年		備考・出所
			4℃の世界	2℃未満の世界	
炭素価格	炭素税	289 円/t-CO_2	67USドル	140USドル	IEA WEO 2023（現状政策シナリオの平均と2050年排出ゼロシナリオの先進国の値）
施工条件の悪化	労働生産性低下率	0.4%	＞0.99%	0.99%	ILO Working on a warmer planet
	熱中症搬送者数	1倍	1.4倍	1.26倍	気候変動適応情報プラットフォーム
建物の省エネ	ZEB目標	—	新築建築物はZEB水準の省エネ性能が必須	新築建築物はZEB水準の省エネ性能が必須	脱炭素社会に向けた住宅・建築物の省エネ対策等のあり方検討会（国交省、経産省、環境省）
	建物のエネルギー需要量	3.7EJ	3.5EJ	3.3EJ	IEA WEO 2023
再エネ電源拡大	太陽光・風力発電（屋根置き除く）	45.5GW	76.6GW	111.2GW	2030年度におけるエネルギー需給の見通し（資源エネルギー庁）
	洋上風力発電	—	＜10GW	10GW	洋上風力産業ビジョン（第1次） 2040年 30～45GW
異常気象の激甚化	洪水による都市への被害	2,000億円	2,600億円	2,200億円	国土技術政策総合研究所資料より推定

出所： Toda Corporation, *TCFD disclosure* 、https://www.toda.co.jp/sustainability/environment/scenario.html （ As of January 2025）

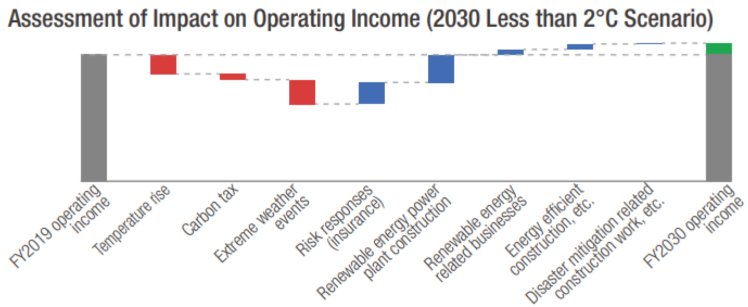
Domestic Disclosure Examples ： Toda Corporation（Material, Buildings, 2/3）

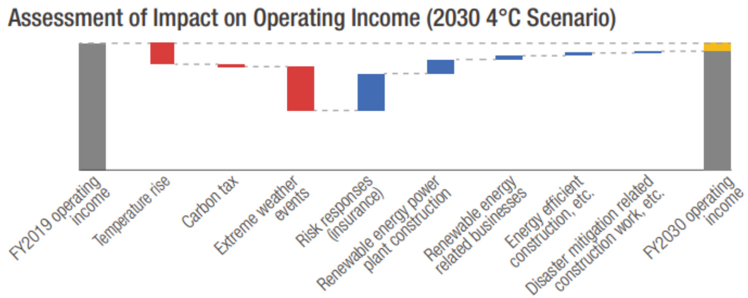
The impact on operating income is illustrated in a waterfall chart. The results of scenario analysis are reviewed every year

- ✓ **Discloses the impact on operating income of each risk/opportunity for the below 2°C and 4°C scenarios in 2030 in a waterfall format**
- ✓ **The results of scenario analysis are reviewed every year and integrated with strategy**

Financial Impact Assessment for 2030

Our assessment of the impact on operating income for fiscal 2030 shows that the increase in profits related to renewable energy is larger in the Well-below 2°C (1.5°C) scenario than in the 4°C scenario, resulting in an increase in operating income. Our first assessment of the impact on operating income for the year 2030 was conducted in 2020. Since then, we have reviewed the results of our scenario analysis annually, but no significant changes have taken place in our assessment of the financial impact of our risks and opportunities, so the waterfall diagram on the right has remained unchanged.





出所： Toda Corporation, *TCFD disclosure* 、https://www.toda.co.jp/sustainability/environment/scenario.html （ As of January 2025）

Domestic Disclosure Examples ： Toda Corporation（Material, Buildings, 3/3）

Reflects climate change risks and opportunities in strategic and financial plans. This fiscal year, the company formulates and discloses a roadmap toward carbon neutrality in 2050, as an update from lasty year

Risk / Opportunity category		Major items	Time axis	Examination of risks and opportunities	Measures to responses to risks and opportunities
Risks	Chronic	Temperature rise	Medium/Long	• Decreased work productivity and increased health risks for workers due to rising temperatures	• Promotion of construction labor conservation and automation • Introduction of health management devices for workers
	Acute	Risk of floods, etc.	Short/Medium/Long	• Damage to owned real estate due to risk of floods, etc.	• Assessment of risk of floods, etc. on owned real estate and when purchasing real estate • Flood control measures and acquisition of appropriate insurance
	New regulations	Changing client needs	Short/Medium/Long	• Risk of lost sales opportunities due to insufficient ability to propose low-carbon design/construction technologies	• Promotion of identification and procurement of low carbon products • Low-carbon building material R&D and expansion of applications • Promotion of low-carbon construction through TO-MINICA
		Carbon price	Medium/Long	• Increased construction costs and reduced construction investment due to higher carbon prices	
Opportunities	Products / Services	Energy-saving construction	Short/Medium/Long	• Increase in sales from the proliferation of ZEB	• Promotion of technology development and accumulation of experience in construction • R&D to achieve carbon-negative building construction
	Market	Changes in the energy mix	Short/Medium/Long	• Increase in construction investment in solar and onshore wind power plants, etc.	• Construction of renewable energy power plants and concentration of resources on renewable energy projects
			Medium/Long	• Expansion of offshore wind power generation plants	• Building a track record in power generation through floating offshore wind power, and commercialization of same • Concentration of resources and development of construction technology in floating offshore wind power generation
		Construction of flood control measures	Medium/Long	• Increase in infrastructure investment relating to flood control	• Concentration of resources on construction work for disaster prevention and mitigation

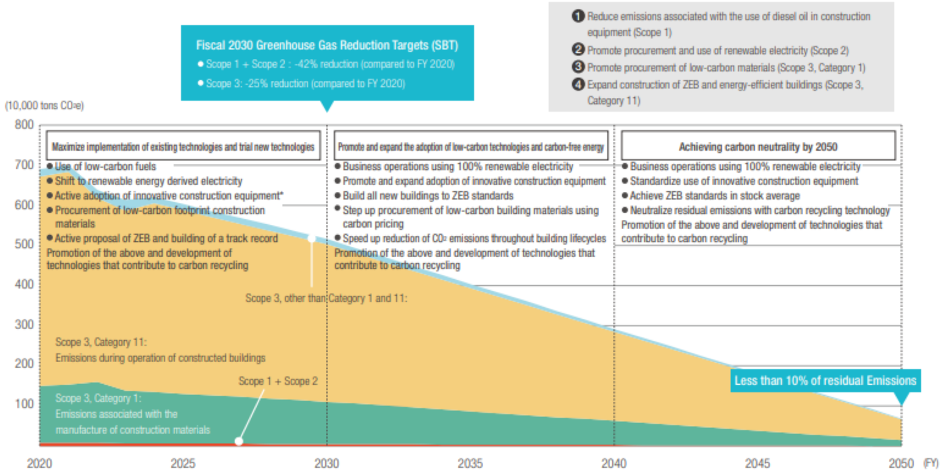
Formulated a roadmap towards carbon neutrality in 2050 as a measure to address risks and opportunities, newly disclosed this year

The roadmap consists of the following three phases:

- Maximize implementation of existing technologies and trial of new technologies
- Expanding the spread and introduction of low-carbon technology and decarbonized energy
- Achieving carbon neutrality in 2050

■ **Action Plan Summary**

With the goal of achieving carbon neutrality in our business activities by fiscal 2050, we are working to reduce greenhouse gas emissions, guided by the roadmap and the four key activities outlined below.



Source : Toda Corporation, Toda Integrated *Report 2024*, https://www.toda.co.jp/english/sustainability/pdf/TODA_Integrated_Report_2024.pdf(As of January 2025）

Domestic Disclosure Examples ： Lixil（Material, Buildings, 1/2）

Describes quantitative calculation results and basis for the impact on important risks and opportunities

✓ **Some of the financial impacts in 2030 are quantitatively calculated, including the impact on operating costs, the impact on damage to our own factories, and the impact on demand for energy-saving products and services**

		Risks and opportunities relating to climate change and other environment issues	Risk and opportunity category	Impacted stage of value chain	Time horizon	Estimated financial impact	
						1.5℃ scenario	4℃ scenario
RISKS	1	Increased operating costs due to introduction of carbon taxes	Policy and Legal, Technology	Direct operations	Medium to long	10 billion yen*1	No additional tax burden
RISKS	2	Increased raw material and component procurement costs due to market changes	Policy and Legal, Technology, Market	Direct operations, Upstream	Medium to long	Financial impact not calculated due to lack of parameters necessary for quantification	
RISKS	3	Loss of revenue opportunities due to damage to the company's plants caused by typhoons, floods, etc.	Physical (acute)	Direct operations	Short to long	1.5 billion yen*2	
RISKS	4	Loss of revenue opportunities due to the suspension of operations at the company's plants caused by drought, etc.	Physical (chronic)	Direct operations	Short to long	Financial impact not calculated due to lack of parameters necessary for quantification	
OPPORTUNITIES	5	Increased demand for energy saving products and services for new ZEH construction and energy-efficiency remodeling	Products and Services, Market, Energy Source	Downstream	Medium to long	20 billion yen*3	Maintain current trends
OPPORTUNITIES	6	Increased demand for using low-carbon, eco-conscious materials or resources	Products and Services, Markets, Resource Efficiency	Downstream	Medium to long	Financial impact not calculated due to lack of parameters necessary for quantification	
OPPORTUNITIES	7	Increased demand for products related to disaster preparation response, and recovery	Products and Services, Markets, Resilience	Downstream	Short to long	Financial impact not calculated due to lack of parameters necessary for quantification	
OPPORTUNITIES	8	Increased demand for products that help conserve water or improve water quality	Products and Services, Markets, Resource Efficiency	Downstream	Medium to long	Financial impact not calculated due to lack of parameters necessary for quantification	

Clearly showing calculation basis such as IEA, WRI (Aqueduct Floods), Japanese government information, etc

1 Financial impact calculation is based on the assumption that a carbon tax (using IEA's estimates of carbon prices considered necessary to achieve the 1.5℃ target) is imposed on Scope 1 and 2 carbon emissions.

2 Average loss is calculated based on the following steps: (1) identified any production sites with flood risks (based solely on production site location; risk mitigation measures set forth in our business continuity plans (BCP) are not incorporated), using the World Resources Institute' s (WRI) Aqueduct Floods tool and hazard maps provided by Japanese municipalities; and (2) multiplied two factors: the number of days of stalled operations for sites in each inundation height zone indicated in Japan's Ministry of Land, Infrastructure, Transport and Tourism (MLIT) Manual for Economic Evaluation of Flood Control Investment; and the daily production volume of each site.

3 Profit is calculated based on the share, price, and profit margin of key products. This calculation assumes an increased ZEH percentage of new and existing housing in 2030 to achieve the Japanese government's 66% reduction target for the residential sector by 2030.

Source : LIXIL, *Disclosure of Environmental Issues Including Climate Change* , https://www.lixil.com/en/impact/environment/pdf/tcfd_tnfd_report_2024en.pdf?_gl=1*pzavgb*_ga*MTgzMTAyOTg2OC4xNzMzMTg4ODUy*_ga_4NY72RD7S3*MTczODEyNjc0OC4xMi4wLjE3MzgxMjc4NDcuNjAuMC4w(As of January 2025)

Domestic Disclosure Examples ： Lixil（Material, Buildings, 2/2）

Demonstrates resilience by reflecting analysis results in strategy

✓ Measures to address risks and opportunities identified through scenario analysis are reflected in environmental strategy

c. Strategic Response to Risks and Opportunities TCFD

By integrating our responses to risks and opportunities identified by the scenario analysis into our environmental strategy, we are working to mitigate risks, achieve sustainable growth, and enhance our resilience as an enterprise.

More specifically, we have set out to improve the profitability of our Japanese business, which is one of our strategic initiatives in the LIXIL Playbook that illustrates our mid-term business direction, and in helping to decarbonize housing through performance enhancements. To do this, we are reorganizing our production systems to reduce fixed costs and switch to platform-based products, adjusting sales prices to increase productivity and profitability of our Japanese business, and this includes the timely launch of new products. Our window line-up revamp is one example. We are responding to external changes flexibly, we are continually working on structural reforms and transforming into a more agile organization, achieving sustainable growth through the expansion of our renovation business. As a result of these initiatives, we completed developing the product platform for our housing technology business in FYE2022 and finished revamping all of our window-series products. In FYE2023, we updated the LIXIL Playbook to include the embedding of the environmental strategy into our business as a key strategic initiative. By continuing to incorporate our environmental strategies into our business , we aim to improve our corporate value while expanding our impact on society and the environment.

The company's efforts regarding climate risks and opportunities,
Describes future strategies and business strategies

（Excerpts from Strategic Response）

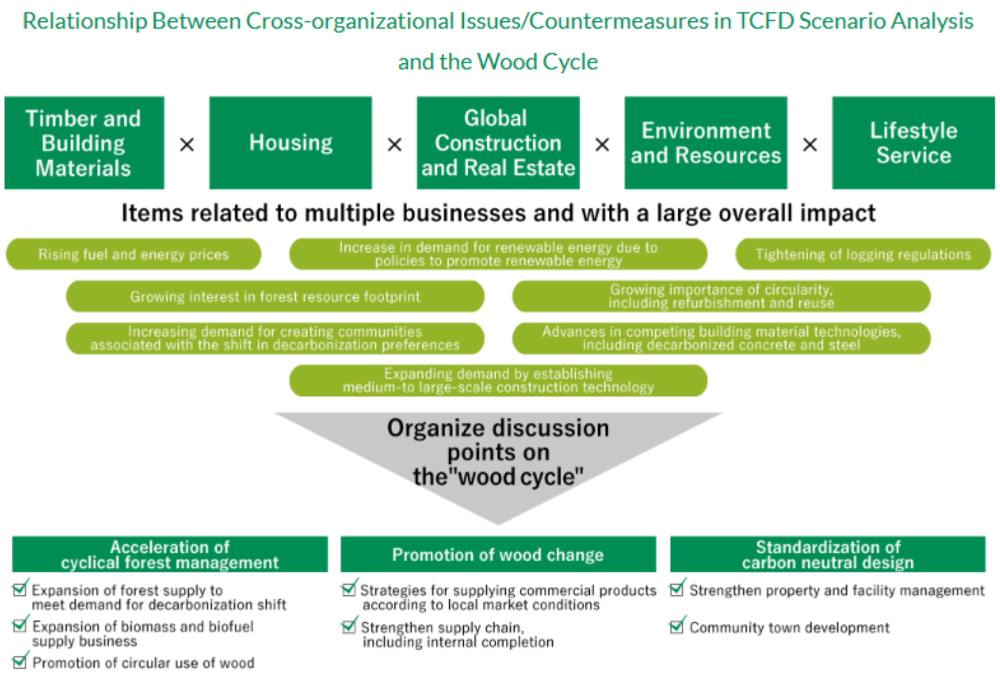
Key risks and opportunities	Strategic response
1 Increased operating costs due to introduction of carbon taxes	To reduce CO_2 emissions from our business sites (especially manufacturing sites), we are working to improve production efficiency, defect rates, and combustion efficiency and upgrade to equipment that meets Japan's Top Runner energy efficiency standards. We are also installing solar photovoltaic systems and increasing procurement of renewable energy when financially feasible, and we are a member of RE100, a global initiative of companies committed to sourcing 100% renewable electricity for their operations. Outside of Japan, we switched all faucet fitting plants and distribution centers (10 locations in total) at LIXIL International, which oversees all our international water-related business, to 100% renewable energy, as well as three plants in Mexico in FYE2023. In Japan, we started using solar power generation equipment installed through Power Purchase Agreement (PPA) on the roofs of the Otani Plant, which manufactures washbasins. The Onomichi Plant, which produces faucets, is also scheduled to switch to solar power in August 2023. Going forward, we will continue to actively consider introducing PPA and other models that offer high additionality as means for procuring renewable energy. Over 80% of our offices, including our sales bases and showrooms in Japan, have already completed the switch to renewable energy. Furthermore, as part of our drive to help realize a carbon-neutral society, we started to consider innovations that incorporate new technologies, such as the conversion to hydrogen fuel and the exploration of CCU technology to separate, capture, and effectively utilize CO_2 emissions. We are also looking to apply new technologies that are currently in the research stage, and are starting studies with a view to putting those technologies into practical application from 2030 onward. In addition, we are consistently verifying manufacturing technologies with a view to switching to hydrogen fuel as part of our business innovation activities. We conducted hydrogen combustion experiments to verify the high-temperature furnaces used for aluminum-melting and firing sanitary ware and tiles, and we ascertained that hydrogen can be used in the same way as conventional natural gas without any issues. We conducted a successful demonstration experiment for mass-produced equipment in LIXIL plants relating to the aluminum aging treatment process, which raises concerns over the potential impact on quality, with a view toward engineering a conversion to hydrogen fuel for aluminum profile manufacturing processes other than high-temperature melting. We are also verifying a more effective internal carbon pricing system to promote more strategic energy-saving investment over the medium to long term. For more information: Climate Change Mitigation and Adaptation > Business Operations LIXIL Starts Verification of Manufacturing Technology with a View to Switching to Hydrogen Fuel and Pursuing Innovation to Help Achieve Net-zero CO2 Emissions in its Business Activities (Japanese only) Introduced LIXIL's first PPA-based solar power generation equipment in Japan at two plants (Japanese only) Supporting the Climate Change Initiative Message Calling for an Accelerated Introduction of Renewable Energy and an Earlier Adoption of Effective Carbon Pricing (Japanese only)
2 Increased raw material and component procurement costs due to market changes	To reduce CO_2 emissions from procurement of raw materials and components, we are switching to low-carbon raw materials and components such as aluminum scraps collected from outside our manufacturing process, making products thinner, and reducing the number of components per product. In FYE2023, we started engaging with suppliers that account for the top 80% of all procurement-related CO_2 emissions to help understand the current situation across our entire value chain and pursue effective CO_2 reduction activities. We conducted a survey of suppliers that are particularly significant in terms of reducing procurement-related CO_2 emissions to help grasp the current situation regarding the aggregation of CO_2 emissions and the setting of CO_2 reduction targets. We will continue to promote communication with suppliers based on the survey results and strengthen our collaboration to reduce procurement-related CO_2 emissions as well as to ensure a stable supply of raw materials and responsible procurement. At LIXIL International's water faucet factories, we carry out alloy smelting in in-house furnaces and, at our plants in Japan, we promote the recycling of aluminum scraps from outside our manufacturing process to help reduce the amount of energy required for the manufacture of aluminum products, such as the refining of new ingots. In terms of plastic resources, we promote the effective use and recycling of resin materials by, for instance, building mechanisms to help recycle scrap materials generated in factories and introducing sorting equipment, which will ultimately enable us to recycle resin windows into new window materials. For more information: Circular Economy > Business Operations Responsible Supply Chain Management > Conducting and Following Up on Responsible Procurement Survey

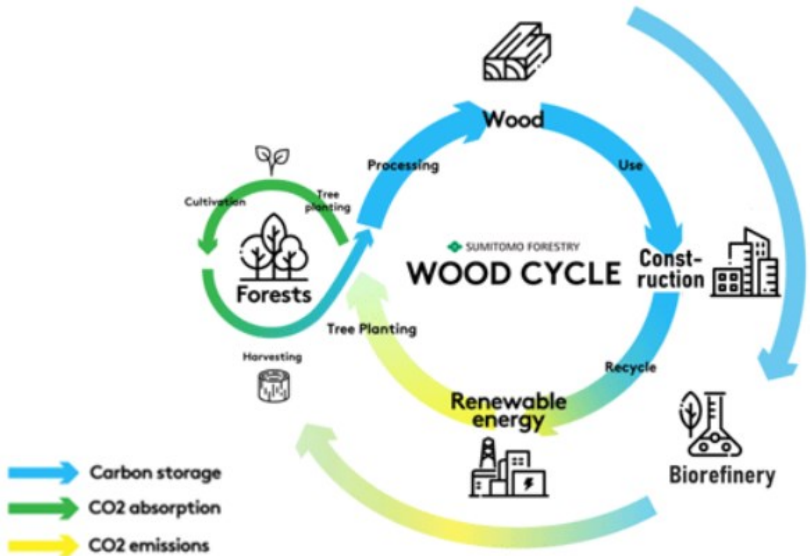
Source : LIXIL, *Disclosure of Environmental Issues Including Climate Change* , https://www.lixil.com/en/impact/environment/pdf/tcfd_tnfd_report_2024en.pdf?_gl=1*pzavgb*_ga*MTgzMTAyOTg2OC4xNzMzMTg4ODUy*_ga_4NY72RD7S3*MTczODEyNjc0OC4xMi4wLjE3MzgxMjc4NDcuNjAuMC4w(As of January 2025)

Domestic Disclosure Examples ：Sumitomo Forestry（Agriculture, food and forestry products）

Based on the scenario analysis results, regarding the cross-business issues, opportunities creations are sorted out in the wood cycle while keeping in mind the three pillars of the decarbonization business: forests, timber, and architecture

- ✓ **Scenario analysis revealed that climate change will have a cross-sectional financial impact on multiple businesses**
- ✓ **Regarding cross-cutting issues, opportunities creations are sorted out in the wood cycle while keeping in mind the three pillars of the decarbonization business: forests, timber, and architecture**





Organizing issues and countermeasures based on the three pillars of the wood cycle: “forests,” “wood,” and “architecture.”

Source：Sumitomo Forestry, *Responding to TCFD*, https://sfc.jp/english/sustainability/environment/climate-change/ (As of January 2025)

Domestic Disclosure Examples：Asahi Group Holdings, Ltd.（Agriculture, Food, and Forest Products）

Quantitative analysis of transition risk and physical risk was conducted by scope and important raw material. It also describes the estimation method that is the basis for the analysis

- ✓ **Quantitative analysis of carbon tax financial impact amount by scope regarding transition risks**
- ✓ **Scope 3 analysis target categories are also enriched each year**

Carbon Tax on the Asahi Group's In-house CO_2 Emissions (Scopes 1 and 2)

		2030		2050	
	Scope 2 electric power CO_2 emission factor	Amount of carbon tax	Total financial impact	Amount of carbon tax	Total financial impact
Experimental calculation for 2023	–70%	\$130/t (Developed countries) / \$90/t (Developing countries)	8.6 billion yen	\$250/t (Developed countries) / \$200/t (Developing countries)	15.3 billion yen
Experimental calculation for 2022	–70%	\$130/t (Developed countries) / \$90/t (Developing countries)	9.0 billion yen	\$250/t (Developed countries) / \$200/t (Developing countries)	15.3 billion yen

*The amount of impact is calculated based on the CO_2 emissions from the production phase.
*Both in 2022 and 2023, the Scope 2 emissions were calculated based on the *IEA's World Energy Outlook 2021* (IEA WEO2021).

- The amount of carbon tax is its own estimate based on IEA NZE projections.
- The Scope 2 emissions are calculated based on the IEA WEO 2021.

Scope 3, Category 4 (Upstream Transportation and Delivery) and Category 9 (Downstream Transportation and Delivery) Financial Impact of Carbon Tax Introduction (experimental calculation for 2023)

	2030	2050
Scope 3, Category 4	11.3 billion yen	22.0 billion yen
Scope 3, Category 9	6.9 billion yen	13.9 billion yen

*The calculation of CO_2 emissions covers Japan, Europe, Oceania and Southeast Asia, which account for 90% of the Group's sales.
*The amount of carbon tax per t is our own estimate based on IEA NZE projections.

Scope 3, Category 1 (Packaging) Financial Impact of Carbon Tax Introduction

	2030	2050
Experimental calculation for 2023	56.2 billion yen	109.3 billion y
Experimental calculation for 2022	52.2 billion yen	101.7 billion yen

*The financial impact is calculated based on the volume of CO_2 emissions from the production phase.
*The amount of carbon tax per t is our own estimate based on IEA NZE projections.
*Since the intensity for packaging was updated at the time of the 2023 calculation, we applied the same updated intensity to the 2022 calculation to unify the preconditions for both calculations.

- The amount of carbon tax is its own estimate based on IEA NZE projections.

- ✓ **Regarding physical risks, yield predictions for important raw materials and quantitative analysis of financial impact were conducted for each business**
- **Also describes the estimation method used as the premise**

More than a 15% decrease compared to the current yields

Category	Item	Country of Production	Scenario (1)	Scenario (2)
Main Raw Materials in Beer Category	Barley	Canada (Spring)	+1%	+2%
		France (Spring)	–10%	–18%
		France (Winter)	–5%	–10%
		Eastern Region of Germany (Winter)	+8%	+19%
		Australia	–7%	–13%
		Czech Republic (Spring)	+18%	+7%
		Hungary (Spring)	+4%	+9%
		Northern Region of Italy (Winter)	+10%	+14%
		Southern Region of Italy (Winter)	–8%	–11%
		Poland	–9%	–15%
	Hops	Czech Republic (Yield)	–5%	–7%
		Czech Republic (Quality)	–13%	–25%

Category	Item	Country of Production	Scenario (1)	Scenario (2)
Common Raw Materials in Each Category	Corn	United States	–12%	–24%
		Brazil	–3%	–9%
		Argentina	–9%	–16%
		China	0%	–10%
		Ukraine	–17%	–26%
		Germany	–2%	–4%
		Australia	–13%	–27%

More than a 15% decrease compared to the current yields

Category	Item	Country of Production	Scenario (1)	Scenario (2)
Main Raw Materials in Non-Alcohol Beverages Category	Sugar	Australia	+1%	+2%
		Brazil	+3%	+12%
		India	0%	–3%
		Japan	+2%	+21%
		Thailand	–26%	–45%
	Raw milk	Australia	–9%	–19%
		United States	–6%	–11%
		Japan	–2%	–3%
		New Zealand	–2%	–2%
	Coffee	Brazil	–8%	–23%
		Colombia	–4%	–15%
		Guatemala	–11%	–17%
		Tanzania	–2%	–9%
		Ethiopia	–8%	–25%
		Vietnam	–9%	–24%
		Indonesia	–10%	–30%

Category	Item	Country of Production	Scenario (1)	Scenario (2)
Main Raw Materials in the Food Category	Palm oil	Indonesia (Suitable Areas)	+1%	–1%
		Malaysia	–3%	–13%
	Cocoa	Ghana	+4%	+11%
		Côte d'Ivoire	+1%	+12%
	Soybean	United States	–5%	–10%
		Canada	+16%	+28%
		China	0%	+5%
		Japan (Hokkaido)	+6%	+9%

Experimental Calculations of Financial Impact in 2050

Item	Scenario (2)
Palm oil	20 million yen
Cocoa	-60 million yen
Soybean	4 million yen
Barley	400 million yen
Sugar	-2.4 billion yen

Predicts values of future production and consumption volumes, GDP per capita, and input ratio of ethanol raw materials (for corn only) from past price trends

Source：Asahi Group, Sustainability Report, https://s3-ap-northeast-1.amazonaws.com/asahigroup-doc/company/policies-and-report/pdf/en/sust-report2024_en.pdf (As of January 2025)

Example of Securities Report： Kameda Seika Co., Ltd.（Agriculture, Food, and Forest Products）

In the definition of scenario groups, external scientific evidence and worldviews referenced are described. In the business impact assessment, disclose the amount of damage caused by physical risks

① 戦略

ａ.シナリオ分析

　気候変動によるリスクおよび機会の特定にあたり、当グループにおける製品およびサービスの調達・生産・供給までのバリューチェーン全体を対象として、国際機関等が公表するシナリオをもとに４℃シナリオと２℃シナリオの２つの将来世界観を整理し、2030年時点における当グループへの影響を考察するとともに、それぞれの世界観におけるリスクおよび機会を特定しております。

４℃シナリオ、２℃シナリオにもとづく将来世界観

４℃シナリオ	２℃シナリオ
気候変動対策への取り組みは現行の政策や規制以上の進展がなく、化石燃料由来のエネルギーが継続的に使用されることによって温室効果ガス排出量が増大し、産業革命期頃と比較して、2100年頃までに地球平均気温が４℃以上上昇する将来予測。台風や豪雨をはじめとする異常気象の激甚化や、慢性的な気温上昇に伴う作物生育への悪影響といった、気候変動による直接的な被害が増加するのに対し、法規制や税制という形での市場への締め付けは強化されないため、移行リスクとしての影響度は小さい。	世界規模でのカーボンニュートラルの達成に向けて低炭素化が推進され、世界の平均気温が２℃程度の上昇に抑えられる将来予測。脱炭素化に向けた厳しい法規制や税制が施行され、温室効果ガスの排出量が抑制されることにより、気温上昇が抑制され異常気象等物理的リスクの規模や頻度は４℃シナリオに比べ縮小するものの、脱炭素化に向けた社会構造の変化に伴い、移行リスクは高まる。
（参考シナリオ） IPCC（気候変動に関する政府間パネル）：RCP8.5 IEA（国際エネルギー機関）：STEPS	（参考シナリオ） IPCC（気候変動に関する政府間パネル）：RCP2.6 IEA（国際エネルギー機関）：SDS/NZE2050

　重要課題となり得るリスク項目の中で定量的な分析が可能な項目については、2030年時点における財務インパクトを推定し、４℃シナリオにおける「生産工場に対する物理的被害の拡大」および「プラスチック製包装資材の価格上昇」、２℃シナリオにおける「カーボンプライシングの導入によるコスト増加」が特に大きな影響を及ぼす可能性があることを確認しております。

　なお、当グループの主原料である米の収量および価格の分析にあたり、外部機関が開示する将来予測パラメータでは、空気中の二酸化炭素濃度の上昇が米の生育に寄与するほか、気温上昇による生産地拡大などにより収量の増加および販売価格が低下すると予測されており、各将来予測シナリオにおける米価格予想、平均収量の推移、消費生産バランス等の要素から試算した結果、仕入れコスト減少の可能性を確認しております。

　一方で、水田の水温上昇などに伴い品質低下が見込まれていることから、こうした米を原料にしながらもおいしい米菓を引き続きお客様にお届けできるよう、製品開発や社会貢献の可能性を模索するのが当グループの役割であり、既存の取り組みを継続・加速するとともに、新たな対応策の検討も推進していきます。

- References to external scientific evidence and worldviews for multiple scenarios

- **Quantitative impact is disclosed for the "expansion of physical damage to production plants"** in the 4°C scenario
- Breakdown of damage amounts is provided, but **no basis for calculation is provided**

Source : Kameda Seika Co., Ltd., *Securities Report*, https://contents.xj-storage.jp/xcontents/AS01309/b7204b65/a1c2/4ef9/bfda/430ed6dee575/S100TMYO.pdf (As of January 2025)

Domestic Disclosure Examples ：Kirin Group（Agriculture, food and forestry products）

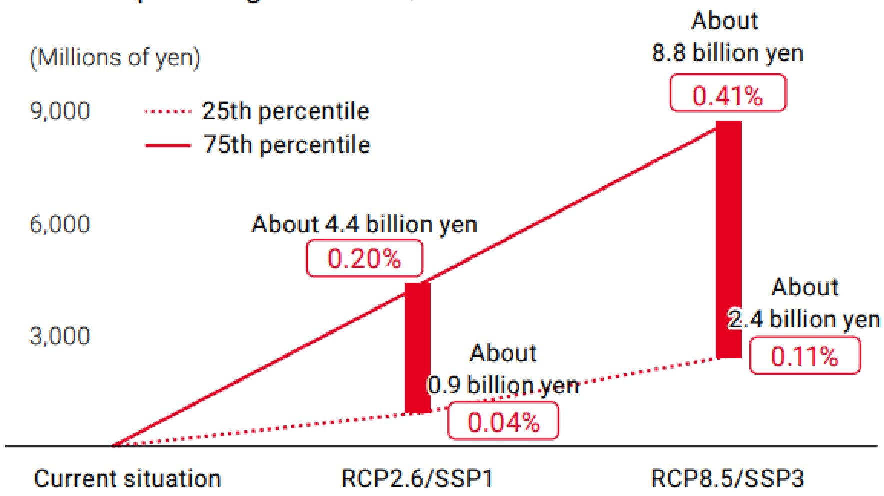
Based on the company's business characteristics, the financial impact of assumed risks and opportunities is estimated qualitatively and partially quantitatively, and the results are disclosed

✓ **Assumes important risks and opportunities in 2030 and 2050 based on the characteristics of the company's strategy, business model, and supply chain, and estimates the financial impact qualitatively and partially quantitatively.**

Financial impact on the procurement of agricultural products from carbon pricing [medium to long term]

The prices of agricultural products may spike if governments introduce carbon taxes and carbon border adjustment mechanisms.
Figure 12 shows the results of our estimation of the financial impact of carbon pricing on agricultural product prices. In 2023, we estimated the impact for Kirin Brewery, Kirin Beverage, Mercian, Lion, Kyowa Kirin, and Kyowa Hakko Bio. Our estimates covered the following agricultural products: barley, hops, tea leaves, grape juice, starch, lactose, corn, and cassava.
In our estimates, we calculated that the impact would be approximately 0.9 billion yen to approximately 4.4 billion yen under the RCP2.6/SSP1 scenario and approximately 2.4 billion yen to 8.8 billion yen under the RCP8.5/SSP3 scenario in 2050. The range of the 25-75 percentile was twice as large for the RCP8.5/SSP3 scenario than the RCP2.6/SSP1 scenario, from which we can conclude that uncertainty is higher and the risk is more significant.

12 Impact on agricultural product procurement costs from carbon pricing in 2050 (percentage of revenue)



*1 The socioeconomic systems in the papers we used for our estimates differ from the Kirin Group scenarios, so we have created and disclosed our estimates under the RCP2.6/SSP1 and RCP8.5/SSP3 scenarios in these papers (sources are listed in reference documents).
*2 Recalculated with 2023 data

（Some excerpts from the risk/opportunity items regarding the cost impact of carbon pricing）

Source : Kirin Group, *Environmental Report 2024*, https://www.kirinholdings.com/en/investors/files/pdf/environmental2024e.pdf (As of January 2025)

Domestic Disclosure Examples：FUJI OIL HOLDINGS INC.（Agriculture, Food, and Forest Products）

Business impact is assessed as "small, medium, or large", according to the size of the scale, including time of onset and period of impact. Countermeasures are also disclosed

1.5°C scenario
Details
The Group seizes the following opportunities by leveraging its differentiated and integrated technologies and by co-creating solutions with customers to enhance product competitiveness through the addition of better flavor, richness of taste, and aroma to plant-based ingredients, resulting in dramatically increased sales for the Group. ・As more and more people place greater priority on environmental problems, consumption of plant-based protein (e.g., meat and dairy alternatives) thrives and the global market for such alternatives grows dramatically, mainly among Millennials, Generation Z, and vegetarians. These groups hold the view that raising livestock requires large amounts of feed, water, and land, causing water shortages and deforestation, and exacerbating climate change. Therefore, they attach greater importance to sustainability and express their values through their consumption behavior. ・While the demand for meat and dairy increases mainly in low- and middle-income countries, there is a global supply shortage of meat and dairy. This is due to global population growth, economic development and dietary changes as well as adverse impacts on livestock production caused by extreme weather events, natural disasters, and the rise in the average global temperature due to climate change. Demand for plant-based protein (e.g., meat and dairy alternatives) increases to make up for this shortage. Demand for plant-based protein expands as Japan, the US, and Europe transition away from their dependency on animal protein toward plant-based protein, and due to a shortage of protein in regions such as Sub-Saharan Africa and South Asia.

Time of onset	Duration of impacts	Impact level
Within 5 years	Longer than 10 years	Medium

The Group seizes the following opportunities by leveraging new and existing technologies from the Group's R&D in the polysaccharide business, stabilized DHA/EPA business, and other functional high-value-added products businesses, as well as the chocolate and plant-based protein businesses, leading to increased sales for the Group.

- Global climate change has shifted the temperature region of infectious diseases such as dengue fever and malaria, causing outbreaks in countries and regions where they have never occurred before. Also, there are new health issues such as higher cases of heat stroke. Health awareness grows over time as a result.
- Adding to the increase in these infectious disease outbreaks and cases of heat stroke is an anticipated sharp rise in lifestyle diseases such as obesity, diabetes and dementia in regions including South Asia, Europe, Africa, North America, and Central and South America. This leads to greater consumer needs for immunity-boosting, highly nutritious, high-protein, and low-sugar foods that help prevent such health issues, driving increased demand and market expansion for lactic acid bacteria, DHA/EPA, polyphenols, proteins, peptides, and low-sugar chocolates.
- With more people in society placing greater priority on environmental problems, the concept of One Health[*2] gains traction across all generations, increasing demand for products focused on human and environmental health. As a result, the Group sees rising demand for its PBF products, which contribute to environmental conservation and improved health through their potential benefits in preventing infectious diseases, heat stroke, and lifestyle diseases such as obesity, diabetes and dementia.

Time of onset	Duration of impacts	Impact level
Within 10 years	Longer than 10 years	Medium

✓ **Time of onset and period of impact for the period of impact are disclosed separately.**
Not only is the degree of impact is disclosed quantitatively, the time of onset and duration of impact is shown as well

✓ **Quantitative assessment based on 3 categories of risk impact**
Small：Impact less than 2 billion yen
Medium：Impact of 2 billion yen or more to less than 10 billion yen
Large：Impact of 10 billion yen or more

✓ **Detailed policy on risk response measures**

Response approach

- **Conserve the environment through sustainable procurement**
- **Offer plant-based ingredients, one of our Group's strengths, to address social issues and foster the next-generation of businesses in a decarbonizing society**
- **Build a global research network and promote open innovation**
- **Recognizing changing market dynamics and needs — such as rising health consciousness and ethical awareness due to climate change impacts — as an opportunity, conserve the environment through sustainable procurement and offer plant-based ingredients, one of our Group's strengths, to address social issues and foster the next-generation of businesses in a decarbonizing society**

・By establishing the systems needed to develop products and promote business strategies that accurately respond to market trends, we will focus on new challenges such as revising our business portfolio for high value-added products and optimizing our production across the Group in anticipation of these future changes in the business environment.
・By building and actively participating in an industry-academia consortium with research institutions worldwide and promoting open innovation using Fuji Oil Global Innovation Center Europe (GICE) as a hub, we will acquire new technologies and develop global human resources that will accelerate the creation of social value in a decarbonized society.

Source：FUJI OIL HOLDINGS INC., *Environmental Management*, https://www.fujioilholdings.com/en/sustainability/environmental_management/ (As of January 2025)

Domestic Disclosure Examples ：J. Front Retailing（Trading, Retail）

Financial impact of risks and opportunities is listed quantitatively and qualitatively, and the analysis results are reflected in long-term business strategies to strengthen resilience in either scenario

- ✓ **Assuming important risks and opportunities as of 2030, the company qualitatively and partially quantitatively estimated the financial impact of two types of scenarios, 1.5°C/less than 2°C scenario and the 4°C scenario, and countermeasures are listed for each opportunity item.**
- ✓ **In qualitative evaluation of business impact, the degree of financial impact is expressed by three-level arrows for each scenario**

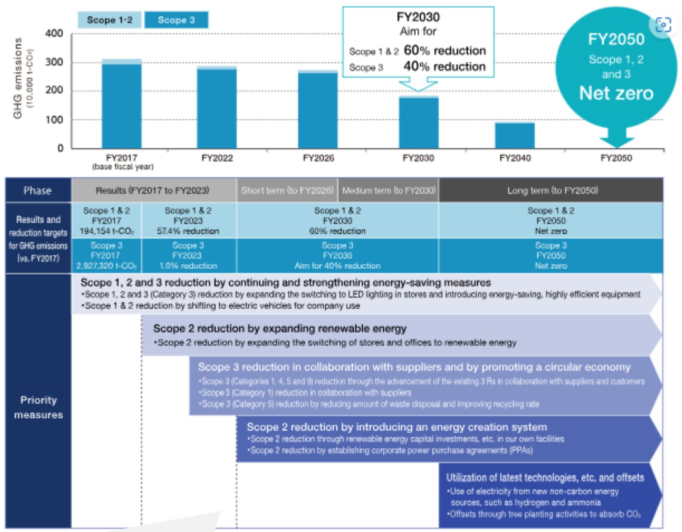
Climate change risks and opportunities of particular importance to the JFR Group and their financial impacts in FY2030

↑ Impact on JFR Group's business and finances expected to be very large
↗ Impact on JFR Group's business and finances expected to be somewhat large
→ Impact on JFR Group's business and finances expected to be negligible

Type of climate-related risks and opportunities		Timing of emergence: Short-term	Medium-term	Long-term	Climate-related risks and opportunities of particular importance to the JFR Group	Financial impact: Below 1.5°C/2°C scenario	4°C scenario	Measures
Risks	Transition risks	●	●		-Increase in costs associated with introduction of carbon tax, etc.	Approx.¥1,500 million※1	Approx.¥1,300 million※1	●Reduction of GHG emissions through aggressive energy conservation measures in stores and expansion of renewable energy switching to achieve the 2050 net-zero target
		●	●	●	-Increase in costs associated with the development of properties with high environmental performance and the installation of equipment	↑	↑	●Financing through Green Bonds, etc. ●Introduction of cost-effective equipment
		●	●	●	-Increase in investment for introduction of high-efficiency energy-saving equipment	↗	↗	●Introduction of internal carbon pricing ●Cost-effective and well-planned investment considerations
		●	●		-Increase in renewable energy procurement costs due to increased demand for electricity derived from renewable energ	Approx.¥700 million※2	Approx.¥300 million※2	●Introduction of internal carbon pricing ●Reduction of renewable energy procurement risk and mid- to long-term costs through diversification of renewable energy procurement methods ●Improvement of energy self-sufficiency through installation of renewable energy equipment in the company's facilities, etc.
	Physical risks	●	●		-Decrease in revenue due to store closures caused by natural disasters	Approx.¥5,200 million※3	Approx.¥10,300 million※3	●Increased resilience of stores and business sites through BCP preparation ●Improvement of disaster prevention performance of stores
Opportunities	Energy sources	●	●	●	-Decrease in energy procurement cost due to introduction of high-efficiency energy-saving equipment	Approx. ¥400 million※4		●Replacement with high-efficiency energy-saving equipment at the appropriate time
	Products and services	●	●		-Decarbonization of the entire supply chain and expansion of earnings by responding to increased demand for environmentally friendly products and services	↑	↗	●Expansion of environmentally friendly products and services handled ●Recycling of waste cooking oil as domestically produced SAF ●Collaboration with suppliers to reduce food waste through the use of AI demand forecasting systems, etc. ●Dialogue with suppliers toward decarbonization, including encouraging suppliers to calculate GHG emissions and holding briefing sessions to link Scope 3 emissions data
	Markets	●	●	●	-Expansion of new growth opportunities through new entry int the circular businesses -Expansion of profits through acquisition of new customers by proposing sustainable lifestyles	↑	↗	●Expansion of circular businesses such as sharing and upcycling, including the fashion subscription business "Another ADdress" ●Launch of circular businesses through effective use of M&A and CVC* investments
		●	●	●	-Expansion of profits due to increased opportunities to acquire new tenants through conversion to stores with high environmental value	Approx.¥2,500 million※5	–	●Acquisition of environmental certifications for newly developed properties (ZEB, CASBEE, etc.) ●Promotion of energy conservation in stores toward realization of RE100

- ✓ **The results of scenario analysis are reflected in long-term business strategies to strengthen resilience**

JFR Group FY2050 Net Zero Transition Plan



- **To achieve net zero in 2050, the company formulated a transition plan to achieve net zero in 2050, based on the need to strengthen strategic resilience from a medium- to long-term perspective even under three temperature zone scenarios**
- **To achieve the reduction targets for FY2030 and FY2050, the company plans to expand energy conservation and renewable energy, promote a circular economy, introduce energy creation systems, and utilize new technology**

Source : J. Front Retailing, *Sustainability*, https://www.j-front-retailing.com/english/sustainability/low-carbon/low-carbon06.html (As of January 2025)

Example of Securities Report：Isetan Mitsukoshi Holdings Ltd.（Trading, Retail）

In each scenario, impact on the company is illustrated along with relationships with the government, suppliers and consumers

✓ **Based on external scenarios, changes in the external environment in a world of less than 2°C/4°C are summarized using the relationship between government/administration, suppliers, consumers and the company**

Less Than 2 Degrees Warming World - Decarbonization Advances and Natural Disasters Stop Intensifying

Government
- Pressure to increase costs grows with the implementation of carbon pricing
- Polices to promote energy conservation and renewable energy become more sophisticated in order to achieve greenhouse gas reduction goals

Suppliers
- Switch is made from fossil fuels to renewable energy
- Demand for decarbonization becomes widespread
- Product prices rise due to carbon pricing

Isetan Mitsukoshi Holdings Ltd.
- Natural disasters stop intensifying and physical risks to department stores and other locations decrease
- More sophisticated energy conservation and greenhouse gas reduction measures are needed
- Means to procure renewable energy become multifaceted, and costs decrease

Consumers
- People choose decarbonized, energy-saving, and environmentally friendly products and services
- Companies' environmental measures directly impact their image (People identify with companies with a strong commitment to environmental measures, and refuse products and services of companies that show no interest in environmental measures)

4 Degrees Warming World - The World Continues on Its Current Path and Natural Disasters Intensify

Government
- Current tax systems and regulations remain unchanged
- Even if carbon pricing or other measures are implemented, financial impacts is relatively slight

Suppliers
- Due to natural disasters becoming more extreme, the risks of suspending operations and disrupting product supply manifests
- Dependence on fossil fuels continues

Isetan Mitsukoshi Holdings Ltd.
- Physical risks to department stores and other locations manifest due to natural disasters becoming more extreme
- Current energy conservation and greenhouse gas reduction measures continue unchanged
- Renewable energy costs remain high, and the switch is slow-going
- The advancement of global warming leads to increasingly poor sales of winter clothes and other items
- Frequent natural disasters cause customer spending to stagnate, resulting in lower sales

Consumers
- Increased needs for decarbonized products
- Increased needs for energy-saving products
- Increased needs for environmentally friendly services
- The advancement of global warming causes demand for winter clothing and other items to stagnate
- Frequent natural disasters cause spending to stagnate

Source：Isetan Mitsukoshi Holdings, *Securities Report*, https://pdf.irpocket.com/C3099/ba4w/z1fO/x0iV.pdf (As of January 2025)

Domestic Disclosure Examples ：Mitsubishi Corporation（Trading, Retail）

Mitsubishi develops its own 1.5°C scenario based on published scenario, conducting detailed scenario analysis which most suites their business model. Furthermore, the analysis is applied when determining policies and initiatives.

- ✓ **Mitsubishi discloses prerequisites and calculation logic on the company's unique 1.5°C scenario (1.5°C scenario for FY2022)**
- ✓ **Businesses that are significantly affected by the transitional risks and opportunities by climate change may be targeted for 1.5°C scenario analysis. Detailed analysis and formulation of business policies and approaches are conducted in accordance with the characteristics of their businesses. Transitional risks cover "natural gas/LNG" and "coking coal" among businesses classified as "transformational businesses," while transition opportunities cover "renewable energy" businesses.**

The 1.5℃ Scenario Used in FY2022

We used the IEA Net Zero Emissions by 2050 Scenario (IEA NZE) as a reference for our 1.5°C scenario analysis in FY2021. However, the IEA NZE data lacks the granularity required to extract precise insights that reflect MC's particular business characteristics and strategies. As such, MC collaborated with a third-party organisation to create and utilise a customised, specific model of the 1.5°C scenario (FY 2022 1.5°C Scenario), while aligning key assumptions with the IEA NZE wherever possible, thus allowing for a detailed level of granularity on topics like demand by region and product. Key assumptions for the FY2022 1.5°C scenario and the comparison with the IEA NZE are shown in Table 1 below.

Table 1 Key assumptions for the FY2022 1.5°C scenario and the comparison with the IEA NZE

		FY2022 1.5℃ scenario		IEA NZE		
Item	Unit	2030	2050	2030	2050	Notes
① GDP CAGR	%	3.2	2.4	~3	~3	IEA NZE discloses only approximate numbers
② Population	Bil ppl	8.5	9.7	8.5	9.7	Aligned
③ Net CO2 Emissions	Gt CO2e	25.8	-2.4	21.1	0	Broadly Alligned (NZE does not include land use change.)
④ Final energy use	EJ	429	400	394	344	See below for further detail
		30	4			
		284	9			

Explains the assumptions of the original scenario and how it differs from IEA scenario

A. Natural Gas／LNG

【Analysis of Business Environment】

In formulating MC's LNG business strategy, it is important to understand the trajectory and scale of LNG demand under the 1.5°C scenario, which assumes that decarbonization progresses. From this viewpoint, MC verified and analyzed (1) The primary energy supply of oil and natural gas, (2) Natural gas demand, and (3) LNG demand based on the FY2022 1.5°C scenario.

(1) The Primary Energy Supply of Oil and Natural Gas
The ratio of oil and natural gas among primary energy supply does not differ significantly between the FY2022 1.5°C scenario and the IEA NZE. Both scenarios project that energy from oil and natural gas will decline to approximately 265-285 exajoules (EJ) in 2030, and to approximately 100 EJ in 2050. This figure falls within the range of other 1.5°C scenarios for 2050, including the IEA NZE published by the WBCSD (see Chart 3)

【Monitoring and Discussion Items for Transform Discussion】

In consideration of the business environment mentioned above, for natural gas and LNG businesses, MC will monitor and discuss at the management level the current status and trends of climate change transition risks and, more specifically, items that could affect supply and demand (see below) in the "Transform Discussion" introduced in the Midterm Corporate Strategy 2024 as one of the sustainability measures. Such results shall be incorporated into the final business strategy.

- Geopolitical risks such as the current energy crisis and situation in Ukraine
- Natural gas, LNG, and decarbonization policies of our partners, such as LNG consumers and major oil and gas companies
- Advances in low-carbon and decarbonizing technologies such as renewable energy, nuclear power, next-generation energy and CCUS
- Trends in climate change-related regulations, including policies on natural gas and LNG, and GHG emissions reductions by various governments

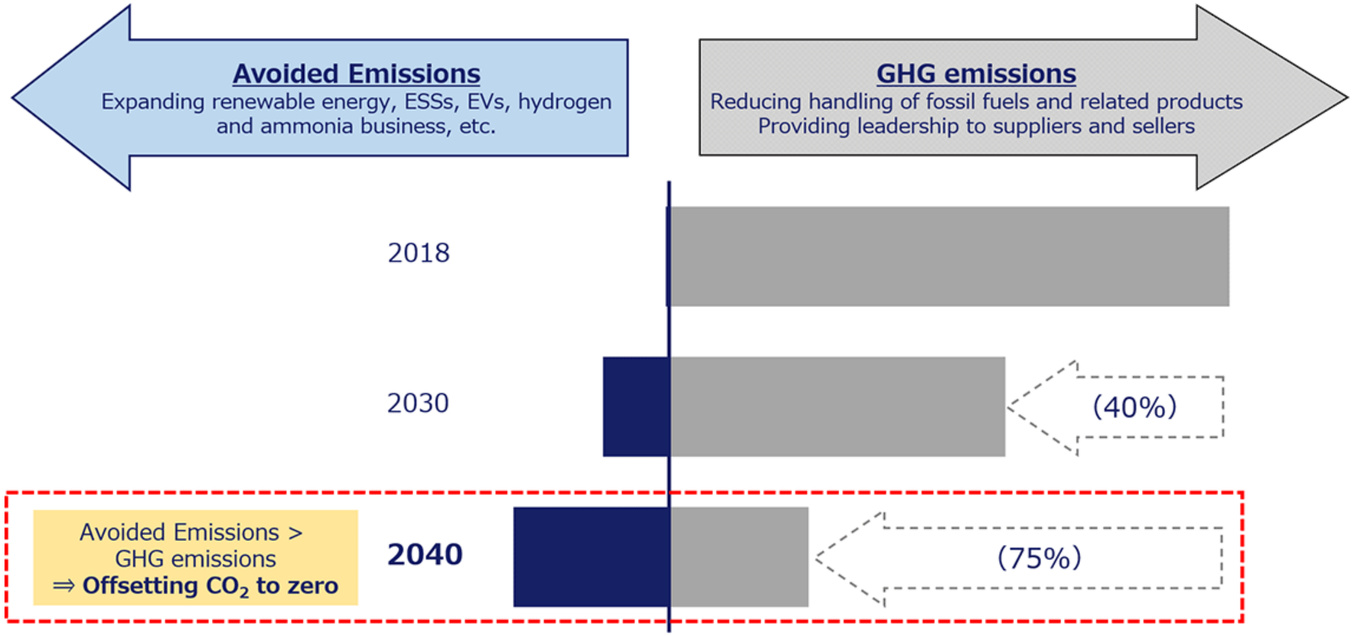
Explains analysis results, policies, and initiatives based on scenarios envisioned by the company for each business

Source : Mitsubishi Corporation, *Climate Change*, https://mitsubishicorp.disclosure.site/en/themes/161/#1326 (As of January 2025)

Domestic Disclosure Examples ：Itochu Corporation（Trading, Retail）

Concisely describes initiatives and reduction policies in the transition plan in two directions: GHG emissions and contribution to reduction

✓ **Describes the policy for initiatives aimed at achieving net zero GHG emissions by 2050, along with intermediating targets for carbon offsets through contribution to reductions**



Setting a goal for 2040 where contribution to reduction exceeds GHG emissions

Setting interim targets for 2030 and 2040 for the total of "Scope 1/2/3+ emissions related to fossil fuel operations and interests"
- **Achieve "virtual zero" GHG emissions by 2050**
- **Achieve "zero offsets" by 2040 by achieving a 75% reduction compared to 2018 and actively promoting businesses that contribute to reducing GHG emissions**
- **Achieve a 40% reduction compared to 2018 by 2030**

Source : Itochu Corporation, *Climate Change (Information Disclosure Based on TCFD Recommendations)*, https://www.itochu.co.jp/en/csr/environment/climate_change/index.html (As of January 2025)

Domestic Disclosure Examples：ASKUL Corporation（Trading, Retail）

Scenarios are defined by defining the worldview for each supply chain

✓ **Defining the worldview of each 2℃/4℃ scenario for each supply chain**

●シナリオ群の定義

シナリオ分析では、サプライチェーンを含むグループ全体を対象とし、IEA等の科学的根拠等に基づき2°Cシナリオと4°Cシナリオ、それぞれの世界観を定義し、2030年社会を考察しました。

	4℃の世界	2℃の世界
政策・規制	(特段の政策、規制なし)	**規制強化**(炭素税引き揚げ、森林資源保護) **支援政策実施**(再プラ認証制度など)
調達	**洪水**による**サプライヤ工場への被害増加** 再エネの普及は進まず、**原油価格上昇**	(洪水影響 軽微) **再エネ普及**による**電力価格上昇** **森林保護規制強化**による**原材料費高騰** **再プラ規制**による**原材料費高騰**
保管・配送	**洪水**等による**施設・配送への被害増加** 原油価格上昇による**電力コスト増加** 真夏日が増加し**冷房等の費用増加**	「4℃」ほどではないが**洪水**等による**被害増加** 炭素税上昇などにより**再エネ、EVにシフト** 「4℃」ほどではないが**冷房等の費用増加**
商品利用・回収	「2℃」ほどではないが**サステナブル商品需要増** **暑さ対策・防災関連商品の需要が拡大**	政策支援もあり**サステナブル商品の需要増** **サーキュラーエコノミーへの需要増**

Source : ASKUL Corporation, *Information disclosure based on TCFD recommendations*, https://askul.disclosure.site/ja/themes/174 (As of January 2025)

Domestic Disclosure Examples：KDDI株式会社（Electricity, Machinery, Communication）

Scenario analysis on transitional and physical risk was conducted and measures are established. Disclosure describes specific measures for base station facilities, in which identified as high risk on business such as flood risk

- ✓ **Extracts migration risks and physical risks and describes countermeasures respectively**
- ✓ **Paying particular attention to business risks due to water damage, and measures to be taken at communication station buildings that are highly affected are described**

The 4°C scenario in which physical impact will become apparent due to lack of measures against climate change (the increase in the global average temperature is held at 4°C above pre-industrial levels)

Reference: IPCC (Intergovernmental Panel on Climate Change) Fifth Assessment Report

Analysis of Physical Risks		KDDI's Risks	KDDI's Responses
Acute Risk	Increase in severity and frequency of disasters caused by extreme weather (typhoons, floods, etc.)	Risk of increased costs such as personnel expenses for emergency recovery in order to respond quickly to the restoration of the communication network	Preparation for efficient recovery operations by reviewing the BCP [3] and conducting disaster recovery drills
Chronic Risk	Increase in average temperature	Risk of increased air-conditioning power usage in data centers to cool servers entrusted to us by our customers [2]	Installation of highefficiency air conditioning systems and replacement with renewable energy power

[2] Of the 3,000 operation and maintenance personnel, the remaining 2,000 operation and maintenance personnel are to cover the normal workload of 1,000 dedicated to emergency recovery, which is estimated to be 4 hours of overtime per day for 10 days, based on past examples of disaster recovery at each site. The cost of reviewing the BCP from a medium-term perspective (~2030) and conducting training based on the BCP is assumed to be approximately 96 million yen.

[3] Business Continuity Plan

Water risk assessment and our response

Climate change in recent years has increased concerns about business risks, including water damage. KDDI conducts water risk assessments and implements countermeasures as a preliminary measure to prepare for efficient recovery activities in the event of a disaster.

KDDI systematically carries out countermeasure works at sites that are highly susceptible to flooding based on the estimated height of inundation in the "expected flood inundation zone (estimated maximum: once in 1,000 years)" as determined by the Ministry of Land, Infrastructure, Transport and Tourism or the prefectural government.

[Examples]

- Example 1

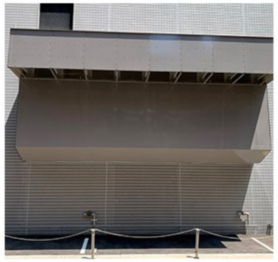
Site	Site A in Chugoku area in Japan
Measurement	Installation of water proof door, covered glass window by concrete wall (water barrier wall), raised ducts for generator supply and exhaust ports installation of backflow prevention valves in toilets, etc.
Construction period	June 2022

- Example 2

Site	Site B in Kyushu are in Japan
Measurement	Installation of water proof door and water barrier shutter, convered opening such as window by concrete, waterproofing measures for generator supply and exhaust ports, etc.
Construction period	By the end of FY2024

[Main measurements]


Water proof door


Raised ducts for generator supply and exhaust ports


Water barrier wall

Source : KDDI, *Responses to the TCFD Recommendations,* https://www.kddi.com/english/corporate/sustainability/efforts-environment/tcfd/ (As of January 2025)

Domestic Disclosure Examples ：NTT Data (Electricity, Machinery, Communication)

As for business impact assessment, the business/financial impacts and measures/costs are described quantitatively and qualitatively, as well as disclosing the basis of calculation

(Partially Excerpted)

Climate Change Risks and Response

Time horizon: Short term

Risk 1 **Loss of reputation due to delayed responses** [Transitional risk: Reputational]

Assumed business and financial impacts

In recent years, various regulations are anticipated globally due to the growing trend toward environmental consideration, and companies' attitudes toward sustainability have increasingly influenced the decision-making of stakeholders, including shareholders and consumers. If companies delay in responding to investor demands for climate change–related information disclosure or fail to adequately implement GHG emission-reduction initiatives, they face risks such as declining stock prices from negative investor evaluations and deteriorating funding conditions in the market.

Financial impact

If our stock price were to decline 1% due to a diminished reputation among ESG investors and financial institutions, we estimate that our market capitalization would decrease by ¥34 billion* (based on the assumption that this event occurs once between fiscal 2022 and fiscal 2025).

* Estimated based on the stock price and the number of issued shares as of the end of fiscal 2023

Measures and costs

Establishment of the Sustainability Committee and advancement of in-house initiatives

To promote the Group's initiatives regarding climate change, we established the Green Innovation Office as a dedicated organization in October 2021 and launched the Green Action Committee. In April 2024, we evolved this into the Sustainability Committee ([Reference page] Sustainability Management "Promotion System") to advance sustainability management from a broader perspective.

Costs

The Green Innovation Office is engaged in various initiatives that include developing and providing services aimed at accelerating the transition to greener solutions for our clients and society, as well as promoting innovation for GHG emission visualization and reduction actions aimed at achieving our own net-zero goal. We have allocated ¥6 billion for the activities and innovation-based investments of the Green Innovation Office for the cumulative period from fiscal 2022 to fiscal 2025.

- ✓ **In business impact assessment, not only the financial impact but also the basis for calculating the financial impact are described quantitatively**
- ✓ **Qualitatively details the business and financial impact of each risk/opportunity and supplements quantitative information**

- ✓ **In defining the measures, includes not only specific measures, but also investment amount and investment philosophy**
- ✓ **Details qualitatively the company structure for measures, the specific details of the measures that have already been taken, and the cumulative amount of investment from FY2022 to FY2025 for the countermeasures and supplements quantitative information**

Source : NTT Data, *Sustainability Report 2024 Data Book*, https://www.nttdata.com/global/en/-/media/nttdataglobal/1_files/sustainability/susatainability-report/2024/sr2024.pdf (As of January 2025)

Domestic Disclosure Examples：Ricoh Group（Electricity, Machinery, Communication）

The impact and financial effects of each risk and business opportunity are quantitatively described. Particularly, for business opportunities, mitigation and adaptation are focused and efforts and achievements are disclosed

- ✓ **Quantitatively describes the impact and financial effects of each risk and business opportunity identified in scenario analysis**
- ✓ **Opportunities are classified into two, Activity-based and Business-based**
  - **For Activity-based opportunities, specifies FY2023 results and financial contribution focusing on contribution to mitigation/adaptation**
  - **For Business-based opportunities, specifies the sales targets for Social issue–resolving businesses**

Degrees of risk impact and urgency (transition and physical risks)

Based on scenario analysis, we have identified major risks that can impact Ricoh Group finances. We investigated each respective climate change, resource circulation and biodiversity risk, combining those that overlapped, and classified them into transition and physical risks, before estimating the degree of impact (financial) and urgency (likelihood of occurring) in line with the concept of a company-wide risk management system. We will increase our resilience to environmental impacts by firmly implementing responses based on these levels of impact.

Risk Category	Risk Type	Field	Item	Risk Scenario (Impact on Ricoh Group)	Impact	Urgency	The Ricoh Group's response	Related page
Transition risks (1.5˚C scenario*1)	Policy and legal	Climate change Resource circulation	1. Rising procurement costs from stronger policies	• The introduction of carbon pricing measures, such as carbon taxes and emissions trading, along with circular economy policies that encourage the use of recycled materials and taxing plastic packaging have increased procurement costs as suppliers pass on higher raw material prices	¥1 billion–¥20 billion	Within 5 years	• Supporting supplier decarbonizing activities • Reducing virgin material usage ratio through downsizing, weight-saving and recycled materials	P.21
	Policy and legal	Climate change Resource circulation	2. Stricter regulations and delays in responding to customer demands	• Strengthening environmental regulations for products and companies and tightening stricter customer requirements to reach the 1.5˚C target and build a circular economy. Losing business opportunities and earnings declining from delayed responses	¥20 billion–¥50 billion	Within 3 years	• Actively implement measures on energy-saving and renewable energy that contribute to the 1.5˚C SBTi • Disclose data on CFP, SuMPO EPD, content rates of recycled material used in products, etc. • Fundraising by using sustainability initiatives	P.22
	Market	Climate change Resource circulation	3. Business performance impacts of changing consumer behavior	• Decreased revenues from the rise of teleworking and a shift toward paperless processes to reduce wasteful printing	¥1 billion–¥20 billion	Within 3 years	• Maintain and expand the customer base for our existing office printing business • Expand into the office services field of business	P.23
	Reputation	Climate change Resource circulation Biodiversity	4. Lost social trust and damage to brand value	• Violations of environmental laws, such as illegal dumping, involvement in deforestation, or lost social trust owing to greenwashing, and other factors	¥1 billion–¥20 billion	Within 1 year	• Enforce our environment management system • Strengthen our industrial waste management system • Promote procurement of sustainable raw materials • Give employees awareness training on greenwashing	P.23
Physical risks (4˚C scenario*2)	Acute	Climate change	1. Rapid increases in natural disasters	• Climate change is driving more extreme weather events, causing unexpected wind and water damage at Group production sites suppliers. This can disrupt supply chains, leading to production stoppages and lost sales opportunities. The costs of tackling climate change are rising, including disaster countermeasures, office relocations, and electricity expenses.	¥1 billion–¥20 billion	Within 5 years	• Assess and analyze flood damage risk to our supply chain, and take countermeasures • Reinforce flood measures at sites in Japan	P.24
	Acute	Climate change	2. Regional infectious disease epidemics	Unforeseen circumstances from the spread of infectious diseases may result in: • Delays or stoppages in parts supplies, product manufacturing, or transportation • Delays or stoppages in supplies to sales companies	¥1 billion–¥20 billion	Within 10 years	• Implement BCP that can plan for emergencies • Select multiple suppliers of important parts, or select substitute parts • Practice a BCP that predicts new work styles such as teleworking	P.25
	Acute	Climate change Resource circulation Biodiversity	3. Declining forest resources	• Global warming is causing more forest fires, insect infestations, and other forest destruction, leading to stricter regulations and higher paper procurement costs	Up to ¥1 billion	Within 10 years	• Reduce base paper use with silicone-top linerless labels, which do not use any release coated paper • Strengthen forestry conservation activities (One Million Trees Project)	P.25

*1 1.5˚C scenario: A scenario where the global average temperature increase is below 1.5˚C by 2100
*2 4˚C scenario: A scenario where the global average temperature increase is 4˚C by 2100

Activity-based Opportunities

The provision of products and solutions that help customers reduce their environmental burden by taking advantage of our energy-saving, resource circulation, and energy-creation services; expanded sales of solutions that help combat infectious diseases, and new business creation have brought us various opportunities. Currently, eco-friendly office equipment, solutions to combat infectious disease, and the environmental and energy businesses have contributed to sales on the scale of ¥1 trillion.

	Field	Overview of FY2023 results	FY2023 Financial Contribution Amount	Related page
Contribution to mitigation	Climate change Resource circulation Biodiversity	1. Sales of eco-friendly products Strengthening energy-saving, use of recycling, and control of chemicals	Approx. ¥1,230 billion	P.26
	Climate change Resource circulation	2. Reuse and recycling businesses Recycle design, sales of recycled equipment	Approx. ¥30 billion	P.26
	Climate change Resource circulation	3. Sales from business deal negotiations involving ESG compliance Bidding, sales negotiations	Approx. ¥40 billion	P.27
	Climate change Resource circulation	4.		
	Climate change Resource circulation	5.		
Contribution to adaptation	Climate change Resource circulation	Sol Sup		

Business-based Opportunities

To better demonstrate to all stakeholders our progress in aligning ESG with business growth, we clarified the businesses and the sums they contribute to resolving social issues, and set sales targets for fiscal 2025. The results for fiscal 2023 are shown below.

Materiality	Social issue–resolving businesses	FY2025 targets	FY2023 sales
Zero-Carbon Society Circular Economy	Eco-friendly MFPs Commercial printing Silicone-top linerless labels Label-less thermal, and others	¥450 billion	¥315 billion
Creativity from Work	Office services Smart Vision, and others	¥1,050 billion	¥926 billion
Community and Social Development	GEMBA (Maintenance and services for non-office sites) Municipal solutions Educational solutions, and others	¥50 billion	¥20 billion

Regarding the results of contribution, specific cases are explained in the following pages

Source：Ricoh Group, *TCFD Report 2023*, https://www.ricoh.com/-/Media/Ricoh/Sites/com/sustainability/report/pdf/Ricoh_Group_Environmental_Report_en_web?241028 (As of January 2025)

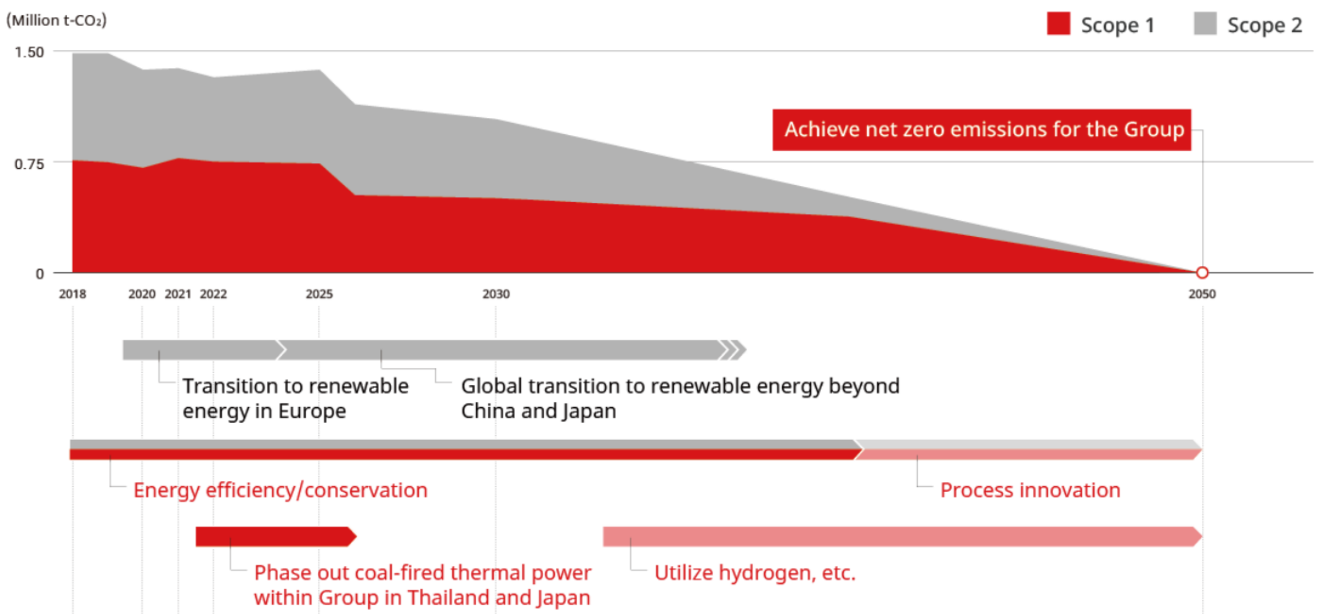
Domestic Disclosure Examples：Teijin （Electricity, Machinery, Communication）

Disclosure indicates a roadmap as initiative that aimed at achieving net zero company emissions in 2050

✓ **Create a roadmap for each scope of initiatives** to achieve net zero in 2050 **in line with the strategy**

Roadmap for Reducing Group CO_2 Emissions (Scope 1 + Scope 2)

Regarding CO_2 emissions, Teijin is implementing initiatives based on its roadmap to achieve net zero emissions by 2050, including shifting to renewable energy sources for electricity and clean energy for heat sources. The shift to renewable energy is progressing smoothly in Europe and is ahead of schedule in China. In addition, projects to fully phase out coal have finished in Thailand, and are likely to be completed in Japan by the end of FY2025, with the full benefits of these projects set to manifest from FY2026.



Describes the efforts in the transition plan in line with the strategy (partial excerpted)

“To reduce the impact on the global environment associated with our business activities, we will work to eliminate coal-fired power generation, as well as promote energy conservation and renewable energy, and technological innovation such as process innovation"

Source : Teijin, *Climate Change Initiatives*, https://www.teijin.com/csr/environment/climate_change.html#anc-04 (As of January 2025)

Domestic Disclosure Examples：EBARA Corporation（Electricity, Machinery, Communication、1/2）

Refers to scientific scenarios such as the IEA, and details the worldview of multiple scenarios set

- ✓ **Sets two scenario groups with reference to IEA WEO and IPCC**
- ✓ **Quantitatively analyzes risks assumed in business for Building and Industrial Equipment market and other market using parameters**

Main Parameters Used in Analysis for Building & Industrial Equipment Market

Transition Risk Analysis Parameters

(As of June 2024, there has been no changes since the disclosure in 2023. The order of the markets has been changed.)

Items of high importance	Parameters	At present (~2020)	2050 4℃	2050 1.5℃	Primary Resources
Carbon pricing, carbon emission targets and policies of each country	Carbon pricing	Introduced in EU	Limited introduction of carbon pricing	Rising carbon prices in all regions 55～250US$/t CO_2	IEA
	GHG emissions targets	Country-specific goals	Country-specific goals	Most major countries pursuing carbon neutrality	Various government websites, etc.
	Electricity prices (in countries where major manufacturing bases are located)	Base year= 1	Slight increase or decrease	Increase by more than 40% depending on the region	IEA
Regulations and legislation related to global warming prevention	Expansion of the refrigerant product market	Base year= 1	-	+Approx. 200%	Our estimates based on various literature
	Top runner motor standards				Our research
Changes in customer companies, governments, and markets	Market trends for pumps and refrigerators	Starting point	-		Various literature
	Power source configuration	Starting point	Oil and gas-derived products decrease, and renewable energy ratio increases	Oil and gas sources down to nearly 0 over 80% renewable energy	IEA
	Demand for more efficient energy-related assets	Base year= 1	Approx. 2.7% global improvement	Approx. 3.5% global improvement	IEA
	Increased Zero Emission buildings	Standard setting	Cannot be expected to grow	Be expected to grow substantially	IEA and the Ministry of Economy, Trade and Industry
Increase in the average temperature	Increase in temperature	Starting point	Short-term: +1.6℃ Medium-term: +2.4℃ Long-term: +4.4℃	Short-term: +1.5℃ Medium-term: +1.7℃ Long-term: +1.8℃	IPCC
	Increase in electricity consumption for air conditioning	Starting point	Energy consumption increased due to an increase in the average temperature.		IEA

: Unable to obtain reliable external parameters.

Physical Risk Analysis Parameters

Items of high importance	Parameters		At present (~2020)	2050 years 4℃	2050 years 1.5℃	Primary Resources
Extreme weather conditions	Frequency of typhoons and cyclones		22 (Typhoon 2021, Japan) World: Unknown	-	-	Meteorological Agency, Ministry of the Environment
	Heavy rain (global)	Frequency of occurrence	Criteria= 1	Approx. 2.7 times	Occurrence frequency: Approx. 1.5 times	IPCC,IEA, Sao Paulo Research Foundation
		Strength	Criteria= 1	Up about 30.2%	Up about 10.5%	
	Frequency of Floods (Japan)		Criteria= 1	Approx. 4 times	Approx. 2 times (Japan 2° C scenario)	Ministry of Land, Infrastructure and Transport, etc.

refers to IEA, IPCC, etc

- ✓ **When describing the worldview qualitatively, the company uniquely categorizes scenarios related to "policies," "customers," and "procurement" based on the company's business model, and describes them in detail in a narrative manner**

(Excerpted partially)

Target Markets	Temperature Scenarios	Policy and Regulatory Scenarios	Customer Scenarios	Procurement Scenarios	New Entrants/Alternatives
Building and Industrial Equipment	4℃ scenario	**Limited regulatory activity** - Limited implementation of carbon taxes, carbon border adjustment mechanism, and emissions trading. - Limited implementation of energy conservation promotion policies such as Zero Emission Building (ZEB). - Climate change adaptation-related grants/subsidies may be implemented. - Disaster countermeasures will be implemented. Disaster prevention and mitigation plans are reviewed.	**The same level of demand continues** - The impact of the introduction of a carbon tax is small. - Costs of end-user operations increase to combat rising temperatures. - Maintenance and replacement of damaged facilities are required.	**Supply will continue at the same level as present** - The impact on procurement costs is small. - Interruptions to supply due to damage caused by wildfires, cyclones, floods, etc.	- None
	1.5℃ scenario	**Regulations are strengthened** - Carbon prices, carbon taxes, and emissions trading are introduced. - Subsidies for technologies contributing to energy conservation and renewable energy are implemented. - ZEB promotion policies are implemented. - New regulations and existing regulations are strengthened.	**Demand for building and industrial equipment with low environmental impact expands** - Energy conservation regulations are strengthened, and energy-saving building equipment is being introduced and refitted. - Installation of air conditioning equipment, pumps, and pump equipment corresponding to ZEB. - Increased installation and refitting of heating/cooling equipment using non-CFC refrigerants.	**Raw material prices rise** - Raw material prices increase due to the introduction of carbon taxes, tighter regulations, and an increase in electricity prices due to the shift to renewable energy.	- Alternative products may emerge.
Oil & Gas	4℃ scenario	**Limited regulatory activity** - Limited implementation of carbon taxes, carbon border adjustment mechanism, and emissions trading. - Energy conservation promotion policies are ad hoc and not strict. - Climate change adaptation-related grants/subsidies may be established.	**The same level of demand continues** - The impact of the introduction of a carbon tax is small. - Petroleum refining and petrochemicals are maintained to a certain extent. - Considerable damage from wildfires, heavy rains, typhoons, hurricanes, floods, etc., which requires service and support.	**Supply will continue at the same level as present** - The impact on procurement costs is small. - Interruptions to supply due to damage caused by wildfires, cyclones, floods, etc.	- None.
	1.5℃ scenario	**Regulations are strengthened** - Carbon taxes and emissions trading are introduced. - New regulations are enacted and existing regulations are strengthened. - Implementation of subsidies/grants for technologies contributing to energy conservation and renewable energy production.	**The oil and gas market evolves** - Demand for oil refinery plants shrinks. - Demand for LNG as an energy source shrinks. - Demand for petrochemicals is maintained to a certain extent. - Demand for energy-saving and highly efficient products will increase. - Demand for hydrogen and ammonia refinery technologies for next-generation energy sources increases over the medium term.	**Raw material prices rise** - The introduction of a carbon tax increases the prices of steel and other raw materials.	- Alternative products may emerge.

Source：EBARA Corporation, *Disclosure Based on TCFD Recommendations*, https://www.ebara.co.jp/en/sustainability/think/information/tcfd.html (As of January 2025)

Domestic Disclosure Examples：EBARA Corporation（Electricity, Machinery, Communication、2/2）

Demonstrates resilience by scenario analysis results and is integrated with business strategy

✓ **Based on the results of business impact evaluation, describes the results of considering countermeasures for risks and opportunities up to 2050**

[Stating resilience clearly] (partially excerpted)

- We believe that the decline in profits resulting from **the decline in sales of conventional oil and gas-related products due to the evolution of the market can be sufficiently offset** by taking the following measures, and **we can also expect an increase in profits on the scale of tens of billions of yen**.

[Integration with business strategy] ((partially excerpted)

- We anticipate that our traditional customers' business field will evolve from the oil and gas market to a next-generation energy market, and we can expect to attract new customers. We **reflect this in our business strategies, including products that respond to advances in CCUS/CCS and hydrogen/ammonia power generation technology, hydrogen production and storage technology, products for geothermal and solar power generation, and compressors for hydrogen liquefaction plants and hydrogen supply pipelines**.

Building and Industrial Equipment, Water Infrastructure Markets

Term Length:
Short: 2025 (Period of our medium-term management plan) / **Medium:** 2030 / **Long:** 2050

Target Markets	Temperature scenarios		Assessment of Business Environment	Term	Countermeasures applicable for both scenarios (1.5℃ and 4℃)
Building and industrial equipment	4℃ scenario	Risk	- There are four major production bases for pumps, blowers, refrigerators, and cooling towers for the … China, two in … of up to appro… typhoons, hu… - We forecast … operating inc…	Short to	- We are continuously working to maintain and implement improvements to our business continuity management, although we …
		Opportunity	We expect de… average temp… increase by a…		
	1.5℃ scenario	Risk	We expect to … 4℃ scenario.		
		Opportunity	- We expect s… billion yen du… promotion of … - We expect s… the tightening… - We forecast… projected ope…		
Oil and gas	4℃ scenario	Risk	We produce … locations in Japan, one in North America and two in … losses and lost profits of up to approximately 4-6 billion yen in the eve… damaged and we are subject to shutdowns by heavy rains, typhoons, and hurricanes.		… believe it unlikely all sites will suffer shutdowns due to extreme weather events at the same time. - We will reduce GHG emissions through implementation of highly efficient manufacturing processes. *We believe we can expect a short- and medium-term sales increase by providing products that contribute to energy saving (energy recovery) at customers' facilities and engineered solutions for energy transition. - We will take measures to strengthen the competitiveness of products for the chemical market. - We believe that the decline in profits resulting from the decline in sales of conventional oil and gas-related products due to the evolution of the market can be sufficiently offset by taking the following measures, and we can also expect an increase in profits on the scale of tens of billions of yen. We will take measures to strengthen the competitiveness of products for the chemical market. We anticipate that our traditional customers' business field will evolve from the oil and gas market to a next-generation energy market, and we can expect to attract new customers. In 2023, we began the medium-term management plan, E-Plan 2025, with a business strategy to develop products that respond to progresses in CCUS/CCS and hydrogen/ammonia power generation technologies, hydrogen production and storage technologies, products for geothermal and solar thermal power generation, and compressors for hydrogen liquefaction plants and hydrogen supply pipelines. In response to the transition to a hydrogen-based society, we launched a company-wide hydrogen-related business project in 2021. We participate in NEDO projects and collaborate with private companies and universities to develop pumps for liquid hydrogen transfer and turbopumps required for hydrogen-fueled rockets. Our aim is to grow this project into an important business area for us over the medium to long term.
		Opportunity	We expect the petrochemical market to continue expanding and related product sales to increase, while the oil and gas sector will trend down resulting in a decrease in related product sales.	Medium to long	
	1.5℃ scenario	Risk	The decrease in operating income due to the decrease in sales of oil and gas-related products is expected to be approximately 5-10 billion yen.	Medium to long	
		Opportunity	- There are two bases in Japan that produce equipment and component products for the semiconductor manufacturing market, and four bases that provide after-sales service for products. Overseas, we operate in several regions and countries, including North America, Europe, China, Taiwan, Korea, Singapore, and Malaysia. We expect to incur property losses and lost profits of up to approximately 5-7 billion yen in the event of shutdowns caused by damage from extreme weather events. - We anticipate that suppliers may experience supply stops due to heavy rain, typhoons or hurricane damage.		

Source：EBARA Corporation, *Disclosure Based on TCFD Recommendations*, https://www.ebara.co.jp/en/sustainability/think/information/tcfd.html (As of January 2025)

Example of Securities Report：Seiko Epson Corporation（Electricity, Machinery, Communication）

Future investment amounts and CAGR are quantitatively described as financial impacts, and efforts to strengthen resilience are disclosed

Category		Evaluated risks & opportunities	Actualization	Business impacts	Financial impact
Transition risks	Market changes Policy & laws and regulations	Paper demand	Short-term	**Impact** • We were unable to detect a strong relationship between climate change and the change in paper demand, but demand for printing and communication paper is assumed to be on a declining trend. Even if the shift to paperless advances further due to changes brought about by COVID-19 (such as the contraction of office printing because of decentralization), we expect only a limited financial impact from the strengthening of products and services based on inkjet technology and paper recycling technology (reduction of printing costs, reduction of environmental impacts, increase of ease of printing, appeal using usefulness of paper information).	Small
		(Initiatives in Environmental Vision 2050) - Decarbonization - Closed resource loop - Environmental technology development	Short-term	**Impact** • Decarbonization of products, services, and supply chains as well as advanced initiatives in resource recycling are needed to respond to the shared global societal issues of climate change and resource depletion. • Scientific and specific solutions are necessary to develop environmental technologies linked with the rapid decrease of environmental impacts. **Response to risks** • Decarbonization - Renewable energy use - Energy-saving facilities & equipment - Greenhouse gas removal - Supplier engagement - Carbon-free logistics • Closed resource loop - Use resources effectively - Minimize production losses - Extend product service lives • Environmental technology development - Dry fiber technology applications - Naturally derived (plastic-free) materials - Material recycling (metal, paper) - CO_2 absorption technology	Invest a total of approximately ¥100.0 billion by 2030
Physical risks	Acute	Damage to business sites due to floods	Long-term (End of 21st century)	**Impact** • Based on the results of risk assessment for 36 sites (17 sites in Japan and 19 sites overseas), the changes in future operational risks due to flooding (rivers overflowing), high tides and water shortage are limited. • Short-term climate change risks to the supply chain will be addressed in line with our business continuity plans.	Small
	Chronic	Damage to business sites due to rising sea levels			
		Impact on operations due to drought			
Opportunities	Products and services	(Initiatives in "Environment Vision 2050") - Customer environmental impact mitigation	Short-term	**Assumed scenarios** • The need for environmentally considerate products and services will increase due to the introduction of a carbon tax, soaring electricity prices, rising waste disposal costs, sustainable production volume, and reduced resource use. **Business opportunities** • In the growth areas defined in Epson 25 Renewed, we expect to grow revenue at a CAGR (compound annual growth rate) of 15% by providing 1) inkjet office printing, commercial & industrial inkjet printing and printheads that reduce environmental impacts, increase work productivity, and reduce printing costs; and 2) production systems with expanded use of new production devices to reduce environmental impacts.	Large CAGR of 15% is expected in growth areas by FY2025
		Environmental business	Short-term	**Assumed scenarios** • Market growth is expected in the areas of global warming prevention, waste treatment, and effective utilization of resources. • The shift to a circular economy is expected to drive market growth for recycled plastics, high-performance biomaterials, bioplastics and metal recycling. **Business opportunities** • Generate revenue by value transformation (enhancing functionality), eliminating plastics (packing and molding materials), creating new high-value-added materials and carrying out other measures through the establishment of technologies, such as applications of dry fiber technology, including paper recycling, development of naturally derived materials (elimination of plastics) and recycling of raw materials (metal and paper recycling) as effective solutions for combatting global warming and shifting to a circular economy.	Medium

Discloses the quantitative financial impact in the 1.5℃ scenario as the amount invested in risk countermeasures and the impact on CAGR

Promoting environmental strategy meetings regularly to strengthen resilience

Strategy

Epson has determined that achieving sustainability in a circular economy and advancing the frontiers of industry are material matters. To achieve these, we are reducing greenhouse gas (GHG) emissions by leveraging our efficient, compact, and precision technologies to drive innovation. We have been implementing activities at regular meetings of the Environmental Strategy Council and its subcommittees to realize our Environmental Vision 2050. In FY2023, we reviewed the status of implementation of activities and submitted deliberations and reports to various management meetings, focusing on the following initiatives.

Increasing resilience	FY2023 initiatives & results	
Environmental Strategy Council	Decarbonization	- Finalized the roadmap for reductions over the medium term toward Scope 1 zero emissions (upgrades of facilities and equipment for electronification and switching of fuels). - Implemented sustainable and stable procurement of renewable energy and formulated a plan for in-house power generation. - Supplier engagement (surveys of suppliers' reduction plans and switching to renewable energy, etc.)
	Closed resource loop	- Started operating resource-loop indicators and targets to become underground-resource-free. - Formulated business-specific/company-wide medium-term plans for utilizing compact, lightweight and recycled materials and switching to sustainable resources.
	Customer environmental impact mitigation	- Started calculation of objective and fair avoided emission for product genre that contributes to reducing the environmental impact of society.
	Environmental technology development	- Materialized the topic of dry fiber technology application (developed packaging materials and cellulose composite bioplastics). - Developed an elemental technology for practical application of a high-value-added technology for metal powders.

Source : Seiko Epson Corporation, *Annual Report*, https://corporate.epson/en/sustainability/initiatives/tcfd.html (As of January 2025)

Domestic Disclosure Examples：NEC（Electricity, Machinery, Communication、1/2）

Referring to multiple external scenarios and independently sets the scenarios into four quadrants. The outline of each scenario is also described narratively

- ✓ **Scenarios are uniquely divided into two axes: "1.5°C" and "4°C", "forced" and "spontaneous", and illustrated in four quadrants**
- ✓ **The worldview is described in the narrative,** and **the external scenarios referenced are also clearly stated**

Larger view

Second scenario: 1.5℃ × Forced environmental supreme efficiency scenario

Larger view

First scenario: 1.5℃ × Spontaneous regional value diversification scenario

Larger view

Third scenario: 4℃ × Forced disaster response scramble scenario

Larger view

Fourth scenario: 4℃ × Spontaneous wider adaptation gap scenario

	Summary of 2030 scenarios
1.5℃	• National and local policies and public concerns are focused on well-being and the environment. • Decarbonization policies are a top priority for national and local governments, and the transition to a decarbonized society is under way due to legislation introduced in the 2020s combined with the efforts of companies and local governments. • Areas at the forefront of decarbonization are introducing renewable energy and promoting energy management, with net zero CO2 emissions in the consumer goods sector. • The penetration rate of the My Number Card is 100%. The number of administrative services that provide incentives and subsidies using this card is increasing, encouraging citizens to change their behavior.

（Excerpted from the table regarding scenario overview）

Referenced Published Scenarios

1.5℃ Scenario	4℃ Scenario
• IPCC AR6 WG Ⅰ SSP1-1.9 • IPCC 1.5℃ Special Report • IPCC AR5 RCP2.6 • IEA World Energy Outlook 2021 Net Zero Emissions by 2050 Scenario (NZE) • National Institute for Environmental Studies, Japan, Version SSP SSP1: Sustainable, SSP5: Reliance on Fossil Fuels	• IPCC AR6 WG Ⅰ SSP1-8.5 • IPCC AR5 RCP8.5 • IEA World Energy Outlook 2021 Stated Policies Scenario (STEPS) • National Institute for Environmental Studies, Japan, Version SSP SSP3: Regional Divisions, SSP4: Disparities

Source：NEC, *Climate Change*, https://www.nec.com/en/global/sustainability/eco/risk.html (As of January 2025)

Domestic Disclosure Examples：NEC（Electricity, Machinery, Communication、2/2）

Among the risks and opportunities assumed in the four types of scenarios, cost increase due to carbon pricing in 2030 is quantitatively evaluated as a particularly large risk

- ✓ **Quantitatively calculates and discloses the impact on business caused by risks due to carbon pricing**
- ✓ **Risks and opportunities that have a particularly large impact are reflected in the medium-term management plan**

Risk Management (Including Opportunity Generation)

NEC identifies and classifies impacts arising from climate change as short-term, medium-term, and long-term risks and opportunities. Under the examination process, NEC evaluates the future impact of climate change based on scenarios after existing businesses are reorganized from a climate change perspective. At the same time, we confirm assets for addressing risks and taking advantage of opportunities. Major risks and opportunities are reflected in mid-term management plans.

Risks	Description	Risk Management and Countermeasures
Transition risk	Risks from carbon pricing • Assuming all of NEC's Scope 1 and Scope 2 emissions (about 164,000 t - CO_2) upon achievement of new targets in fiscal 2031 toward net zero CO_2 emissions by 2040 ar e subject to carbon pricing (130 U.S. dollar/t-CO_2), costs will increase by 2.8 billion yen (assuming 130 yen/1 U .S. dollar) • Assuming impact from higher costs in upstream and downstream supply chains	Increase use of renewable energy and achieve thorough gains in efficiency to achieve net zero CO_2 emissions target by 2040 (ongoing efforts in supplier engagement and to improve energy saving performance of products)
Physical risk	Possible disruption of supply chains due t o weather-related disasters (floods, landslides, water shortages, etc.), long-term outages of lifelines such as electricity, gas, and water	Risk assessment of the entire supply chain, BCP measures (installing flood gates and moving power supply equipment) with provisions for weather-related disasters, such as river flooding, and strengthening of power generation in data centers

- **“Scope 1,2 emissions when achieving SBT in 2030 (approximately 164,000 tons)” x “carbon price ($130/tCO2)” = cost increase equivalent to 2.8 billion yen is assumed**
- **Recognizing increased costs upstream and downstream of the supply chain will have a financial impact on our business**

- ✓ **（Reference) Introducing internal carbon pricing to improve energy efficiency and introduce low-carbon equipment**

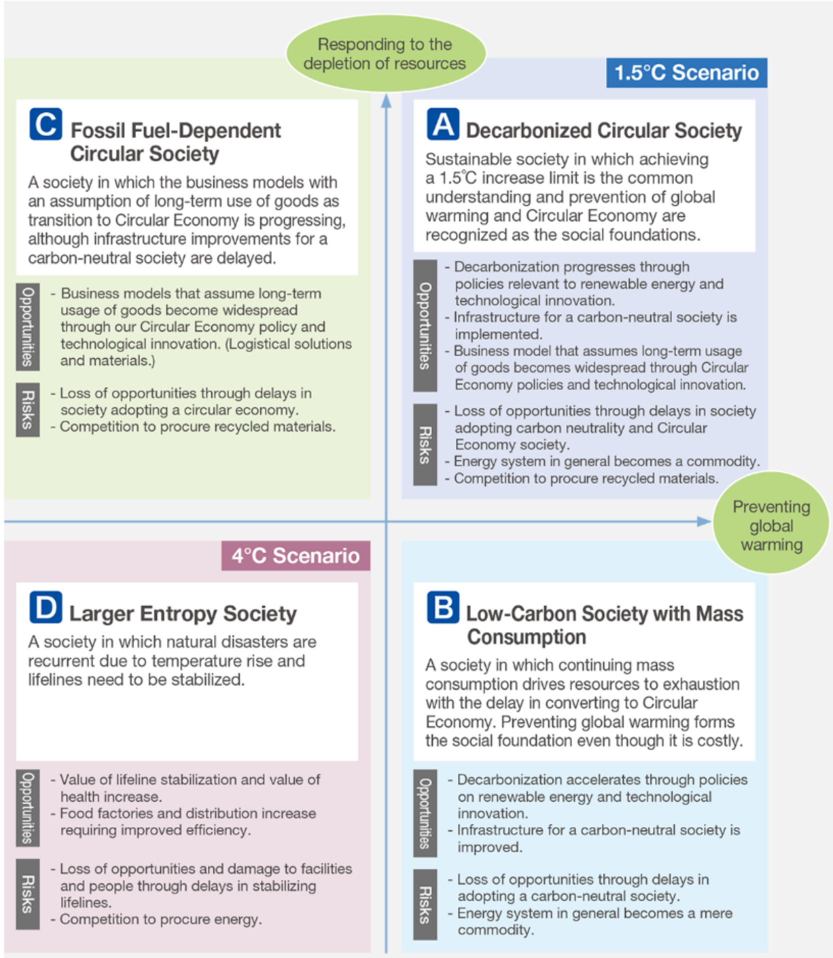
Introduction of Internal Carbon Pricing

With the aim of improving energy efficiency and promoting the introduction of low-carbon facilities and equipment, we have set internal carbon pricing. This pricing allows us to convert the CO_2 emission reductions that would result from a given capital investment into a monetary value, which we can then use as a reference when making investment decisions. The aforementioned carbon pricing mechanism will drive our decarbonization activities going forward and reduce the risk associated with potential increases in carbon taxes and emissions trading in a carbon-free society of the future. NEC has set its internal carbon price at 3,000 yen/t-CO_2.

Source：NEC, *Climate Change*, https://www.nec.com/en/global/sustainability/eco/risk.html (As of January 2025)

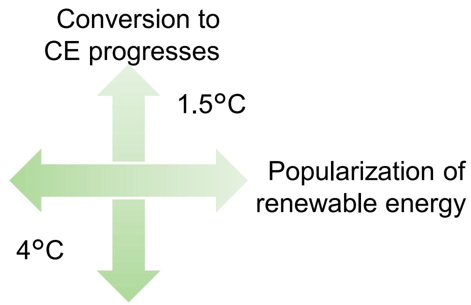
Domestic Disclosure Examples：Panasonic Group（Electricity, Machinery, Communication, 1/2）

Defines in total of four scenarios, including 1.5℃ scenario based on the IEA's NZE. In the 1.5℃ view, it considers the impact from increasing the ZEV ratio and expanding CO2-free fuels and such to the company



✓ **It has defined four scenarios including 1.5°C, and has set its own world view for 2030 for each scenario**

- **A Decarbonized Circular Society**
- **B Low-Carbon Society with Mass Consumption**
- **C Fossil Fuel-Dependent Circular Society**
- **D Larger Entropy Society**



✓ **Regarding the world view of each scenario, the impact on industry and changes in customer value are described**

A Decarbonized Circular Society

●**Impact on industries**

Concurrent progress of legislation and technological innovation related to preventing global warming and creating a circular economy help to form a related infrastructure for a carbonneutral society and Circular Economy. This encourages investment in decarbonization in automotive and real estate industries, and advances the shift to business models that assume long-term use of goods in industries involved in the supply chain. It is also expected that not only products but also the construction of sustainable towns designed for carbon neutrality and Circular Economy will attract investment.

●**Changes in customer value**

Consumers: Eco-consciousness, cost reduction, ethical, on-demand usage, etc.
Corporations: Eco-consciousness, cost reduction (energy saving, asset-light approach, better fuel efficiency, etc.), effect and efficiency enhancement (maximization of customer value, i.e. better experience value, etc.).

（Partially excerpted from the table on the left）

Source：Panasonic Group, *Strategic Resilience through Scenario Analysis*, https://holdings.panasonic/global/corporate/sustainability/environment/tcfd/resilience.html (As of January 2025)

Domestic Disclosure Examples：Panasonic Group （Electricity, Machinery, Communication, 2/2）

The group's seven operating companies formulated climate change strategies and disclosed some of their measures. The company is possible to respond to any of the four scenarios, demonstrating the resilience of the business

✓ **Formulated climate change strategies for seven operating companies based on the results of each scenario analysis**

We can address the risks and opportunities corresponding to the above scenarios through any of our seven main operating companies shown below.

1. Panasonic Corporation
   (Home appliance business, Air quality and air conditioning business, Food distribution business, Smart Energy System business, Electrical facility materials business)
2. Panasonic Automotive Systems Co., Ltd.
3. Panasonic Connect Co., Ltd.
4. Panasonic Energy Co., Ltd.
5. Panasonic Industry Co., Ltd.
6. Panasonic Entertainment & Communication Co., Ltd.
7. Panasonic Housing Solutions Co., Ltd.

- **A** Decarbonized Circular Society
- **B** Low-Carbon Society with Mass Consumption
- **C** Fossil Fuel-Dependent Circular Society
- **D** Larger Entropy Society

1. Panasonic Corporation

Sales for fiscal 2024: 3,494.4 billion yen

1-1 Living Appliances and Solutions Comp...	
• Build a circular value chain with customers through products and services.	A B
• Achieve extension of the product life cycle and improve customer engagement looking ahead of circular economy.	A C
1-2 Heating & Ventilation A/C Company	
• Provide the optimum and highest air and water quality values with low environmental impact, not found in conventional air conditioning, with a combination of our unique air and water technologies.	A B C D
• Create unprecedented value with water and air heating systems with heat pump (A2W), chillers, and combination of air quality and air conditioning in the air conditioning business of water circulation type to contribute to improvement for decarbonization and air quality values.	A B C D
1-3 Cold Chain Solutions Company	
• Promote energy conservation offering comprehensive support for our energy monitoring system covering from system installation to operations and maintenance. Our equipment refurbishing service prolongs system usage while contributing to a circular economy.	A B C
• Accelerate development of natural refrigerants with lower environmental impact through wider use of CO_2 refrigeration equipment.	A B
1-4 Electric Works Company	
• Provide a sustainable and safe and secure facility infrastructure based on our wiring fixtures to contribute to electrification and disaster-resilient society with zero environmental impact in the world.	A B C D
1-5 Direct Control (Hydrogen Related Businesses)	
• Achieve local production for local consumption of energy by developing a decentralized energy package business utilizing hydrogen.	A B D

✓ **Stated that resilience was verified in all four scenarios**

The scenario analysis found that either of the businesses in our group can respond to the situation even if any of the 4 scenarios of the societies is achieved. In other words, the analysis successfully verified the resilience of our business strategies. The analysis also helped us understand that we can contribute to building a sustainable society through our businesses. We continue our efforts to build the 1.5˚C world, represented by our society (A).

Source : Panasonic Group, *Strategic Resilience through Scenario Analysis*, https://holdings.panasonic/global/corporate/sustainability/environment/tcfd/resilience.html (As of January 2025)

Domestic Disclosure Examples：Kao Group（Consumer Discretionary, Pharmaceutical or Food）

Regarding scenario analysis, it provides an overview of the estimation method and describes the magnitude of the financial impact in stages.

- ✓ **Financial impact based on scenario analysis is expressed by the number of symbols (+, -) for each risk item in terms of magnitude**
- ✓ **Also describes the method of calculating the business impact, which is the basis of calculation**

Estimation of business impacts by 2030

We estimate that CO_2 emissions (scope 1 + 2) in 2030 will increase by 67% compared to 2017 unless we take any m … s/ ton-C … CO_2 e … assum … ur carbo … , aroun … d to tak …

An overview of the calculation method for business impact estimation

We evaluated the business impacts in relation to What Kao Aims to Be by 2030 by four product groups. More specifically, we set baseline Profit and Loss (P&L) data for 2030 on the assumption that our company's sales would reach 2.5 trillion yen by 2030 (1.67 times as high as in 2018), and that P&L would grow proportionately compared to 2018. Business impacts were estimated on the basis of this baseline P&L. In order to compare the respective impact of individual factors on our business based on different climate change scenarios, we performed an evaluation for both the 1.5°C scenario[*2] and 4°C scenario[*3]. For this reason, evaluation was not performed for some factors even though there was the potential for them to have a significant impact. There were also some factors which might have a major impact by 2050, but which will have only a relatively small impact by 2030.

*1 As it is assumed that new equipment adopted in the future will still be in use after 2030, we have estimated the likely carbon tax rate in 2035 based on the IEA's World Energy Outlook 2021, and changed the base currency from Japanese yen to U.S. dollars from February 2023.

*2 1.5°C scenario
This is equivalent to the IEA's NZE 2050 Scenario, 2DS Scenario, IPCC's RCP 1.9 scenario or SSP1-1.9 scenario, etc. It refers to the economic measures that would be needed in order to keep the average global temperature rise down to less than 1.5°C compared to the situation prior to the Industrial Revolution, and to the environmental damage that is expected to result from such a rise in temperature.

*3 4°C scenario
This is equivalent to the IEA's Current Policy Scenario, IPCC's RCP 8.5 scenario or SSP5-8.5 scenario, etc. It refers to the economic measures that would be needed in order to keep the average global temperature rise down to less than 4°C compared to the situation prior to the Industrial Revolution, and to the environmental damage that is expected to result from such a rise in temperature.

Decarbonization scenario analysis

		Evaluation items	Evaluated financial impact	Impact of climate-related risks and opportunities, and financial planning, for 2030 (+ indicates a positive impact, - indicates a negative impact, ND indicates no impact, and numbers indicate the size of the impact)				Kao's response status
				1.5°C scenario[*1]		4°C scenario		
Transitional	Policies, laws and regulations	Introduction and/or raising of carbon tax	Increased operating costs due to introduction and/or raising of carbon tax	Increased operating costs due to introduction of new taxes and/or raising of tax rates	- - -	New carbon taxes are not introduced, and tax rates are not raised	ND	Scope 1+2 emissions reduction targets are set, and emissions reduction activities continue
		Introduction of restrictions on plastics	Taxation of fossil-derived raw materials for packaging	Increased procurement costs due to introduction of new taxes	-	New taxes are not introduced	ND	Public announcement of an Innovation in Reduction implementation strategy Annual adoption targets are set for innovative film packaging, and activities to reduce plastics usage continue
			Increased costs due to use of recycled plastic becoming compulsory	Increased procurement costs due to a rise in the unit price of recycled plastic resulting from the use of recycled plastic becoming compulsory	-	The use of recycled plastic is not made compulsory	ND	Public announcement of an Innovation in Recycling implementation strategy Expanded adoption of packaging made from recycled plastic
	Markets	Rising energy prices	Volatile electricity retail price	Increased costs due to a rise in the electricity retail price	-	Reduced costs due to a fall in the electricity retail price	+	Setting of energy use reduction targets, and proactive installation of solar panels to generate electricity for own use
		Rising raw materials prices	Rising prices for fossil-derived raw materials	Increased procurement costs due to rising crude oil prices	- -	Increased procurement costs due to rising crude oil prices	- - -	Continuing activities to reduce usage of fossil-derived raw materials in product groups that utilize such raw materials
			Rising prices for procurement of palm oil	Increased procurement costs due to supply shortages resulting from tighter restrictions on forest development	-	Unchanged costs due to increased supply resulting from the development of new plantations	ND	Promotion of the development of substitute raw materials (such as algae-derived fats and oils, and unused biomass), and commencement of use
			Rising prices for procurement of pulp	Costs remain unchanged because, although forests fires increase, there is no shortage of supply	ND	Costs remain unchanged because, although forests fires increase, there is no shortage of supply	ND	—
		Changes in consumers' behavior	Increased sales of ethical products	Sales increase because of increased demand for ethical products on the part of the generation that will be the main purchasers of Kao products in 2030	+ +	Sales increase because of increased demand for ethical products on the part of the generation that will be the main purchasers of Kao products in 2030	+ +	Inviting Ms. Rika Sueyoshi, CEO of the Ethical Association, to become a member of Kao's ESG External Advisory Board Development and provision of ethical products
Physical	Acute	Intensification of abnormal weather conditions	Increased damage from flooding	Increased risk of flooding, but difficulty in accurately predicting the amount of damage	-	Increased risk of flooding, but difficulty in accurately predicting the amount of damage	-	BCP adjustment Implementation of supplier water risk surveys
	Chronic	Rising average temperatures	Increased sales of sunscreen and antiperspirant products Increased sales of products against infectious diseases	Increased sales in regions and seasons with higher temperatures	+	Sales increase due to more expansion of regions and seasons with higher temperatures	+	Production planning adjustment Development and launch of products against infectious diseases
		Demand for water outstripping supply	Rising operating costs due to increased water use charges	Rising operating costs at plants operating in regions with water shortages		Rising operating costs at plants operating in regions with water shortages		Setting of water use reduction targets, and continued implementation of water use reduction activities

*1 Kao's assessment based on scenario analysis using the 2°C scenario

Source：Kao Group, *Kao Sustainability Report 2024*, https://www.kao.com/content/dam/sites/kao/www-kao-com/global/en/sustainability/pdf/sustainability2024-e-all.pdf (As of January 2025)

Domestic Disclosure Examples：Shiseido（Consumer Discretionary, Pharmaceutical or Food）

The analysis results are disclosed quantitatively while clearly indicating calculation method. Analysis show resilience and its integration with the strategy

- ✓ **Clarifying the calculation method** when analyzing quantitative financial impact
- ✓ **Regarding the risk of an increase in raw material costs** listed below, it is stated that **a quantitative financial impact analysis will be carried out for material crops that are likely to have a large impact on business in the future**

Procurement impact = $A_{2030} * P_{2030AVE} * \sigma * R_{AW}$

A_{2030}: Expected procurement amount in 2030
$P_{2030AVE}$: Expected average price in 2030
σ: Standard deviation of the percentage change in price relative to the moving average
R_{AW}: Percentage of price upswing by extreme weather events

As a result, we estimated that the potential cost increase as of 2030 would be about 140 million yen per year due to climate impacts under the 1.5/2° C scenario and about 290 million yen under the 4° C scenario. In addition to promoting the procurement of sustainable palm oil, with regard to material crops other than oil palm, we should also be aware of the possibility that material demand might lead to higher procurement costs in the future, as well as the possibility that procurement itself might become impossible because of climate change. We will continue to analyze the financial impact and implement measures to avoid or mitigate risks, such as changing materials and diversifying production areas.

（Regarding the risk of increased raw material costs due to rainfall and weather changes are partially excerpted）

- ✓ **As a countermeasure, transition plans are made for GHG emissions and renewable energy, Raw material procurement, Saving water, and product development, Disclosure**

1. GHG emissions and renewable energy

neutralization. We also set the science-based target of 46.2% reduction for Scope 1 and Scope 2 GHG emissions, and 55% reduction by 2030 in terms of economic intensity along the 1.5° C trajectory as the mid-term targets.

Shiseido aims to reduce GHG emissions throughout the value chain by working with our suppliers and other stakeholders on introducing renewable energy into our supply chain, preventing deforestation related to raw material production, and developing and implementing new social models for the efficient collection and recycling of a wider range of materials, as well as our own efforts for selecting raw materials based on green chemistry principles, replacing with plant-derived materials, reducing packaging weight by expanding refilling and design optimization, making packaging recyclable, reducing energy consumption, and expanding renewable energy at our sites.

4. Product development

As the transition to a decarbonized society, consumer awareness of climate and environmental issues is expected to increase more than ever. Responding flexibly to these changes in consumer awareness is critical to the sustainability of our business. We aim to replace all plastic cosmetics packaging with reusable, recyclable, or biodegradable materials by 2025. Shiseido developed and provided a variety of solutions for packaging since the launch of the first refillable face powder in 1926. Shiseido declares that it will optimize packaging design, select appropriate materials, and implement the concept of global reuse by refillable and replaceable products for consumers. In addition to these efforts, we will also work to reduce GHG emissions through innovation for a sustainable future by developing new materials using algae and new chemical recycling methods that can regenerate various types of plastic.

Example of a product development transition plan:

- **By 2025, switch all plastic cosmetic packaging to reusable, recyclable or biodegradable sustainable packaging**
- **Improve the suitability of container recycling, save input resources, and encourage circular use**

Source : Shiseido, *2024 Shiseido Climate/Nature-related Financial Disclosure Report*, https://corp.shiseido.com/en/sustainability/env/pdf/risks_report.pdf (As of January 2025)

Domestic Disclosure Examples：SEKISUI CHEMICAL（Consumer Discretionary, Pharmaceutical or Food, 1/3）

By setting four axes, the disclosure establishes company's own view on other environmental issues

- ✓ **Establishing a unique worldview based on the UN's IPCC (Intergovernmental Panel on Climate Change) Fifth and Sixth Assessment Reports**
- ✓ **Based on the 1.5°C/4°C scenario, uniquely developed two axes: "Climate change mitigation progresses/does not progress" and "Social systems disperse to rural areas/Concentrate in large cities"**
- ✓ **Furthermore, four climate change scenarios are assumed, taking into consideration the mutual influence that other environmental issues with climate change issues**

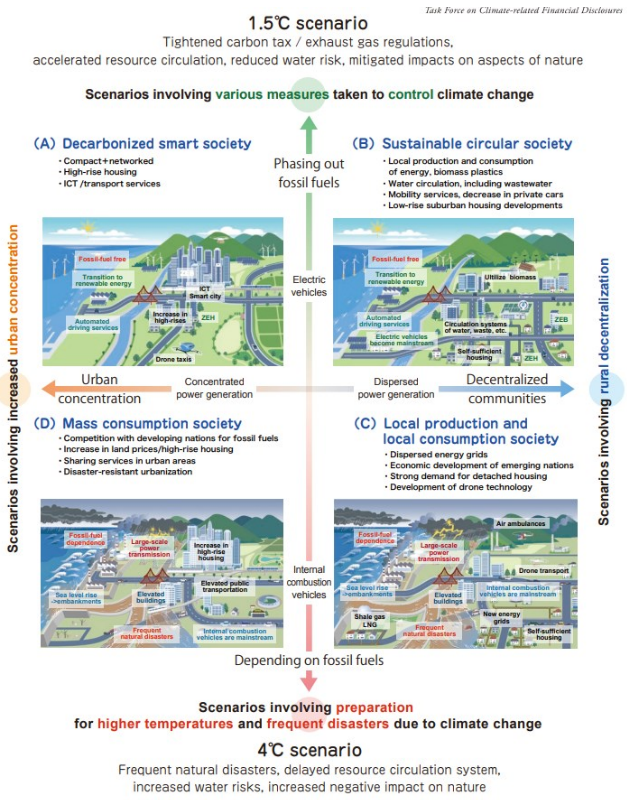
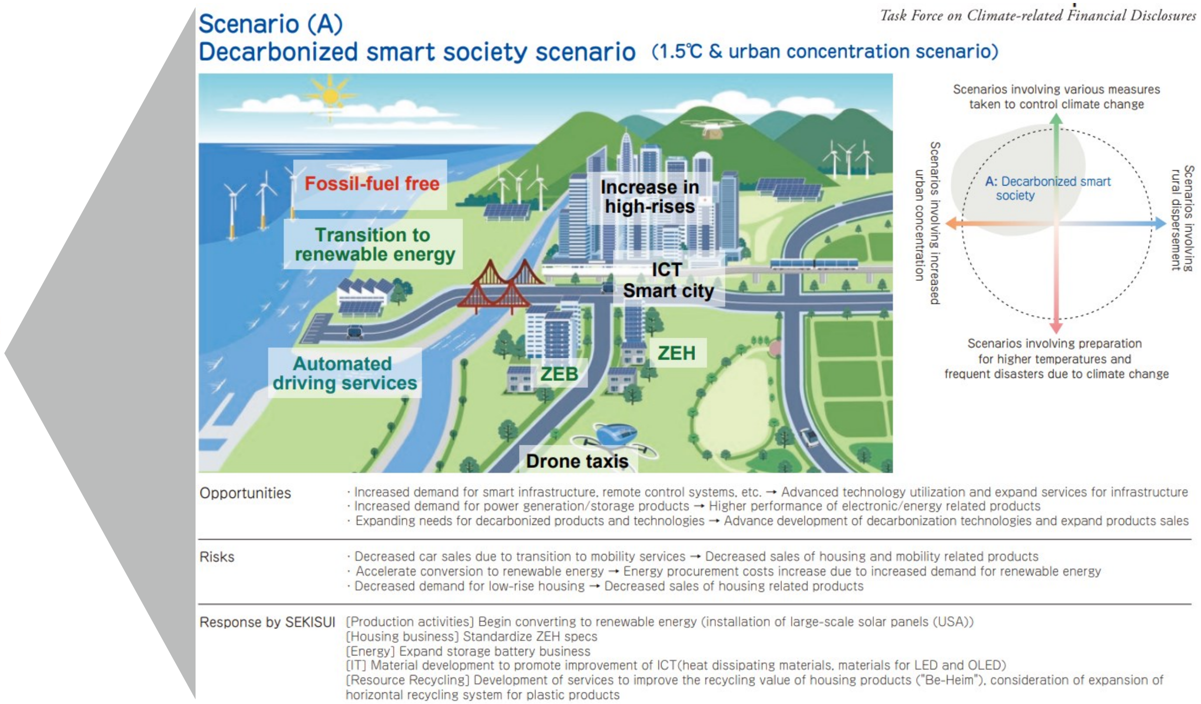


Figure 7: Four Scenario Societies



Source：SEKISUI CHEMICAL, *TCFD/TNFD Report 2024 Task Force on Climate-related Financial Disclosures Task Force on Nature-related Financial Disclosures*, https://www.sekisuichemical.com/sustainability_report/pdf/2024_TCFD_TNFDReport_E.pdf (As of January 2025)

Domestic Disclosure Examples：SEKISUI CHEMICAL（Consumer Discretionary, Pharmaceutical or Food, 2/3）

Discloses financial impact on business as an image of corporate value in the product life cycle

✓ Analyzes financial impact during product life cycle

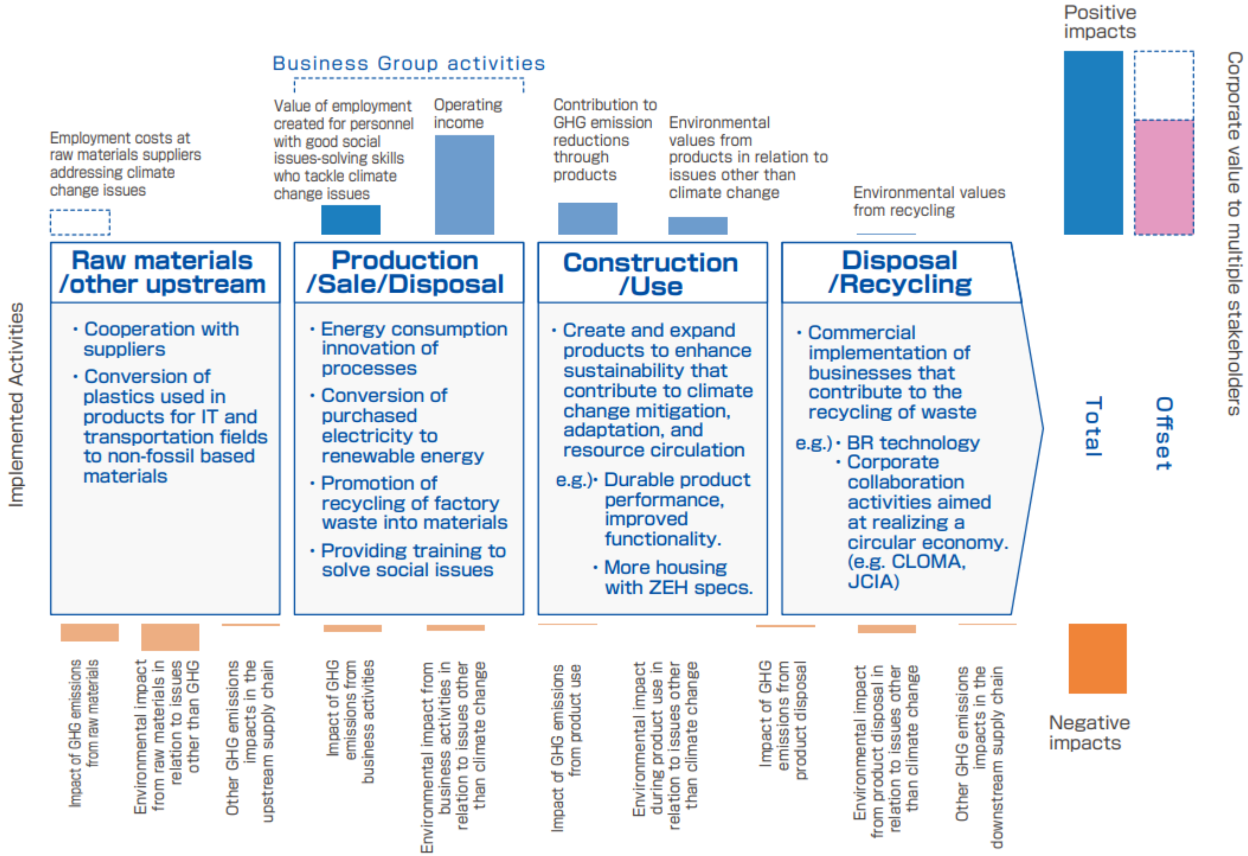


Figure 10 (b): Details of Positive and Negative Impacts on Corporate Value Over the Life Cycle of Products Using Impact-weighted Accounting Methods

Source : SEKISUI CHEMICAL, *TCFD/TNFD Report 2024 Task Force on Climate-related Financial Disclosures Task Force on Nature-related Financial Disclosures*, https://www.sekisuichemical.com/sustainability_report/pdf/2024_TCFD_TNFDReport_E.pdf (As of January 2025)

Domestic Disclosure Examples：SEKISUI CHEMICAL（Consumer Discretionary, Pharmaceutical or Food, 3/3）

Measures as a result of scenario analysis are integrated with business strategy through long-term business and financial planning

- ✓ **As a result of analyzing (1) Monitoring carbon efficiency (environmental performance), (2) Correlation between carbon efficiency and economic performance, (3) Stakeholders' comprehensive income using**
- ✓ **impact-weighted accounting methodology, strategies to address climate change issues are confirmed as appropriate and demonstrates its business resilience**
- ✓ **Verify and review the validity of strategies in each scenario and reflect them in management plans**

4-3. Validation of Climate Change Strategies

The following verification were conducted to confirm the validity of our strategy in response to climate change issues.

(1) Monitoring carbon efficiency (environmental performance)

(2) Correlation between carbon efficiency (environmental performance) and economic performance

(3) Stakeholders' comprehensive income using impact-weighed accounting methodology (factoring in the impact on resource circulation and biodiversity)

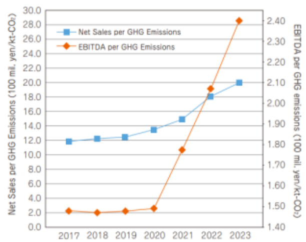


Figure 8 (a): Carbon Efficiency in Business Activities*

*Business activities: Scope 1+2

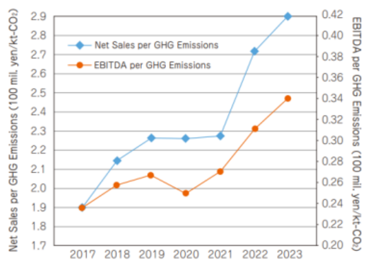


Figure 8 (b): Carbon Efficiency Across the Supply Chain

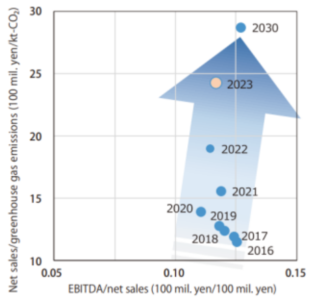


Figure 9. Correlation between Carbon Efficiency (Environmental Performance) and Economic Efficiency of Business Activities

Regarding (1) to (3) on the left, explain the validity of the strategy using multiple graphs.

■Scenario analysis

SEKISUI CHEMICAL Group conducted scenario analyses to identify potential risks and opportunities that could arise from climate change, and it was confirmed that strategies to reduce risks or to convert risks into opportunities are in place for all scenarios assumed. The scenario analyses also reaffirmed the effectiveness of the strategies as a solution to the issues related to climate change.

Based on the 1.5°C scenario and the 4°C scenario, two axes were set: one axis is whether climate change mitigation progresses or not, and the other axis is the decentralization of social systems in rural areas or concentration in large cities. Furthermore, mutual impacts of other environmental issues with climate change issues were taken into account, and four climate change scenarios were assumed.

Recognizing that environmental issues such as resource circulation, water risk, and biodiversity are related to climate change issues, measures from a broader perspective were reaffirmed. Strategies to re-establish milestones and accelerate efforts to realize a decarbonized economy were reviewed in each scenario, while verifying the validity of these strategies.

Source : SEKISUI CHEMICAL, *TCFD/TNFD Report 2024 Task Force on Climate-related Financial Disclosures Task Force on Nature-related Financial Disclosures,* https://www.sekisuichemical.com/sustainability_report/pdf/2024_TCFD_TNFDReport_E.pdf (As of January 2025)

Domestic Disclosure Examples：Nichirei Group（Consumer Discretionary, Pharmaceutical or Food, 1/3）

In FY2023, scenario analysis on shrimp procurement was conducted, and continuing from FY2021 and FY2022, efforts to improve the sophistication of scenario analysis are recognized

- ✓ **Conducting scenario analysis from 2019. In FY2021, risks and opportunities by business and high-importance scenario were identified, and in business impact assessment, "water risk due to abnormal weather" as a risk common to multiple businesses were selected and formulated climate change scenarios**
- ✓ **In FY2022, the risks and opportunities that climate change poses to rice and chicken procurement were selected and formulated climate change scenarios**
- ✓ **In FY2023, the risks and opportunities that climate change poses to shrimp procurement was considered, and an increase in the sophistication of scenario analysis is recognized**

FY2022

Climate Change Scenarios in Relation to Water-Related Risks Arising from Abnormal Weather

	(1) Risk of Future River Flooding		(2) Risk of Future Rising Sea Levels (Tidal Flooding)	
	Description	Results	Description	Results
Assessment criteria	The location criterion is the scale of rainfall assumed to result in flooding according to the hazard maps of municipalities in the region where the facility is located. The assessment is conducted based on predicted rainfall amounts.	When creating hazard maps for regions where the facilities are located, **three facilities in Japan** were found in locations where the number of rainfall events exceeding the anticipated maximum rainfall amount was expected to be around the same as the current number of rainfall events or potentially higher in the future.	For facilities in areas with either no risk or unknown risk of flooding according to the municipal hazard map of the region where they are located, an assessment was conducted of the risk of flooding assuming the occurrence of a typhoon on the scale of the Ise Bay Typhoon, one of the most destructive typhoons in Japanese history, and future rising sea levels (set at 1 meter by the Japan Meteorological Agency in *Climate Change in Japan 2020*).	**39 of the 145 facilities** were in flood areas according to municipal hazard maps. • **No facilities overseas** • Based on an Ise Bay Typhoon-scale typhoon and rising sea levels, a simple calculation was performed for the facilities outside of flood areas according to municipal hazard maps or in areas for which hazard maps had not been prepared (106 facilities). As a result, **27 facilities** were found to be in flood areas when rising sea levels were not considered, and **32** when rising sea levels associated with climate change were considered.
Facilities to be assessed	21 facilities in Japan (8 plants and 13 refrigerated warehouses)		145 facilities in Japan 1 facility overseas	
Facility selection criteria	• Facilities located in regions where hazard maps have been prepared • Food factories with large production volume • Refrigerated warehouses (distribution centers) in areas with high base flood elevation according to current hazard maps • Selected to avoid overrepresentation of certain regions		• All facilities in Japan, and facilities where significant financial risk and distance from the coast were considered (Thailand: Chicken production facility)	

In 2021, water risk impact assessment was conducted

In FY2023, the risks and opportunities that climate change poses to **shrimp procurement** was considered and analyzed **future yield projections for each climate scenario** (details on the next page)

In FY2021, we conducted scenario analyses that identified risks and opportunities by business and degree of importance. One scenario analysis was for shrimp procurement in FY2024.

■ Material Risks and Opportunities by Business and Scenarios Identified in FY2021

Business		Risks		
Foods Business	Chicken	Baseline scenario	General abnormal weather	• Soaring prices due to shrinking agricultural production • Deterioration in the quality of raw materials • Difficulty in obtaining raw materials and production delays due to logistics network disruptions
	Rice			
	Shrimp		Flooding, rising sea levels	• Reductions in production efficiency and volume and submerged aquafarms
	Vegetables, marine products, and meat and poultry products			• Submerged agriculture farms, aquafarms and processing factories • Difficulty in obtaining raw materials and production delays due to supply chain disruptions
	Common	1.5℃ scenario	Low-carbon policies	• Increased cost for measures for converting to renewable energy and equipment electrification, reduction of emissions
			Environmental countermeasures within the supply chain	• Curtailment of transactions; higher cost of measures such as the maintenance of global certifications
Logistics Business		Baseline scenario	General abnormal weather	• Damage to refrigerated warehouses and logistics centers
				• Difficulty securing human resources in disaster risk areas
		1.5℃ scenario	Low-carbon policies	• Increase of investment in natural refrigerants and opportunity loss caused by the slow adoption of technological platforms such as electrical and low-carbon vehicles

In 2022, **an impact assessment of rice and chicken procurement** was conducted

■ Rice and Chicken Procurement Risks and Opportunities

We examined the risks and opportunities created by climate change in relation to the procurement of rice and chicken, using the "Introduction to Information Disclosure on Climate-related Risks and Opportunities for Food, Agriculture, Forestry and Fisheries" issued by the Ministry of Agriculture, Forestry and Fisheries; and the Representative Concentration Pathway (RCP) scenarios described in the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC). The analysis showed that, in terms of transition risks (risks related to transitioning to a low-carbon economy), both rice and chicken would be impacted by increasing costs associated with the introduction of a carbon tax and low-carbon production methods.

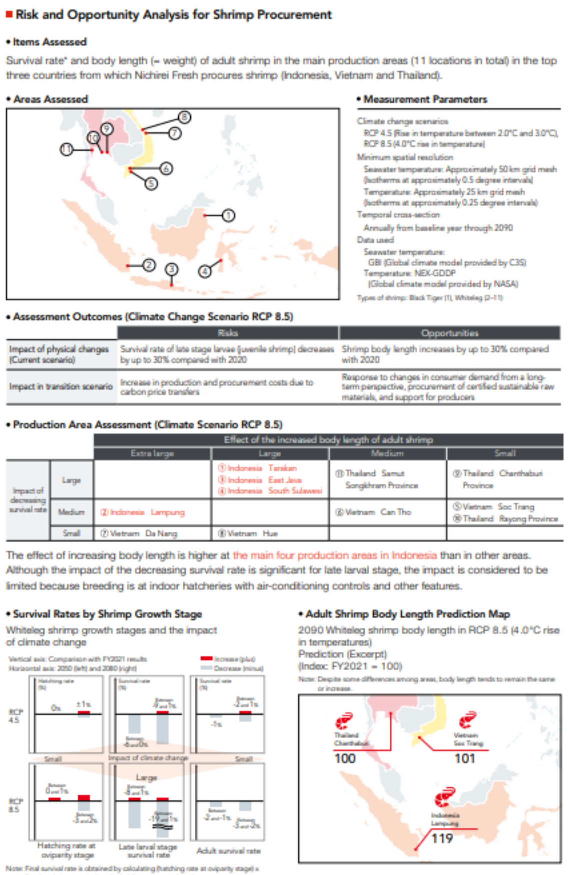
For physical risks (risks related to the physical impact of climate change), we conducted the following investigation to clarify how a temperature rise would affect our suppliers in terms of the impact on production volume.

Source：Nichirei Group, *Integrated Report 2023*, https://www.nichirei.co.jp/sites/default/files/inline-images/english/ir/integrated/pdf/nichirei_IntegratedReport2023_all.pdf (As of January 2025)

Domestic Disclosure Examples：Nichirei Group（Consumer Discretionary, Pharmaceutical or Food, 2/3）

By quantitatively grasping the financial impact through analysis of yields over multiple years, ensuring resilience in transition scenarios related to raw materials are described

- ✓ **Using IPCC's RCP scenarios (4.5, 8.5), the simulation of the main sources of shrimp until 2090 was conducted and quantitatively analyzed future survival rates and body length predictions for multiple years**
- ✓ **By developing suppliers and thoroughly managing habitats and such, the company describes that "over the medium to long term, we expect that we will be able to effectively deliver social value by maintaining stable distribution of protein-rich shrimp" which indicates resilience of business**



■ Risk and Opportunity Analysis for Shrimp Procurement

• Items Assessed

Survival rate* and body length (≈ weight) of adult shrimp in the main production areas (11 locations in total) in the top three countries from which Nichirei Fresh procures shrimp (Indonesia, Vietnam and Thailand).

• Areas Assessed

• Measurement Parameters

Climate change scenarios
RCP 4.5 (Rise in temperature between 2.0°C and 3.0°C),
RCP 8.5 (4.0°C rise in temperature)
Minimum spatial resolution
Seawater temperature: Approximately 50 km grid mesh (Isotherms at approximately 0.5 degree intervals)
Temperature: Approximately 25 km grid mesh (Isotherms at approximately 0.25 degree intervals)
Temporal cross-section
Annually from baseline year through 2090
Data used
Seawater temperature: GBI (Global climate model provided by C3S)
Temperature: NEX-GDDP (Global climate model provided by NASA)
Types of shrimp: Black Tiger (1), Whiteleg (2–11)

• Assessment Outcomes (Climate Change Scenario RCP 8.5)

	Risks	Opportunities
Impact of physical changes (Current scenario)	Survival rate of late stage larvae (juvenile shrimp) decreases by up to 30% compared with 2020	Shrimp body length increases by up to 30% compared with 2020
Impact in transition scenario	Increase in production and procurement costs due to carbon price transfers	Response to changes in consumer demand from a long-term perspective, procurement of certified sustainable raw materials, and support for producers

• Production Area Assessment (Climate Scenario RCP 8.5)

		Effect of the increased body length of adult shrimp			
		Extra large	Large	Medium	Small
Impact of decreasing survival rate	Large		① Indonesia Tarakan ③ Indonesia East Java ④ Indonesia South Sulawesi	⑪ Thailand Samut Songkhram Province	⑨ Thailand Chanthaburi Province
	Medium	② Indonesia Lampung		⑥ Vietnam Can Tho	⑤ Vietnam Soc Trang ⑩ Thailand Rayong Province
	Small	⑦ Vietnam Da Nang	⑧ Vietnam Hue		

The effect of increasing body length is higher at the main four production areas in Indonesia than in other areas. Although the impact of the decreasing survival rate is significant for late larval stage, the impact is considered to be limited because breeding is at indoor hatcheries with air-conditioning controls and other features.

• Survival Rates by Shrimp Growth Stage

Whiteleg shrimp growth stages and the impact of climate change

• Adult Shrimp Body Length Prediction Map

2090 Whiteleg shrimp body length in RCP 8.5 (4.0°C rise in temperatures)
Prediction (Excerpt)
(Index: FY2021 = 100)

■ **Financial Impact**

We expect the financial impact on the shrimp business to include higher purchasing costs resulting from higher supplier costs, and various issues arising from market distribution of higher-priced products. Over the medium to long term, we expect that we will be able to effectively deliver social value by maintaining stable distribution of protein-rich shrimp.

Phenomena Confirmed	Assumed Financial Impact on Suppliers	Assumed Financial Impact on Nichirei	Measures to Address Financial Impact 1	Measures to Address Financial Impact 2
Decrease in late stage larvae survival rate	Decrease in final survival rate ・Higher shipping costs ・Higher energy costs due to increased use of air conditioning Reduced profit margins	Higher purchasing costs Current profit margin to slightly lower profit margin	・Develop new supplier relationships (Consider suppliers with little exposure to the impact of higher temperatures)	・Plant and strictly manage mangrove forests, which are a critical shrimp habitat ・Cooperate financially with producers to offset the increased administrative expense component of annual purchasing costs
Increase in adult shrimp body length	Shorter breeding period ・Reduced cultivation costs ・Increased production capacity for high-margin products Increased profit margins	Impact of purchase costs Lower profit margin to slightly higher profit margin	・Base response on market trend toward price increases for lower-priced products ・Control costs with seasoning processing technology ・Create new product categories (For example, develop higher-priced products in sizes that do not currently exist)	

We expect the financial impact on the shrimp business to include higher purchasing costs resulting from higher supplier costs, and various issues arising from market distribution of higher-priced products. **Over the medium to long term, we expect that we will be able to effectively deliver social value by maintaining stable distribution of protein-rich shrimp.**

Source : Nichirei Group, *Integrated Report 2023*, https://www.nichirei.co.jp/sites/default/files/inline-images/english/ir/integrated/pdf/nichirei_IntegratedReport2023_all.pdf (As of January 2025)

Domestic Disclosure Examples：Nichirei Group（Consumer Discretionary, Pharmaceutical or Food, 3/3）

In FY2024, scenario analysis on carbon pricing was conducted, and continuing from FY2021 and FY2023, efforts to improve the sophistication of scenario analysis are recognized

- ✓ **As part of the first phase of transition risk assessment, the company has used the IEA's WEO2023 and ETP2023 scenarios to estimate the financial impact of introducing carbon pricing and fluctuations in energy procurement prices for the years 2030 and 2050.**
- ✓ **As a countermeasure, the company has specified the transition to renewable energy, including the utilization of solar power generation and the expansion of corporate PPA adoption.**

"In the first phase (during FY2025), we reevaluated our scenario analyses and financial impact assessments for transition risks associated with carbon and energy price regulations, referring to FY2021 scenario analyses that identified risks and opportunities by degree of importance. **During the second phase, we will also reevaluate physical risks and disclose the results as they become available.**"

Risk Assessment Overview

Target fiscal years	FY2031 and FY2051			
	Phase 1	Phase 2			
Risk type	Transition risk	Physical risk			
Reference scenario	IEA WEO2023 and ETP2023	IPCC AR5			
Assessment items	Carbon and energy pricing regulations	Flooding and high tides	Drought	Water stress	Rising temperatures (Raw materials)

Financial Impact Calculation Results

Risk type	Business risk	Financial impact
Transition risk	Impact of the introduction of carbon pricing and fluctuations in prices of energy procured	Negative impact of ¥5.0 billion (FY2031 Scope 1 and 2) Positive impact of ¥700 million (FY2051 Scope 1 and 2)

Calculation Parameters Electricity and fuel prices: IEA WEO2022
Agency for Natural Resources and Energy, "Simplified Calculation Table for Energy Consumption (Crude Oil Equivalent)" and "Standard Calorific Value and Carbon Emission Coefficients"
Carbon pricing: World Bank, *State and Trends of Carbon Pricing 2023*
GX League Secretariat, *Rules for the First Phase of GX-ETS*
Reference Scenario IEA WEO2023･ETP2023

We did not identify any new opportunities in reevaluating our scenario analyses. However, we did estimate the financial impact from the transition risk associated with the introduction of carbon pricing and fluctuations in prices of energy procured to be negative ¥5.0 billion for FY2031 and positive ¥700 million for FY2051.

Based on these results, we will reduce CO_2 emissions by shifting to renewable energy in ways such as using solar power generation and expanding the use of corporate PPAs.

Source : Nichirei Group, *Integrated Report 2024*, https://www.nichirei.co.jp/sites/default/files/inline-images/english/ir/integrated/pdf/nichirei_IntegratedReport2024_all.pdf (As of January 2025)

Example of Securities Report：Members Co., Ltd.（Service)

Financial impact is analyzed and disclosed in four stages. The basis for calculation is provided in the increase in the procurement cost of environmental value certificates for electricity, which was analyzed to have a particularly large impact

(２) 戦略

当社はTCFD提言に基づき、全社を対象として気候変動リスク･ 機会による事業インパクト、対応策の検討に向けたシナリオ分析を行い、1.5℃～２℃及び４℃の気温上昇時の世界を想定し、2020年度より将来までの間に事業に影響を及ぼす可能性がある気候関連のリスクと機会の重要性を評価しました。

その結果、リスクとしては、電力価格の上昇に伴う環境価値証書価格の大幅拡大が懸念され、価格影響額を試算した結果、以下のとおりコスト上昇の可能性があることがわかりました。

（2020年実績、2030年見込み）

リスク	1.5℃～２℃ 財務インパクト	計算式
環境価値証書価格	約１億円のコスト	1tCO2あたりのJクレジット価格×調達量(※１)(※２)

※１　Jクレジット価格の推移データを参考に、1.5℃～２℃では2020年10月の日本政府の脱炭素宣言～現在までのJクレジット価格の推移率を使用し、2030年のJクレジットの価格を算出。

※２　事業拡大に伴う増加分も加味。

- Discloses quantitative impact of “**environmental value certificate price**” among transition risks
- **Calculation basis is stated** in the notes "JCI price per 1t-CO2 (2030 forecast) x procurement amount (increase due to business expansion is also taken into account")

・リスク　　(the risk below is an example)

区分	想定される事象	当社へのリスク	対策
緊急性の物理リスク	(1)台風や洪水などの異常気象の重大性と頻度の上昇 (2)山火事の可能性と重大性の上昇	(1)当社の事業所のハザードマップの状況等から、長期間におよぶ事業所の浸水等のリスクは低いと考えられますが、豪雨、洪水により事務所･ 発電所や従業員が影響を受け業務遂行に支障をきたした場合、当社に中規模のリスクが考えられます。 また、自然災害時の従業員の安否確認や事業所等の災害対応、また保険料の上昇により当社へコスト増加の影響が考えられます。 (2)当社のオフィスは山間部から離れているため、関連するリスクへの影響はない旨の判断を行いました。	(1)災害発生時の対応計画策定、浸水対策

※財務影響度　小：1,000万円以内　中：1億円以内　大：10億円以内　甚大：10億円超

- For climate change risk/opportunity categories other than those listed above, **the financial impact is categorized into "small, medium, large, and severe." The size of the amount is also described**

Source : Members Co., Ltd., *Annual Report*, https://ssl4.eir-parts.net/doc/2130/yuho_pdf/S100TP0C/00.pdf (As of January 2025)

Example of Securities Report： Recruit Holdings（service）

Quantitative impact is disclosed regarding carbon tax risk with relatively high certainty of monetary basis, referring to 1.5°C/4°C scenario (SSP1-1.9, SSP5-8.5)

b. Key Risks Relating to Climate Change

The key risks identified through the Company's scenario analysis, their likelihood and their financial impacts are shown below. The financial impact is calculated for each item but only the figures for carbon taxes are shown here as they are considered relatively definitive. "⤴" indicates that the likelihood of occurrence is expected to increase toward FY2030, and "→" indicates that the likelihood of occurrence does not change significantly.

	Key Climate Change Risks	Likelihood	Financial Impact	Risk Mitigation Measures
1	Increase in price of carbon credits to achieve carbon neutrality	High⤴	High	Promote GHG emissions reductions by enhancing energy efficiency in offices and switching to renewable energy, promoting remote work, involving in public policy[2], and engaging with partners in key value chains to achieve carbon neutrality throughout the Company's business activities and value chains by FY2030.
2	Introduction of carbon taxes and possible increase in price	High⤴	Low (approx. 400M yen[1])	
3	Submerged/damaged servers	Low→	High	Begin monitoring flood or damage risks of areas where our servers are located. Consider relocating servers or substituting them with alternatives if risks exceed a certain level.

[1] The estimated carbon tax in FY2030 is based on the following assumptions:
- Carbon tax price: approximately $300/t-CO2 (Ref. 2023 version, Net Zero 2050 scenario of the NGFS Climate Scenarios for central banks and supervisors provided by International Institute for Applied Systems Analysis)
- The Company's GHG emissions throughout its business activities (Scope 1 & 2): Approx. 9,600t-CO2 based on the assumption that there is no change in the Scope 1 emissions from FY2022.

[2] Recruit Group evaluates the feasibility of all climate-related engagement activities (including partnerships with stakeholders in the value chain, the consideration of trade association memberships, public policy engagement and other related activities) in line with the Paris Agreement and our goals on environmental strategy, which are then approved by the responsible Senior Vice President for execution.

This analysis did not identify any physical or transition risks with significant impacts on the Company's business strategies. Nonetheless, under the governance structure described above, we will continue to closely monitor and reassess the impact of climate change on our group as well as enhance our disclosures of relevant information.

- Among transition risks, **disclosing the quantitative impact of "Introduction of carbon taxes and possible increase in price"**
- **Calculation basis is stated** in the notes "Scope 1 and 2 GHG emissions (actual results for the fiscal year ending March 2022) x Carbon tax ($300/tCO2)"

（Disclosing quantitative impact）

（Disclosing calculation basis）

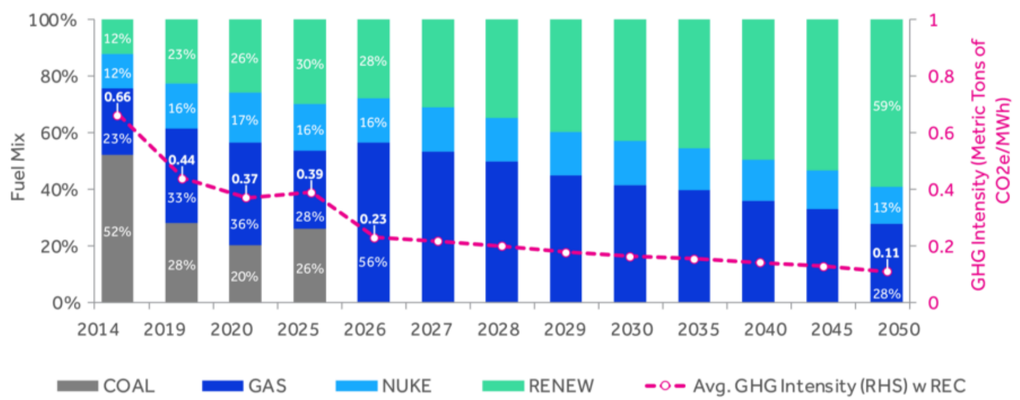
Source : Recruit Holdings, *Annual Report*, https://recruit-holdings.com/files/ir/library/upload/report_202403Q4_ar_en.pdf (As of January 2025)

Overseas Disclosure Examples: NRG Energy Inc.（US, Energy, 1/2）

Scenario analysis is conducted based on the IEA's SDS scenario and scenarios provided by the U.S. Energy Information Administration. The world view is also shown quantitatively, and calculation methods are also supplemented

Figure 5: Climate Risk Scenario Analysis

Fuel Mix and Greenhouse Gas (GHG) Intensity of NRG Electricity Sales, 2014-2050 with Carbon Price Beginning in 2026[1]



[1] Based on U.S. Energy Information Agency $15 carbon fee case ($15 carbon fee beginning in 2021, rising @ 5% per annum in real terms through 2050): https://www.eia.gov/todayinenergy/detail.php?id=43176, March 2020

✓ **Shows changes in the fuel mix for electricity sales until 2050, with detailed calculations**

- **Calculation formula: NRG electricity sales amount = NRG retail sales amount + other market sales amount**
- **Data source:**
  - ➢ **2014, 2019, 2020: NRG results**
  - ➢ **2025: NRG 2020 Budget**
  - ➢ **2026-2050: NRG and US EIA scenario data**

- NRG electricity sold = NRG retail sales + other market sales
  - NRG electricity sold is supplied by (1) NRG electricity generation + (2) NRG renewable and non-renewable electricity power purchase agreements (PPAs) + (3) market purchases of electricity when NRG's retail load (demand for electricity by NRG's customers) exceeds the sum of NRG electricity generation and NRG electricity PPAs
- NRG retail load assumed to grow @ 1.2% per annum, 2026-2050

Data sources:

- 2014, 2019, and 2020: NRG actuals
  - Excludes divestitures of power plants over 2014-2020
  - Includes electricity generation and retail load in ERCOT, PJM, NYISO, ISO-NE, and MISO regions, as well as generation in CAISO
  - Adjusted per the methodology described below
- 2025: NRG 2020 budget, adjusted per the methodology described below
- 2026-2050: NRG and U.S. EIA scenario data

Source : NRG Energy Inc., *2020 TCFD Report*, https://www.nrg.com/assets/documents/sustainability/2020-TCFD.pdf (As of January 2025)
*no update since 2020

Overseas Disclosure Examples: NRG Energy Inc.（US, Energy, 2/2）

Developed four transition plans to achieve net zero goal in 2050

NRG's Transition Levers

To meet NRG's 1.5°C-aligned net-zero by 2050 goal, NRG is using multiple transition levers. These transition levers can be grouped into four main categories:

- DECARBONIZATION of existing business lines
- DIVERSIFICATION into low emissions businesses
- DIVESTMENT of select high emissions assets
- DEPLOYMENT of new technologies and innovations

✓ **Adopting multiple transition measures towards the 2050 net zero goal**

- **Decarbonization of existing businesses**
- **Diversification into low-emission gas business**
- **Divestment from selected high-emission assets**
- **Development of new technology and innovation**

Divestment of high emission assets

On NRG's journey to net-zero emissions by 2050, NRG will also look to exit certain high GHG activities via strategically targeted sales of non-core assets where the opportunity generates appropriate risk-adjusted returns for shareholders. Over 2014-2020, NRG divested 27,510 MW net capacity of fossil generation. In addition, in 2021, NRG divested 4.8 GW of fossil-fired power plant capacity. We will continue to monitor the market for future portfolio optimization opportunities.

✓ **Details of each transition method are provided**

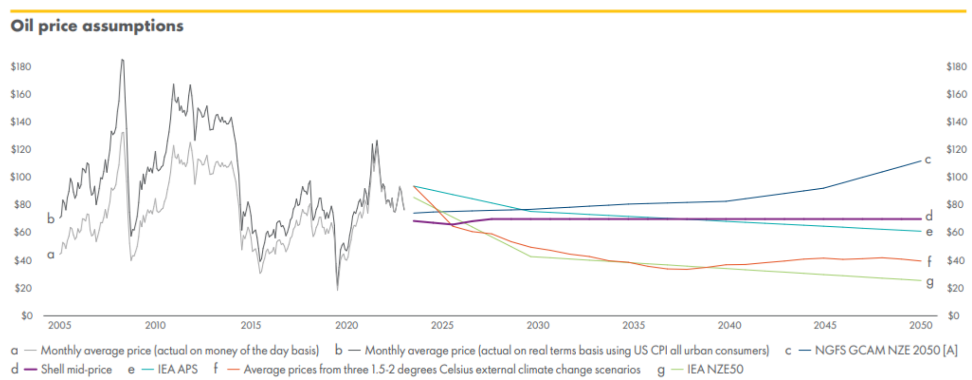
- **Example: Specific measures for divestment from selected high-emission assets**
  - ➢ **High-emitting assets are being sold; from 2014 to 2020, NRG sold 27,510 MW of net fossil generation capacity**

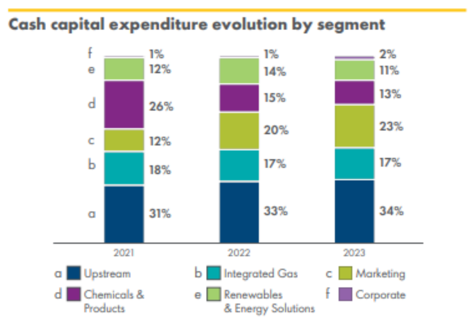
Source : NRG Energy Inc., *2020 TCFD Report*, https://www.nrg.com/assets/documents/sustainability/2020-TCFD.pdf (As of January 2025)
*no update since 2020

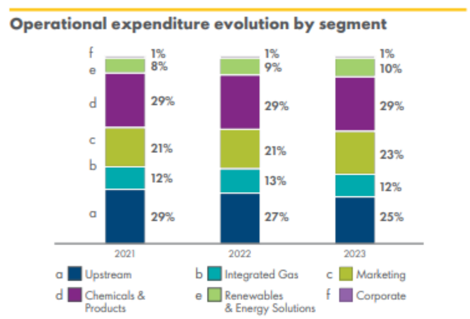
Overseas Disclosure Examples: Shell plc.（UK, Energy）

Outlook for oil and gas prices based on external climate change scenarios is being considered, and an assessment of the impact of climate change on financial statements is being conducted and disclosed

- ✓ **Assessing the impact of climate change and energy transition on financial statements is being carried out as a sensitivity analysis to test financial resilience**
- ✓ **As a basis for sensitivity analysis, the outlook for oil and gas prices based on external climate change scenarios is considered, as oil and gas prices are one of the important assumptions supporting financial statements**







Estimated oil and gas prices by scenario (only oil prices are listed below).

- IHS Markit/ACCS 2022: Oil prices gradually decline towards $25/barrel in 2037 and recover towards $63/barrel in 2045
- Woodmac WM AET 1.5°C: Oil prices will gradually decline towards $28/barrel in 2050
- IEA NZE50: Oil prices will gradually decline to $26/barrel in 2050

Assessing the impact on gas integrated assets of $75 billion and upstream assets of $88 billion as of December 31, 2022, taking into account various external climate scenarios.

- Adopts the average price expected from three scenarios: IHS Markit/ACCS 2022, Woodmac WM AET 1.5°C, and IEA NZE50.
  - **The recoverable amounts were estimated to be $12-16 billion and $3-5 billion lower than their carrying values** as of December 31, 2023, respectively.
- Adopting IEA's NZE50 scenario
  - **The recoverable amounts were estimated to be $15-20 billion and $3-5 billion lower than their carrying values** as of December 31, 2023, respectively.
- Considering the sensitivity of -10% or +10% to Shell's medium-term price outlook, averaged over the entire period.
  - **The recoverable amount was estimated to be $5-8 billion for each asset, with a reversal of impairment of $2-5 billion.**

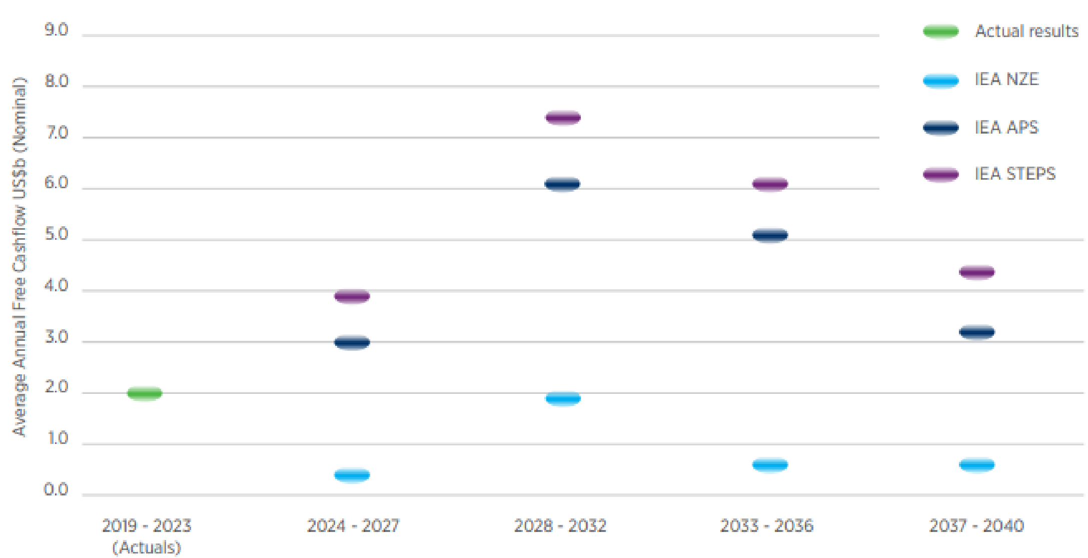
Source : Shell, *Annual Report and Accounts 2023*, https://reports.shell.com/annual-report/2023/_assets/downloads/shell-annual-report-2023.pdf (As of January 2025)

Overseas Disclosure Examples: Woodside Energy Limited（Australia, Energy）

To test the financial resilience of the portfolio, the potential impact on average annual free cash flow was estimated, and targets for investment plans that contribute to low-carbon

- ✓ **Estimated financial impact using three IEA scenarios (STEPS, APS, and NZE scenarios)**
- ✓ **As a result of the scenario analysis, state that the business impact (impact on FCF) is small, demonstrating resilience**

PORTFOLIO RESILIENCE: TESTED AGAINST CLIMATE SCENARIOS[1]



Oil price (US$/bbl, Brent)[2], North Asian LNG price (US$/MMBtu)[2] and Carbon price (US$/$tCO_2$-e)[3] average real 2022

	2024 - 2027			2028 - 2032			2033 - 2036			2037 - 2040		
IEA NZE	52	8	101	41	5	139	34	5	169	31	5	195
IEA APS	76	10	100	74	8	133	72	7	153	69	7	169
IEA STEPS	84	11	80	85	9	80	84	9	80	84	8	80

* 2019-2023 average real terms 2022 Brent price was US$74/bbl.

- Average annual free cash flow (FCF) generation will increase from 2028 to 2032.
- After that, assuming there are no new oil and gas investments, it will decline due to the natural attrition of older assets in the portfolio.

出所：Woodside Energy Limited, *Climate Transition Action Plan and 2023 Progress Report*, https://www.woodside.com/docs/default-source/investor-documents/major-reports-(static-pdfs)/ctap2023/climate-transition-action-plan-and-2023-progress-report.pdf (As of January 2025)

Overseas Disclosure Examples: Canadian National Railway（Canada, Transportation）

Comprehensive disclosure of risks and opportunities based on the company's strategy and business model. Conducting quantitative business impact assessments of all major risks and opportunities

✓ **A risk significance assessment is conducted for four risks and four market opportunities, and the potential impact on the business and the estimated costs required to manage the risk/realize the opportunity are quantitatively disclosed. However, there is no clear description of the specific calculation process**

Climate-Related Opportunities

	Description	Type	Potential Impact to Business	Strategic Planning, Risk Mitigation and Opportunities	Metrics [1]
OPPORTUNITY					
Demand for Low-Carbon Goods and Services The opportunity to increase revenues	The movement towards carbon pricing in North America coupled with the growing pressures on CN customers to reduce their supply chain carbon emissions present important opportunities for us to position the environmental benefits of rail. Shipping	**Transition:** Market **Opportunity level:** Medium—High	May promote growth within our intermodal and carload business segments. **Time horizon:** Medium term **Potential financial impact figure:** Up to $8.7 billion, based on our truck-competitive business revenue. **Estimated cost to realize opportunity:** ~$2.9 billion	We actively engage with customers to position the environmental benefits of rail. CN furthermore invests in the expansion and strengthening of the Company's rail network. Investments include key track expansion projects that will boost capacity allowing CN to better service our customers. Other program elements will focus on the replacement, upgrade and maintenance ... emissions from transportation of goods.	• Market demand and supply projections • Intermodal commodities growth projections • Emissions regulations with potential impact on customer revenues
Emerging	Concerns over price volatility, potential	**Transition:** ... Medium—High	May promote growth of our clean energy commodity segment. **Time horizon:** Long term **Potential financial impact figure:** $750 million - 1 billion **Estimated cost to realize opportunity:** ~$0.5 million	We are working closely with our customers to further develop these business opportunities. This includes proactively marketing the environmental benefits of shipping by rail. For example, CN is working closely with our	• Market demand and supply projections • Emissions regulations with potential impact on customer revenues

Opportunities to increase profits due to increased demand for low-carbon goods and services
- Transporting freight by rail instead of by truck can reduce GHG emissions by up to 75%, positioning rail as the most environmentally friendly method of transporting freight over land, making our intermodal and Potentially offers opportunities to increase revenue in the auto transport sector.

- Potential financial impact: up to $8.7 billion
- Estimated cost to realize opportunity: $2.9 billion *

Calculation process not described

Opportunities to increase revenue through access to emerging markets
- Risk that changes in consumer behavior and climate change regulations could reduce demand for products that currently make up a large portion of CN's product portfolio, resulting in a decline in revenue.
- **Consumer preferences impact our thermal coal customers and** could result in a 5% loss in rail freight revenue if all coal shipments were to cease.

- Potential financial impact: $750 million to $1 billion
- Estimated management cost: $500,000

*Some of the basis for calculation is shown, but the calculation process is not stated.

Source : Canadian National Railway, *2021 TCFD Report*, https://www.cn.ca/-/media/files/delivering-responsibly/cn-2021-tcfd-en.pdf (As of January 2025)
*no update since 2021

Overseas Disclosure Examples: FirstGroup plc（UK, Transportation）

Original scenarios including 1.5°C are set, and the world view is described qualitatively and quantitatively. In the business impact assessment, impacts are evaluated for each risk item, divided into "low," "medium," and "high" categories

✓ **Based on the IEA SDS and NZE scenarios, four proprietary scenarios were established according to external technological trends and degree of regulation**

Table 1: Climate scenarios considered in risk modelling

Policy Pathway	1 No Policy	2 Current Policy	3 Stated Policy	4 Paris Agreement	5 Paris Aspiration
Global temperature increase	>4°C	3°C	2.5°C	2°C	1.5°C
Global emissions reduction target	0% by 2100	-50% by 2100	-75% by 2100	Net zero by 2070	Net zero by 2050

Conducted modeling work on climate change-related risks. At that time, five scenarios were considered in the temperature range of 1.5℃ to 4℃.

Integrated report describes 1.5°C/2.5°C/4°C
(the two most extreme scenarios and the “default policy” scenario)

- 4°C (no policy): Even existing policies are partially or completely abolished. Devastating physical impacts ranging from extreme weather events to large-scale migration.
- 2.5℃ (prescribed policy): intermediate model. Globally, policies remain relatively the same as they currently are, with additional measures likely to be introduced in the future. However, the uptake of low-carbon technologies will be slow, resulting in higher temperatures and more frequent extreme weather events.
- 1.5°C (Paris Ambition): Assumes that countries around the world work together to ensure that global temperature increases are kept as low as possible through an immediate transition to net-zero carbon emissions. Global transport remains primarily powered by fossil fuels, and a 1.5°C pathway is expected to have a major impact on the transport sector.

✓ **Describes the potential financial impact of transition risks and opportunities over a 5-year cumulative period, assessed for each scenario**

Table 2: Transition risks – potential Enterprise Value at Risk, cumulative over five-year period, assessed against different emissions pathways scenarios

Transition risks/opportunities		No Policy 1	Stated Policy 3	Paris Aspiration 5
Policy	Action by central government/regulators, including carbon pricing	**Low impact** ■ Expected carbon price of ~£2 per tonne by 2025 in some regions ■ Low emission zones leading to some route constraints	**Medium impact** ■ Expected carbon price of ~£30 per tonne by 2025 across the UK ■ Zero emission zones leading to further route constraints and potential loss of licence to operate	**Medium impact** ■ Expected carbon price of ~£65 per tonne by 2025 across the UK ■ Zero emission zones leading to significant route constraints and potential loss of licence to operate
Technology	Cost and availability of new technology to support a lower-carbon economy	**Low impact** ■ Potential impairment of carbon-intensive vehicles ■ Ongoing investment in zero emission fleet to meet current commitments	**Medium impact** ■ Increasing impairment of carbon-intensive vehicles ■ Some investment in zero emission fleet ahead of current schedule ■ Some increase in cost of zero-carbon vehicles and green electricity	**High impact** ■ Significant investment in zero emission fleet ahead of schedule ■ Substantial increase in cost of zero-carbon vehicles and green electricity, due to demand outstripping supply
Investors	Financing influenced by environmental credentials	**Low impact** ■ Low focus from investors on green credentials	**Medium impact** ■ Moderate focus by investors ■ More favourable interest rates for green companies	**High impact** ■ Significant focus by investors ■ Expected green covenants in financing
Customers	Demand driven by sustainability of products and services, leading to increased modal shift towards public transport	**Low opportunity** ■ Small shift to public transport, due to increasing environmental impacts and customers' climate awareness ■ No transport policy to encourage modal shift to public transport	**Medium opportunity** ■ Increasing shift to public transport due to customers' growing climate consciousness ■ Some transport policy to encourage modal shift to public transport	**High opportunity** ■ Substantial shift to public transport due to customers' high climate consciousness ■ Substantial transport policy to encourage modal shift

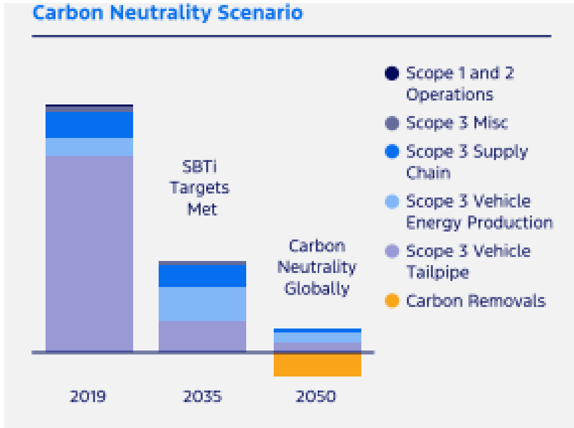
Low impact <£20m　**Medium impact** £20m – £50m　**High impact** >£50m
Limited opportunity <£20m　**Medium opportunity** £20m – £50m　**High opportunity** >£50m

Source : FirstGroup plc, *Annual Report and Accounts 2024*, https://www.firstgroupplc.com/~/media/Files/F/Firstgroup-Plc/reports-and-presentations/reports/annual-report-2024.pdf (As of January 2025)

Overseas Disclosure Examples: Ford Motor Company（US, Transportation）

Discloses roadmap towards carbon neutrality in 2050

✓ **Formulated a roadmap to gradually reduce emissions towards carbon neutrality in 2050**
- **Zero-emissions capability for the full range of European light commercial vehicles by 2024**
- **By 2030, 40-50% U.S. EV vehicle sales**
- **By 2035, meets our SBTi-approved emissions targets - operations and vehicles**
- **By 2050, achieving carbon neutrality globally**



Climate Change — Carbon Neutrality Overview
— continued

2022
Launched all-electric F-150 Lightning and E-Transit
Issued a second Green Bond of $1.75 billion, published the first Sustainable Financing Report
Entered agreement for multiple Michigan locations to purchase 100% renewable electricity
Achieved 100% carbon-free electricity sourcing for our manufacturing facilities in Europe, Mexico and Ohio
Announced Ford in Europe 2035 carbon neutrality target date
Announced reorganization of business into three business segments: Ford Blue, Ford Model e and Ford Pro
Joined the First Movers Coalition (Steel and Aluminum)

2023
Announced Ford Pro and Xcel Energy charging infrastructure collaboration for fleets
Announced Memorandum of Understanding with RheinEnergie to expand solar panels at our Cologne facilities

2024
Launch an all-new electric Explorer in Europe produced in Cologne — Ford's first carbon neutral vehicle assembly plant
Target zero emissions capability for full range of European Light Commercial Vehicles

2025
Build next generation electric truck and battery packs with SK Innovation at BlueOval City
Target 100% carbon-free electricity and zero natural gas for building heat — Tennessee Electric Vehicle Center
Target 100% carbon-free electricity — all Michigan manufacturing facilities
Target 20% recycled and renewable plastics content for North American, EU and Turkey programs and 10% for China

2026
Build batteries at BlueOval Battery Park (Marshall, MI)

2030
Target 40-50% U.S. EV vehicle sales
Target reducing GHG emissions from U.S. manufacturing facilities by 50% (Better Climate Challenge, 2017 baseline)
Purchase at least 10% near-zero carbon steel and aluminum (First Movers Coalition)
Target elimination of single-use plastics from our operations

2035
Meet our SBTi-approved emissions targets — operations and vehicles
Work toward 100% zero-emissions cars and vans in leading markets (A2Z)
Target 100% carbon-free electricity in all manufacturing
Target Ford in Europe 2035 carbon neutrality

2040
Work toward 100% zero-emissions cars and vans globally (A2Z)

2050
CARBON NEUTRALITY GLOBALLY

Integrated Sustainability and Financial Report 2024

Source : Ford, *Integrated Sustainability And Financial Report 2024, https://s201.q4cdn.com/693218008/files/doc_financials/2023/ar/2024-Ford-Integrated-Sustainability-and-Financial-Report_Final.pdf* (As of January 2025)

Overseas Disclosure Examples: The Dow Chemical Company（US, Materials, Buildings）

Adopted a phased approach to decarbonization for multiple scenarios, explaining that the business strategy is resilient

✓ **Describe the scenarios and clearly state that the strategy is resilient by providing business opportunities under each scenario**

Transition Risks

Most recently, Dow has utilized two scenarios to assess strategy and exposure to transition risk: one where global ambition aligns with the IEA Net Zero Emissions by 2050 scenario (NZE) for decarbonization, and another with IEA Stated Policies Scenario (STEPS) that reflects the impact of existing policies on energy use, emission and energy security.

Different scenarios yield a range of outcomes; for instance, in the Net Zero Emissions by 2050 Scenario, Dow's cost of regulatory compliance is higher than in the Stated Policies scenario, but so are its opportunities for the development of low-emissions goods and services and low-emissions technologies.

Scenario Description, 2050 Snapshot	IEA Net Zero Emissions by 2050	IEA Stated Policies
Description	Coordinated path to decarbonization	Conservative benchmark for the future
Market trends	Increased demand for solutions that mitigate climate change	Slower, regionally driven demand for solutions that mitigate climate change
Temperature rise (by 2100)	1.4°C	2.4 °C
Carbon price (USD per ton of CO_2)	250 (USD per metric ton of CO_2) for advanced economies with net zero emissions pledges	135 (USD per metric ton of CO_2) for European Union
Renewable energy (% of total primary energy)	71 %	31 %

Dow's strategy is resilient to a range of potential outcomes. Dow's phased approach to decarbonizing its assets while growing its business will enable the Company to reduce Scope 1 and 2 GHG emissions in line with a well-below 2°C world, while mitigating the affordability risk that presents itself should there be a slower global adoption of the regulatory frameworks needed to address climate change, as is the potential under the Stated Policies scenario. Dow expects to invest an average of $1 billion per year across the economic cycle to decarbonize manufacturing assets. Dow has a roadmap outlined that enables the Company to decarbonize its manufacturing footprint while growing. This roadmap includes replacing end-of-life assets with high-efficiency, low-emissions assets. This phased approach allows Dow to adjust its investment timing based on affordability, regulatory drivers and market demand.

Dow's downstream businesses view all scenarios as opportunities to develop solutions related to climate change. These include increased demand for solutions that aid customers in achieving their climate goals, whether it involves mitigation of climate change or products that address climate adaptation. This extends to packaging products that reduce food waste and improve resource efficiency, mobility solutions that reinforce the transportation industry's electrification initiatives, and applications for building envelopes that enable more energy-efficient buildings.

Source : Dow Chemical Company, *2023 PROGRESS REPORT,* https://corporate.dow.com/content/dam/corp/documents/about/066-00469-01-2023-progress-report.pdf (As of January 2025)

Overseas Disclosure Examples: Freeport-McMoRan Inc（US, Materials, Buildings, 1/3）

Three unique scenarios are set up to detail the envisioned worldview: aggressive climate change measures (1.5°C), moderate climate change measures (~2.5°C), and status quo (~4°C)

✓ **For transition risks and physical risks, the IEA and IPCC (models used in the Fifth Assessment Report) are used, and unique scenarios are set qualitatively and quantitatively**

2021 GLOBAL CLIMATE SCENARIO ANALYSIS SUMMARY

Our 2021 global climate scenario analysis considered both physical risks and transition risks and opportunities across three different climate scenarios: no climate action* scenario, moderate climate action scenario and aggressive climate action scenario. In general, the results of the analysis demonstrated that physical risks are highest for FCX in the no climate action scenario and lowest in the aggressive climate action scenario. Conversely, transition risks and opportunities are highest in the aggressive climate action scenario and lowest in the no climate action scenario. Our global scenario analysis covered our operational and non-operational assets as well as our supply chain. For more detailed information on our global climate scenario analysis, please refer to our 2020 and 2021 Climate Reports.

AGGRESSIVE CLIMATE ACTION (1.5°C)
Global collaboration to reduce GHG emissions to meet Paris Agreement goals and reduce emissions to net zero by 2050

Reference Scenarios:
Intergovernmental Panel on Climate Change (IPCC) Representative Concentration Pathways (RCP) 2.6 and International Energy Agency (IEA) Net Zero Emissions by 2050

MODERATE CLIMATE ACTION (~2.5°C)
Uncoordinated response based on announced policy commitments that are insufficient to meet the Paris Agreement goals

Reference Scenarios:
IPCC RCP 4.5 and IEA Stated Policies Scenario, implementation of climate policies

NO CLIMATE ACTION* (~4.0°C)
Unabated increases in emissions due to increasing use of fossil fuels leads to significant physical risks

Reference Scenarios:
IPCC RCP 8.5 and IEA Current Policies Scenario, high-end estimate of non-climate policy scenarios

Lower GHG emissions, increasing **transition risks and opportunities** ← → **Higher GHG** emissions, increasing **physical risk**

Source : Freeport-McMoRan, *2022 Climate Report*, https://www.fcx.com/sites/fcx/files/documents/sustainability/2022-Climate-Report.pdf (As of January 2025)

Overseas Disclosure Examples: Freeport-McMoRan Inc（US, Materials, Buildings, 2/3）

Examples of the introduction of the ICP system are cited as climate change-related countermeasures based on scenario analysis, and are linked to decision-making regarding current and future business plans

✓ **Based on the results of the scenario analysis, the Internal Carbon Pricing System (ICP) was introduced. Assess and incorporate into decision-making the impact on current and future long-term business plans. Commitment to continue reviewing pricing in accordance with external climate change-related policies**

INTERNAL CARBON PRICING

In many of the jurisdictions in which we operate, governmental bodies are increasingly enacting legislation and regulations in response to the potential impacts of climate change. Carbon tax legislation has been adopted in jurisdictions where we operate, including Indonesia. We expect that such carbon taxes and other carbon pricing mechanisms will increase over time. Depending on the future state of various climate policies and the speed at which the world adopts various policies and initiatives, we recognize that all of our operating regions must prepare for carbon pricing regimes. With the benefit of our global scenario analysis (discussed in more detail in the Resilience section), as well as input and ongoing dialogue with external stakeholders and associations, FCX has established internal carbon shadow prices that include $50, $100, and $150 per metric ton of CO_2 equivalent, reflecting the results and inputs from our three scenarios — no climate action (~4.0°C, formerly referred to as "Current State"), moderate climate action (~2.5°C) and aggressive climate action (1.5°C) — evaluated in our global climate scenario analysis completed in 2021.

We continue to work to integrate these internal carbon prices into our business processes to evaluate the potential impacts of an imposed carbon pricing regime on our current operations, longer-term business plans and potential future projects. We have integrated this internal carbon shadow price range into our life-of-mine plans and continue to socialize the use of internal carbon shadow prices with our project teams, incorporating its use in evaluating select projects as additional input to our decision-making for both existing operations and future projects. We recognize that climate-related policy changes are dynamic and rapidly shifting, and that our pricing assumptions must also be iterative and flexible. Accordingly, we are committed to reviewing our carbon pricing scale periodically so that the range is appropriate and relevant.

Introduction of Internal Carbon Pricing (ICP)

- Background: "Carbon tax laws have been adopted in the jurisdictions in which we operate, including Indonesia. Such carbon taxes and other carbon pricing are expected to increase over time. Depending on the various future climate policies and the speed at which the world adopts various policies and initiatives, we recognize that **all of our operating jurisdictions will need to be prepared for carbon pricing schemes.** "
- ICP Set Price: "**Following dialogue in our scenario analysis, we have established internal carbon prices (shadow prices) including $50/tCO2, $100/tCO2, and $150/tCO2.** We believe this will be a key decision-making factor for both current and future projects. We are working to **incorporate this price into our business processes to assess the potential impact of the carbon pricing system on our current operations, long-term business plans, and future projects.**"
- Case study: "**We have begun to incorporate it into our internal mine life planning, and we have also incorporated this price range into our project evaluation and approval process.**"

Source : Freeport-McMoRan, *2022 Climate Report*, https://www.fcx.com/sites/fcx/files/documents/sustainability/2022-Climate-Report.pdf (As of January 2025)

Overseas Disclosure Examples: Freeport-McMoRan Inc（US, Materials, Buildings, 3/3）

Targets for achieving carbon neutrality by 2050, and presents emission reduction targets through 2030 by reducing emission factors, and shows reduction pathways through electrification of facilities and energy efficiency

✓ **Explain the details and projects (currently being implemented or under consideration) of the four specific routes to 2030/40 towards net zero in 2050**

SUMMARY OF DECARBONIZATION INITIATIVES BY LEVER

LEVER	DETAILS	PROJECTS IN PROCESS AND/OR UNDER EVALUATION
1 DECARBONIZING ELECTRICITY SUPPLY	Purchased electricity generates more than half of the GHG emissions of our Americas copper operations. Renewable energy projects and power purchase agreements (PPAs) in the U.S., Chile and Peru will be important to progressing our GHG emissions reduction efforts. In some jurisdictions where we operate, such as Chile, we benefit from using the local grid when renewables are integrated. In Indonesia, approximately 63% of our current GHG emissions generated result from our coal-fired power plant.	• Progressing the first phase of Copper Skies initiative to integrate up to 450MW in renewable power projects (wind/solar/battery storage) and PPAs in the U.S. • Executed a new 160MW renewable PPA in Peru to replace the existing contract based on natural gas fueled generation • Continuing to evaluate opportunities in Chile to incorporate renewable power • Built and currently commissioning a new DFPP at PT-FI, which will operate initially using biodiesel and evaluating feasibility to transition to LNG
2 EQUIPMENT ELECTRIFICATION	Electrification of our haul trucks and other ancillary and light-duty equipment will be critical to decreasing our Scope 1 GHG emissions across our global operations. There is not currently a commercially viable alternative to the diesel-fuel haul trucks used at our open-pit operations. Electrification of ancillary equipment and light-duty vehicles can also support our efficiency and potentially reduce ventilation demands at our underground operations at PT-FI.	• Continue to participate in Caterpillar's Early Learner program and Komatsu's GHG Alliance • Currently completing second year of two-year trials of 400-ton diesel-electric Komatsu and Caterpillar trucks at Cerro Verde; evaluating a full diesel-electric fleet as a future platform for further electrification, including trolley assist systems • Initiated a project to convert Bagdad's haul truck fleet to autonomous and evaluating options at other sites • Designed, built and currently operating an autonomous electric train at PT-FI underground • Evaluating in-pit crushing and conveying at several mine sites • Evaluating and testing various options for electrifying ancillary and light-duty equipment • Actively involved in industry groups to create pathways for decarbonization
3 ENERGY & ASSET EFFICIENCY	Increased energy and asset efficiency at our sites can help support both our operational- and emissions-related performance. For example, by providing our operators with predictive data from machine learning technology, we have successfully enhanced concentrator throughput and efficiency at certain of our sites. FCX also has an extensive haul truck rebuild program to extend the life of our existing equipment, which avoids capital and Scope 3 GHG emissions. Sites are also working to identify other potential efficiency projects that will support GHG emissions reductions.	• Digital twin technology • Energy management systems • Several mill recovery improvement projects underway, including trials of new technology related to flotation • Improvements to high pressure grinding mill circuits • Haul truck cycle-time improvements; digital haul truck operator scorecards (HTOS) • Haul truck rebuild program to extend equipment life
4 PROCESS INNOVATION	Through process innovations, such as Leach to the Last Drop, we are advancing efforts to improve copper recovery from our leach processes, including initiatives across our North America and South America operations to incorporate new applications, technologies and data analytics. Our CLP innovation allows for the hydrometallurgical processing of copper sulfide concentrates and advanced processing of molybdenum concentrates. For copper, CLP is a less energy intensive alternative to smelting, and for molybdenum, CLP results in a more refined product directly at the mine site.	• CLPs at Morenci and Bagdad are operational • Internal and external initiatives underway to advance sulfide leaching technologies and to drive continuous recovery improvement; focused on traditional ores and ores that had been considered difficult to leach, like chalcopyrite • In research and development phase and conducting in-field trials at existing leach stockpiles and future opportunities to recover copper from below mill cut-off grade material

Describe the means to achieve net zero in 2050 (example: ①)

- 2022-30: Large-scale renewable power centered on wind and solar power, microgrid integration including battery storage, and low-carbon power sources such as LNG
- 2030-40: Industrial-scale next-generation renewable power sources such as hydrogen and geothermal
- 2040-50: Carbon capture and storage, advanced next generation renewable energy

Details for each method, and projects being implemented or under consideration (example: ①)

- Details: More than half of the greenhouse gas emissions at our US Continental Copper operations are generated by purchased electricity. Renewable energy projects and power purchase agreements (PPAs) in the US, Chile, and Peru will be critical to advancing efforts to reduce greenhouse gas emissions.
- Project: Promoting the first phase of the Copper Skies initiative to integrate up to 450 MW into U.S. renewable power projects (wind/solar/battery storage) and PPAs

Source : Freeport-McMoRan, *2022 Climate Report*, https://www.fcx.com/sites/fcx/files/documents/sustainability/2022-Climate-Report.pdf ; *2023 Climate Update* https://www.fcx.com/sites/fcx/files/documents/sustainability/2023-Climate-Report.pdf (As of January 2025)

Overseas Disclosure Examples: Newmont Corporation（US, Materials, Buildings, 1/2）

Original scenarios based on IEA STEPS, SDS, and NZE scenarios, detailing a world view based on IEA forecasts, long-term macroeconomic projections, etc.

✓ **Qualitatively and quantitatively explain the worldview up to 2050 based on the current business and project portfolio**

- **Explain the worldview of the scenario using seven variables (carbon price, gold price, crude oil price, electricity, renewable energy, transportation, energy sector policy, grid emission factor, world GDP, world population)**

Scenario framework

1 Transitional Change	2 Planned Energy Transition	3 Accelerated Response
Reliance on fossil fuels with greater than 3°C temperature rise	Limit global warming to well below 2°C	Limit global warming to 1.5°C
• Consistent with the IEA's Stated Policies Scenario[1] • Results in a shortfall in meeting the goals of the Paris Agreement	• Most consistent with the IEA's Sustainable Development Scenario[1] • Phased actions during the 2020s to limit global warming to well below 2°C	• Most consistent with the IEA's Net Zero Emissions by 2050 Scenario[1] • Accelerated actions prior to 2030 to limit global warming to 1.5°C

Scenario 1 is the IEA STEPS scenario, Scenario 2 is the IEA SDS scenario, Scenario 3 is generally consistent with the IEA's NZE scenario

Key assumptions for Newmont's climate scenarios[1]

Macroeconomics[2]	Climate scenarios
Gold price ($/oz) – $1,500	Transitional Change
Silver price ($/oz) – $23	Planned Energy Transition
Copper ($/lb) – $3.25	Accelerated Response
USD/AUD – $0.75	
MXN/USD – $21.0	
USD/CAD – $0.80	

Mineral prices based on macroeconomic forecasts

1

Scenario assumptions[1, 2, 3]

Variables	Scenario assumptions
External	
Carbon price[4]	$40/tCO₂ by 2030, increasing up to $50/tCO₂ by 2050
World population[4]	Over nine billion in 2040 with a compound average growth rate of 0.7%

Worldview of scenario 1 (example)

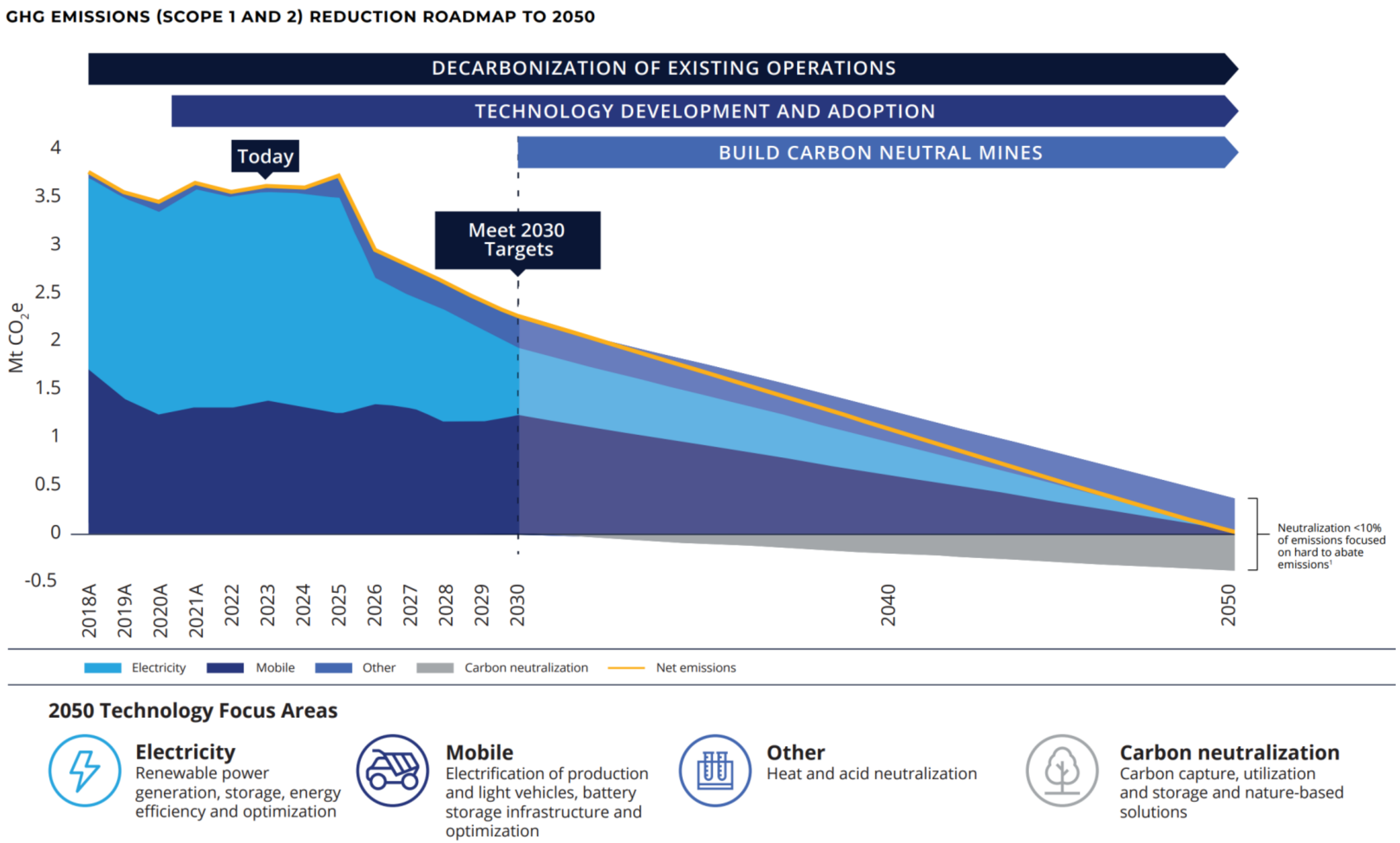
- Carbon price: rises to $40/tCO2 in 2030 and $50/tCO2 in 2050
- Gold price: $1,500/oz
- fossil fuel prices
  - ✓ Crude oil: rises to $77/barrel in 2020 and $88/barrel in 2050
  - ✓ Natural gas: $7.7/MBtu in 2020, $8.3/Mbtu in 2050 (based on EU costs)
  - ✓ Thermal coal: $67/ton in 2020, $63/ton in 2050

Source : Newmont Corporation, *2022 Climate Report*, https://s24.q4cdn.com/382246808/files/doc_downloads/2023/05/Newmont-2022-Climate-Report.pdf As of January 2025)
*no update since 2022

Overseas Disclosure Examples: Newmont Corporation（US, Materials, Buildings, 2/2）

Setting the goal of achieving carbon neutrality by 2050 and charting a transition path

✓ **The project will focus first on deploying commercially available technologies to decarbonize existing operations. Collaborate with joint venture partners on technology development strategies and timelines and develop a technology roadmap for capital projects to identify new technologies that will support the construction of carbon neutral mines and redefine the project pipeline to be carbon neutral**



Source : Newmont Corporation, *2022 Climate Report*, https://s24.q4cdn.com/382246808/files/doc_downloads/2023/05/Newmont-2022-Climate-Report.pdf (As of January 2025)
*no update since 2022

Overseas Disclosure Examples: J Sainsbury Plc（UK, Agriculture, Food, and Forest Products）

For each risk/opportunity identified in the 1.5°C and 4°C scenarios, the impact on earnings is disclosed for each risk/opportunity when countermeasures are taken and when no action is taken

✓ **Explaining the calculation method, the impact on revenue is presented for the risks identified in the 1.5°C and 4°C scenarios for the years 2030 and 2050, with and without taking measures to address the risks**

Potential financial impact of climate-related transition risks on most exposed products in a low emissions scenario in 2030

To assess the financial impact associated with regulation and changes in consumer preferences, we evaluated the sale of Meat, Fish and Poultry, Clothing and Fuel in the UK. For regulation risks, we considered the impact of a carbon price on the Meat, Fish and Poultry category and the ban of the sale of new petrol, diesel and hybrid cars and vans from 2035 on the Fuel category. For Meat, Fish and Poultry the carbon prices applied in our scenario analysis align with IPCC data and costs are assumed to pass on directly to customers, reducing demand for the highest emission Meat, Fish and Poultry products. For Fuel we have assumed a rapid uptake of battery electric vehicles leading to a 50 per cent reduction in fuel demand by 2030. For consumer preference, we considered the impact of more climate-conscious customers favouring lower GHG emission protein and purchasing more second-hand clothing (displacing new clothing purchases).

The results show the potential revenue loss in a 1.5°C (low emissions) world in which physical risks associated with climate change are limited, but high transition risks are experienc[…] as the world attempts to meet the Paris Agreement. As the results do not reflect the impact of any mitigating actions, the Meat, Fish and Poultry res[…]o not capture the business opportunity of developing and promoting lower GHG animal protein and nutritionally positive meat alternatives to car[…]itching calories from existing and new customers. The Fuel result does not capture the business opportunity from providing customer electric veh[…]ng.

Explains the basis for assessment

Annual revenue loss to most exposed categories in isolation in 1.5°C scenario in 2030, assuming no actions are taken to mitigate risks:

Most material transitional climate risks[a]:	Meat, Fish and Poultry	Clothing	Fuel
Regulation	£50m to £100m revenue loss to MFP category in isolation *Overall opportunity to business post-mitigations*	N/A	£2,900m to £3,000m revenue loss to fuel category in isolation *Smaller revenue loss risk/potential opportunity to business post-mitigations*
Changes in consumer preferences	£350m to £400m revenue loss to MFP category in isolation *Overall opportunity to business post-mitigations*	£35 to £40m revenue loss to Clothing category in isolation	N/A

- **Example: Business impact due to risk of changes in demand for animal protein with high GHG emissions**
  - ➢ **If no action is taken: estimated revenue loss of 300-350 million euros in 2030**
  - ➢ **If addressed: Overall opportunity**

Source : J Sainsbury Plc, *Annual Report and Financial Statements 2024*, https://www.about.sainsburys.co.uk/~/media/Files/S/Sainsburys/documents/reports-and-presentations/annual-reports/2024/sainsbury-annual-report-and-financial-statements-2024.pdf (As of January 2025)

Overseas Disclosure Examples: Mondi Group（UK, Agriculture, Food, and Forest Products）

Assessment of financial impact, timeframe, and scenario sensitivity is conducted for risks and opportunities

Climate change-related risks and opportunities

Climate change-related risks		Estimated financial impact (€m)	Timeframe: Short	Medium	Long	Scenario sensitivity: 1.5°C	2°C	BAU
Physical risks	1. Higher wood procurement costs	90–180			●	●●	●●●	●●●●
	2. Risk of flooding	15–85			●	●	●●	●●●●
	3. South African plantation yield loss	15–20		●		●	●●	●●●
	4. Chronic changes in precipitation	10–15			●	●	●●	●●●
Transition risks	5. Energy supply costs	60–150		●		●●●●●	●●●●	●●
	6. GHG emissions regulatory changes (net impact)	30–85		●		●●●●●	●●●●	●●●
	7. Asset impairment risk	10–30			●	●●●●	●●●	●
Total climate change-related risks		230–565						
Climate change-related opportunities								
1. Changing customer behaviour		120–240			●	●●●●●	●●●●	●●
2. Reduced operating costs through energy efficiency		15–25		●		●●●●●	●●●●	●●
3. Sale of by-products		15–20	●			●●●●●	●●●●	●
Total climate change-related opportunities		150–285						

Anticipated onset of risk or opportunity
● Estimated full impact of risk or opportunity
●●●●● High likelihood
●●●●
●●●
●●
● Low likelihood

✓ **Evaluates financial impact, timeframe, and sensitivity in each scenario for risks and opportunities**

Risk/opportunities
- Physical risk
  - ➢ Higher wood procurement costs
  - ➢ Risk of flooding
  - ➢ South African plantations yield loss
  - ➢ Chronic changes in precipitation
- Transition risk
  - ➢ Energy supply costs
  - ➢ Changes in GHG regulations (net impact)
  - ➢ Asset impairment risk
- Opportunity
  - ➢ Changing customer behavior
  - ➢ Reducing operating costs through energy efficiency
  - ➢ Sale of by-products

Climate change-related risks: Physical risks

Risk	Risk description	How we manage and mitigate this risk	Estimated financial impact (€m)
1. Higher wood procurement costs **Timeframe:** Long term	Temperature increase, changes in rainfall patterns and windstorms can result in large-scale forest damage. In Europe, at lower altitudes, fibre losses from pests (e.g. bark beetles) and diseases are expected to continue unless precipitation increases. A reduction in the cutting capacity of the sawmilling industry due to a lack of spruce saw logs could lead to a change in the mix of available pulpwood and sawmill chips. Increasing competition for wood is being driven by demand for renewable raw materials and timber for green energy generation to achieve EU GHG reduction and Net-Zero targets. At the same time, there is a call to increase forest areas set aside for conservation, which is reflected in the 2030 EU Forest Strategy.	In mountainous regions, we expect an increase in yearly forest growth due to rising temperatures. At lower altitudes, spruce will be mainly replaced with other softwood species. We are investigating alternatives to support flexibility in species mix for our future pulp production. We invest in research and development projects and are building strategic partnerships with forest owners and industries, NGOs and scientific institutions to foster sustainable forest management. This is supported by the sustainable working forest model and fit-for-purpose certification concepts, which we developed and promote with our partners. We have started to explore approaches to climate-fit forestry to enhance forest ecosystems' resilience. We also promote the cascading use of wood nationally and via Cepi on a European level.	90–180

✓ **Describes the impact of each risk/opportunity on your company and countermeasures**

Source : Mondi Group, *Integrated report and financial statements 2023*, https://www.mondigroup.com/globalassets/mondigroup.com/investors/results-reports-and-presentations/2023/annual-report/mondi-group-integrated-report-and-financial-statements-2023.pdf (As of January 2025)

Overseas Disclosure Examples: Eaton Corporation plc（US, Electricity, Machinery, Communication, 1/3）

Scenarios of 1.5°C, 2°C, and 2°C or higher are set with reference to external data from the IEA, IPCC, and other sources. Each scenario describes drivers such as energy intensity and government regulations

✓ **Drivers are listed for each scenario regarding "regulations/policies," "economy," and "energy intensity."**

Scenario classification	Risk focus	Climate scenarios analyzed	Global average temperature increase by 2100	Scenario drivers
1.5°C (Net zero)	Transition Risks	IEA Net zero	1.5°C	Lower challenges to mitigation and adaptation. Economic growth emphasizes human well-being and lower resource and energy intensity.
~2°C	Both transition risks and physical risks	SSP1-2.6	1.7-1.8°C	Low challenges to mitigation and adaptation. Economic growth emphasizes human well-being and lower resource and energy intensity .
		IEA announced policies	2°C	Announced nationally determined contributions are implemented.
Above 2°C	Physical risks	IEA stated policies	2.6°C	Actions taken to enforce policies affecting energy markets (policies adopted by 2022).
		SSP5-8.5	3-5°C	Emissions double by 2050. Quick global economic growth and high energy intensity.

Figure 4: Climate scenarios table

Source : Eaton, *Task Force on Climate-related Financial Disclosures report 2023*, https://www.eaton.com/content/dam/eaton/company/sustainability/files/eaton-tcfd-disclosure.pdf (As of January 2025)
*no update since 2023

Overseas Disclosure Examples: Eaton Corporation plc（US, Electricity, Machinery, Communication, 2/3）

Based on scenario analysis, specific countermeasures are integrated with business strategy to contribute to increasing corporate value by reducing climate change-related risks and capturing opportunities

✓ Describes specific measures to reduce energy demand and green energy supply to reduce climate-related risks and seize opportunities

We are working to both reduce our energy demand and green our energy supply. We are focusing on the first six primary levers (Figure 13) to reduce

What we're doing:

- We are targeting $3 billion in sustainable

Transition plan due to climate change

- **Prioritize energy efficiency, renewable energy procurement and feed new renewable energy into the grid.**
- **The goal is to invest $3 billion in sustainable research and development by 2030. Since 2020, the company has invested $900 million in research and development to grow sustainable solutions.**

Financial plan

- Described about 2022 outlook for **investments and acquisitions in companies offering green solutions, assuming that climate change opportunities can provide an additional 8-10% EPS growth over the next five years.**
  (Example)
  - Acquired Green Motion, a major designer and manufacturer of electric vehicle charging hardware and related software. **Complementing existing energy storage and distribution offerings and positioned to grow with the global energy transition to electric vehicles.**
  - In August 2021, **we made a strategic investment in Reactive Technologies, a grid technology company** based in the UK and Finland.

✓ The results of scenario analysis are integrated into financial planning for investments, acquisitions, etc.

Financial planning: Eaton is actively managing its portfolio and expects to deliver higher margins and more consistent earnings supported by secular growth trends: sustainability, intelligent and connected products, and electrification and energy transition. Climate transition opportunities position Eaton to deliver an incremental 8-10% EPS growth between 2021-2026. Eaton has been working to formalize integration of ESG risk considerations in its M&A activities. Recent acquisitions deployed capital in businesses poised to respond to these opportunities:

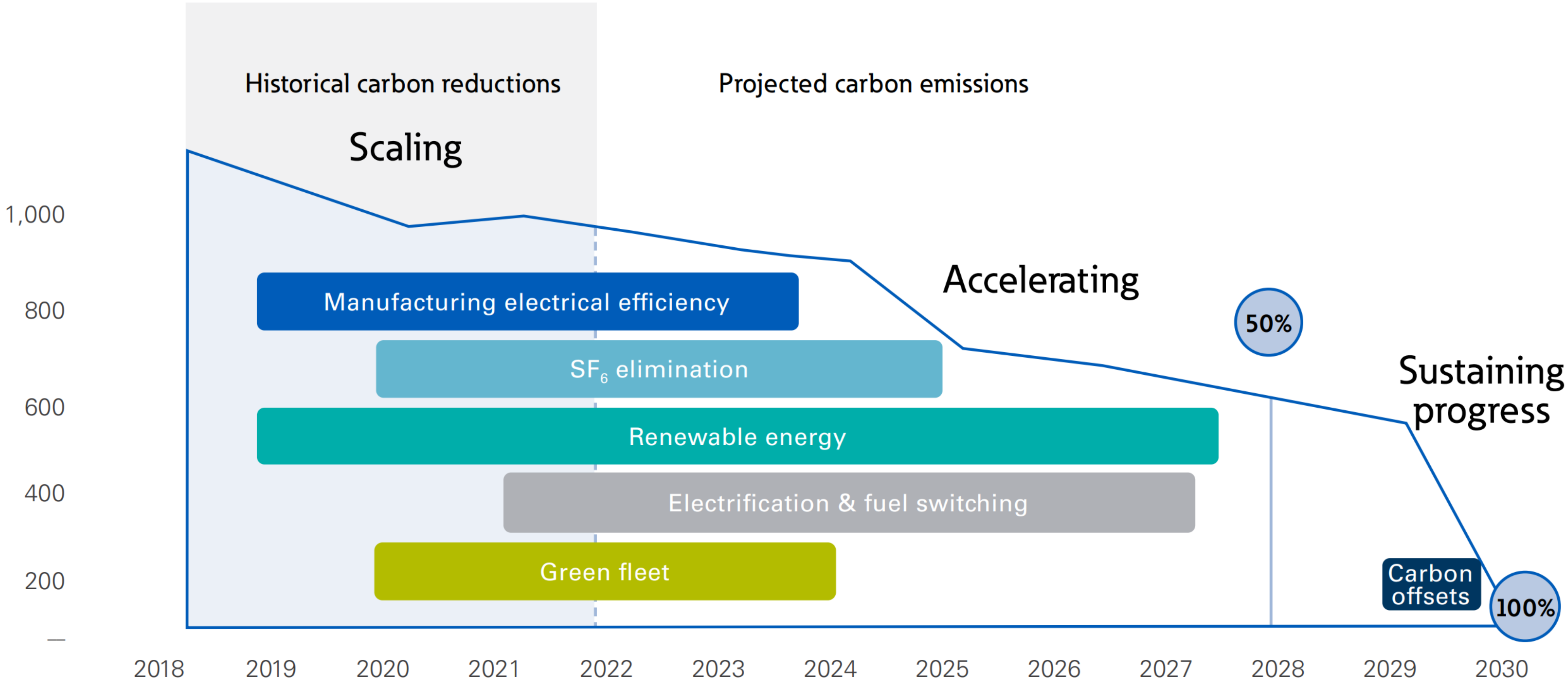
- Jiangsu Ryan Electrical: Eaton recently acquired a 49% interest in Jiangsu Ryan Electrical, which manufactures power distribution and sub-transmission transformers in China, focusing on dry-type transformers that are a booming market amid an increasing renewable energy base and rising electricity consumption globally.
- Innovative Switchgear and Ulusoy Electrik: In 2019 Eaton acquired Innovative Switchgear, and a 93.7% controlling interest in Ulusoy Electrik, to expand Eaton's offerings in medium voltage switchgear and other equipment for utility customers, including more environmentally-friendly SF_6-free solutions.
- Reactive Technologies: In August 2021, Eaton made a strategic investment in the UK and Finland-based grid technology company, Reactive Technologies Ltd. Eaton is collaborating with Reactive on supporting utilities to cost-effectively increase renewable energy capacity.
- Souriau-Sunbank: Eaton acquired Souriau-Sunbank Connection Technologies in 2019 to enhance offerings of highly engineered electrical interconnect solutions for harsh environments in the aerospace, defense, industrial, energy and transport industries. Harsh environments will be more frequent as customers mitigate climate risks, making harsh environment solutions more important in the future.
- Tripp Lite: Eaton's March 2021 acquisition of Tripp Lite expands and strengthens Eaton's single-phase, uninterrupted power supply system and data center solutions, product lines that support growing demand for reliability, edge computing and distributed information technology in the face of increased energy challenges.
- Green Motion: In March 2021, Eaton acquired Green Motion SA, a leading designer and manufacturer of electric vehicle charging hardware and related software. This acquisition complements existing energy storage and power distribution offerings, and positions Eaton to grow with the global energy transition to electric vehicles.

Source : Eaton, *Task Force on Climate-related Financial Disclosures report 2023*, https://www.eaton.com/content/dam/eaton/company/sustainability/files/eaton-tcfd-disclosure.pdf (As of January 2025)
*no update since 2023

Overseas Disclosure Examples: Eaton Corporation plc（US, Electricity, Machinery, Communication, 3/3）

Transition plan is presented with the goal of achieving carbon neutrality by 2030

✓ **Demonstrate plans to achieve carbon neutrality through manufacturing efficiency, introduction of alternative solutions, renewable energy, green fleets (Deploying electric vehicles, charging infrastructure, and more efficient vehicles for sales, service, and other business fleets), electrification and fuel switching (Switch to sustainable fuel sources where possible and, if difficult, electrify processes with renewable energy), carbon offsets, etc.**



Source : Eaton, *Task Force on Climate-related Financial Disclosures report 2023*, https://www.eaton.com/content/dam/eaton/company/sustainability/files/eaton-tcfd-disclosure.pdf (As of January 2025)
*no update since 2023

Overseas Disclosure Examples: Schneider Electric SE（France, Electricity, Machinery, Communication）

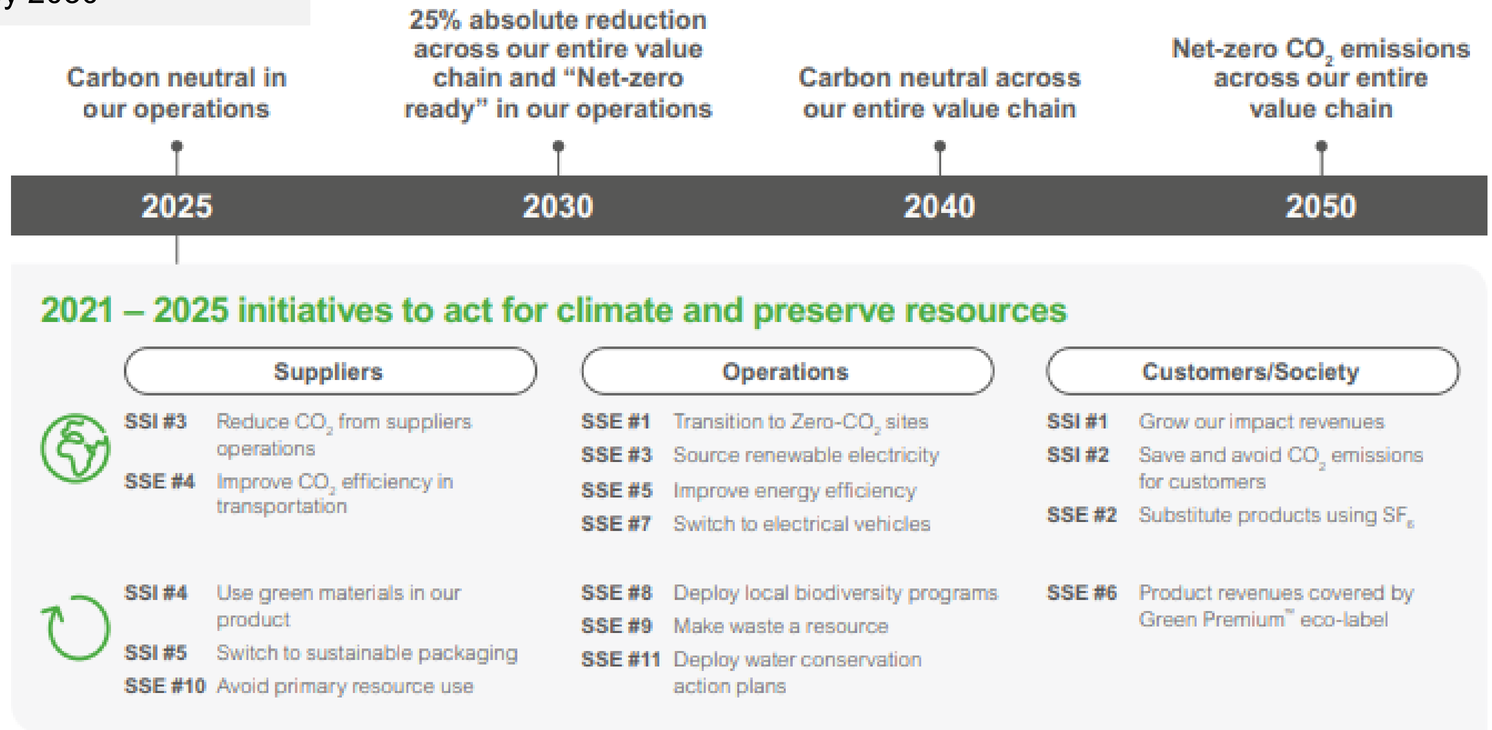
Discloses a roadmap and specific measures to achieve 1.5°C by 2050

Future strategy

- Achieve 150 Zero-CO2 locations by 2025
- Propose alternative technologies by 2025
- 90% of electricity will be provided by renewable energy by 2025, 100% by 2030
- Increase the energy efficiency of business facilities by 15% by 2025 and double energy productivity by 2030 compared to 2005.
- Switch one-third of company cars to electric vehicles by 2025, and increase to 100% by 2030

✓ **Shows a roadmap in line with the 1.5℃ scenario and describes countermeasures**

- **2025: Carbon neutral operation**
- **2030: Reduce CO2 emissions by 25% in the value chain**
- **2040: Carbon neutrality in the value chain**
- **2050: Net zero value chain**



Source : Schneider Electric, *2023 Universal Registration Document Financial and Sustainable Development Report*, https://www.se.com/ww/en/assets/564/document/462018/2023-universal-registration-document.pdf (As of January 2025)

Overseas Disclosure Examples: Burberry Group PLC（UK, Consumer Discretionary, Pharmaceutical）

Evaluating business impact in >4°C, 2°C-3°C, and 1.5°C scenarios

Impact

Potential impact on Burberry's cumulative discounted cash flows over five years, assuming no mitigating actions are taken:

Low: (<£1m – £25m) Medium: (£25m – £125m) High: (£125m – £250m)

Market risk

Global emissions environment

Average global temperature rise compared to pre-industrial levels by 2100

	> 4°C	2°C – 3°C	1.5°C
Impact	Low	Medium	High

Timeframe for most significant impact: short to medium term

How we modelled the risk

We quantified how shifts in consumer preferences towards more sustainable and less carbon intensive goods may impact demand for our products.

Consumer preference shifts have been considered at a country level.

Potential areas of impact

A shift away from products constructed using less sustainable raw materials, including animal-based products, towards organic, regenerative or recycled fabrics. This shift is expected to happen in the short to medium term, and more quickly in geographical regions where public attention on sustainable materials used to produce clothing is greater, such as Europe and North America. The shift will be more apparent in a lower temperature scenario, which assumes that a higher proportion of consumers will adopt more sustainable choices.

Key assumptions

- Consumer perception of Burberry products is assumed to be linked to the carbon footprint of sourcing raw materials, production and distribution
- Scenario analysis is based on Burberry's future Product strategy and revenues, aligned with its updated strategic vision and projected raw material usage
- We have considered how shifts in consumer preferences may impact operating margin and net cash. This has been assessed in line with our current cost structure

✓ **The impact on profits if each risk is not addressed is shown as low, medium, or high**
- **Low: <1m-25m lbs**
- **Medium: 25-125m lbs**
- **High: 125m-250m lbs**

✓ **Presenting the financial impact of >4℃, 2℃-3℃, and 1.5℃ scenarios for the following key risks:**
- **Physical risk**
- **Regulatory changes**
- **Market changes**
- **Change in reputation**
- **Liabilities**

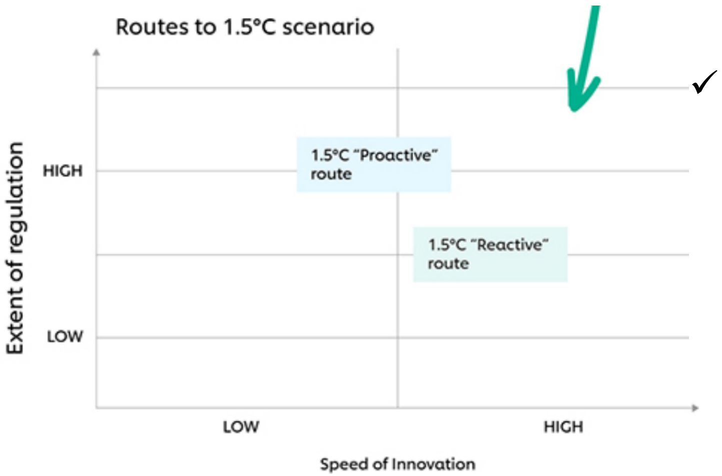
Example of describing risks to the market

- How to model market risk: Quantifying how changes in consumer preferences towards more sustainable and less carbon-intensive products affect demand for products
- Potential areas of impact: A shift away from products made with less sustainable raw materials, including animal products, to organic, recycled and recycled materials. The timing is expected to occur in the short to medium term, and is expected to occur sooner in geographic regions where there is greater societal concern for sustainable materials used in clothing production.
- Key assumption: Consumer sentiment towards Burberry products is assumed to be related to the carbon footprint of raw material sourcing, production and distribution. The scenario analysis is based on Burberry's future product strategy. **The impact of changes in consumer preferences on operating profit margins, etc. is considered and evaluated in line with the current cost structure.**

Source : Burberry Group PLC, *Annual Report 2023/24*, https://www.burberryplc.com/content/dam/burberryplc/corporate/2024-updates/burberry-annual-report-and-accounts-2023-24.pdf (As of January 2025)

Overseas Disclosure Examples: Unilever plc（UK, Materials, Consumer Discretionary, Pharmaceutical）

Scenario analysis was conducted at 1.5℃, 2℃, and 4℃, and two unique scenarios were used at 1.5℃. Calculate a wide range of business impacts for 2030, 2039, and 2050



Proactive route	Reactive route
▪ Aggressive and persistent regulation from today ▪ Dramatic changes to lifestyle from today, towards minimising climate impact and social inequality ▪ Reliance on available and proven technologies ▪ Lower reliance on carbon removal technologies	▪ Gradual regulation by 2030, very aggressive post-2030 ▪ Continuation of historical societal trends until 2030, then rapid pivot ▪ Major reliance on technologies that are not yet proven to scale ▪ Higher reliance on carbon removal technologies

- ✓ **Scenario analysis is conducted at 1.5℃, 2℃, and 4℃, and two unique scenarios are used at 1.5℃**
  - **Proactive Route requires gradual tightening of regulations from now on and relies on existing technology**
  - **Reactive Route will rely on future technology as regulations will rapidly tighten starting in 2030**
- ✓ **Regarding the risks and opportunities of the main 1.5℃ scenario, evaluate and disclose the business impact for 2030, 2039, and 2050, and describe the basis and assumptions for calculation**
  - **Main risks/opportunities:**
    - ➢ **Impact of carbon taxes and voluntary carbon removal costs**
    - ➢ **Impact of land use regulations on food crop production**
    - ➢ **Impact of rising energy prices on suppliers and manufacturing industries**
    - ➢ **Impact of water scarcity on crop yields**
    - ➢ **Impact of abnormal weather (increase in average temperature) on crop yields**
    - ➢ **Growth in the plant-based food sector**

Financial quantification of assessed risks and opportunities — Potential financial impact on profit in the year (€bn)[a]

Regulatory and Market Risks	Key assumptions	Sensitivity	2030	2039	2050
1. Carbon tax and voluntary carbon removal costs We quantified how high prices from carbon regulations and voluntary offset markets for our upstream Scope 3 emissions might impact our raw and packaging materials costs, our distribution costs and the neutralisation of our residual emissions post-2039.	▪ Absolute zero Scope 1 and 2 emissions by 2030 ▪ Scope 3 emissions exclude consumer use emissions ▪ Carbon price would reach 245 USD/ tonne by 2050, rising more aggressively in early years in a proactive scenario ▪ The price of carbon offsetting would reach 65 USD/ tonne by 2050 ▪ Offsetting 100% of emissions on and after 2039	ρ	**-3.2**	-5.2	-6.1
		ɾ	**-2.4**	-4.8	-6.1
2. Land use regulation impact on food crop outputs We quantified how changing land use regulation to promote the conversion of current and future food crops to forests could drive reduced crop output and lead to increased raw material prices, impacting sourcing costs.	▪ By 2050, in a proactive scenario, land use regulation would increase prices by: ▪ Palm: ~28% ▪ Commodities and food ingredients: ~33%	ρ	**-0.8**	-2.1	-5.1
	▪ By 2050, in a reactive scenario, land use regulation would increase prices by: ▪ Palm: ~10%; ▪ Commodities and food ingredients: ~11%	ɾ	**-0.3**	-0.7	-1.7

Source : Unilever, *Annual Report and Accounts 2023*, https://www.unilever.com/files/66bc4aea-608f-46ee-8da3-cde0ec8ebe90/unilever-annual-report-and-accounts-2023.pdf (As of January 2025)

Table of contents

Main Part

Appendix

Partial excerpts on transition risk and physical risk parameters

Transition risk

IEA	• World Energy Outlook (WEO) 2022 • Energy Technology Perspectives (ETP) 2023
NGFS	• CA Climate Impact Explorer • （Reference, Physical risk）IIASA Scenario Explorer
PRI IPR	• 1.5℃ RPS Scenario • Forecast Policy Scenario (FPS) • FPS＋Nature
SSP	• SSP (Shared Socioeconomic Pathways) Public Database Ver2.0

Physical risk

Physical risk tools used in past support projects (excerpt)

- AQUEDUCT Water Tool（WRI）
- Climate Change Knowledge Portal（World Bank）
- Climate Impact Viewer（AP-PLAT）
- Working on a warmer planet（ILO）

Parameters referenced in past support cases

（FY 2020, FY2021, FY2022）

※Parameters and data are from February 2024

Ways to obtain tools and literatures from IEA, NGFS, PRI, SSP

Issuing Organization	Tool Name	Data acquisition method	URL
IEA	**World Energy Outlook (WEO) 2022**	• **Download the PDF** report from the IEA homepage • From the IEA homepage, **download the excel for related data.** There are 2 data, **the free dataset and the extended data set**	• PDF：https://www.iea.org/reports/world-energy-outlook-2023 • Free Dataset：https://www.iea.org/data-and-statistics/data-product/world-energy-outlook-2023-free-dataset-2 • Extended Dataset：https://www.iea.org/data-and-statistics/data-product/world-energy-outlook-2023-extended-dataset
	Energy Technology Perspectives (ETP) 2023	• From the IEA homepage, **download the report**	• https://www.iea.org/reports/energy-technology-perspectives-2023
NGFS	**NGFS IIASA Scenario Explorer**	• Can be **viewed through the NGFS homepage**. The datasets are **available for download as an excel** ※Must make an account	• Web tool：https://www.ngfs.net/ngfs-scenarios-portal/data-resources • Excel dataset：https://data.ene.iiasa.ac.at/ngfs/#/downloads
	（Reference、Physical risk） NGFS CA Climate Impact Explorer	• Can be **viewed through the NGFS homepage** ※Must make an account	• Web tool：https://climate-impact-explorer.climateanalytics.org/
PRI	**1.5℃ RPS Scenario**	• **Download excel** from the PRI homepage	• https://www.unpri.org/download?ac=15399 ※Download will start after clicking the link
	Forecast Policy Scenario (FPS)	• **Download excel** from the PRI homepage	• https://www.unpri.org/download?ac=15398 ※Download will start after clicking the link
	FPS＋Nature	• **Download excel** from the PRI homepage	• https://www.unpri.org/ipr-fps-nature-value-drivers ※Download will start after clicking the link
SSP	**SSP Public Database Ver2.0**	• **Can be viewed through the web tool** on the IIASA homepage	• https://tntcat.iiasa.ac.at/SspDb/dsd?Action=htmlpage&page=10

Parameters referenced in past support cases

Transition risk（1/5）

	Item	Parameter	Source	Reference: FY 2020~2021 supported companies
Transition risk	Carbon price	Carbon tax	• IEA WEO2019, WEO2020, NZE2050, WEO2021 • PRI IPR FPS • Information of countries • Ministry of the Environment "Introduction of Taxes to Combat Global Warming" • IPCC "Mitigation Pathways Compatible with 1.5℃ in the Context of Sustainable Development" Below 1.5℃ pathway	ASKUL Corporation, ORIX Asset Management Corporation, Kyushu Railway Company, Shin-Etsu Chemical, Mitsui Mining & Smelting, YASKAWA Electric Corporation, SCSK Corporation, GUNZE, Nishi-Nippon Railroad, Nippon Paper Industries, Fuji Oil Company, Maruha Nichiro Corporation, UACJ Corporation
		Border carbon	• IEA WEO2021 • Ministry of the Environment "Recent Developments in Carbon Tax and Border Adjustment Measures" • ICAP (Average of EU-ETS in 2020)	Fuji Oil Company, UACJ Corporation
		Electricity price	• IEA WEO2018, WEO2020	ASKUL Corporation, ORIX Asset Management Corporation, Kyushu Railway Company, Mitsui Mining & Smelting, SCSK Corporation, GUNZE, Nishi-Nippon Railroad, Nippon Paper Industries, UACJ Corporation
	Carbon emissions targets/policies in each country	Target values for emissions	• Ministry of the Environment's "Draft Japanese Commitments," "Toward Significant Reductions in Greenhouse Gases by 2050" • IEA ETP2020 • Target set by countries • Ministry of Foreign Affairs of Japan "Climate Change: Japan's Emission Reduction Targets" • Ministry of Foreign Affairs of Japan "Domestic and International Developments Concerning Carbon Neutrality in 2050" • Agency for Natural Resources and Energy "Basic Energy Plan" • UNFCCC "Thailand's Updated Nationally Determined Contribution" (October 2020)	Kyushu Railway Company, Shin-Etsu Chemical, YASKAWA Electric Corporation, SCSK Corporation, Nippon Paper Industries, Fuji Oil Company, UACJ Corporation
		Target unmet penalty amount	• IEA WEO2021	Fuji Oil Company
		Annual target of forest area decrease	• Indonesia NDC "First Nationally Determined Contribution REPUBLIC of INDONESIA"	ASKUL Corporation
		Spread of environmentally friendly vehicles (EVs and FC buses)	• IEA WEO2020, NZE2050	Nishi-Nippon Railroad
	Carbon emissions targets/policies in each country (Logging tax)	Logging tax	• Forestry Agency "Forest Environment Tax and Forest Environment Transfer Tax • Customs and Tariff Bureau, Ministry of Finance "Overview of the TPP11 Agreement (CPTPP) (tax rate differences, etc.) • Forestry Agency "Provision of Information on Legally Logged Timber, etc.	Nippon Paper Industries

※ The parameters surveyed during support program by the Ministry of the Environment are shown regardless of whether they are used by each company.

Parameters referenced in past support cases

Transition risk（2/5）

	Item	Parameter	Source	Reference: FY 2020~2021 supported companies
Transition risk	**Carbon emissions targets/policies in each country （Plastic Regulation)**	Recycled plastic usage rate	• EU Government • Plastic Recycling and Reuse Association, European Plastics Strategy • JPCA • EU Technical Expert Group (TEG), "Taxonomy Report Technical Annex"	ASKUL Corporation, Shin-Etsu Chemical, GUNZE, Fuji Oil Company
	Changes in the energy mix	Power Generation Mix (Japan)	• IEA WEO2019,2020, 2021 • PRI IPR FPS2019 • Japanese Government • Agency for Natural Resources and Energy "Outline of the Basic Energy Plan (Draft 2)"	Kyushu Railway Company, Mitsui Mining & Smelting, YASKAWA Electric Corporation, SCSK Corporation, Nippon Paper Industries
		Fuel price increase/decrease rate	• IEA WEO2020, NZE2050	Nishi-Nippon Railroad
		Oil supply	• IEA WEO2021	Fuji Oil Company
	Dissemination of renewable energy and energy-saving technologies	ZEV ratio	• IEA ETP2017 • Shinichiro Fujimori et al. "The marker quantification of the Shared Socioeconomic Pathway 2: A middle-of-the-road scenario for the 21st century"	ASKUL Corporation, Kyushu Railway Company, Shin-Etsu Chemical
		EV rate of new vehicles	• IEA Global EV Outlook2021	SCSK Corporation, Nippon Paper Industries
		EU Inventory	• IEA WEO2021	UACJ Corporation
		Global Telecommunications Volume Trends	• Cisco "Global IP Traffic Forecast by Cisco VNI, 2018-2023" • Nomura Research Institute, "Nomura Research Institute, Outlook for ICT and Media Market Size and Trends through FY2025" • SMART CITY PROJECT	SCSK Corporation
	Development of next-generation technologies	Spread of environmentally friendly trains	• East Japan Railway Company "Production of hybrid vehicle (fuel cell) test vehicle using hydrogen as energy source and implementation of demonstration test" June 2019	Kyushu Railway Company
		Change in the number of passengers between private cars and buses due to decarbonization	• IEA NZE2050	Nishi-Nippon Railroad

※ The parameters surveyed during support program by the Ministry of the Environment are shown regardless of whether they are used by each company.

Parameters referenced in past support cases

Transition risk（3/5）

	Item	Parameter	Source	Reference: FY 2020~2021 supported companies
Transition risk	Changes in important products/ prices	Recycled Aluminum Utilization Rate	• IAI "1.5 DEGREES SCENARIO A MODEL TO DRIVEEMISSIONS REDUCTION" • National Institute for Environmental Studies, "Estimating the Impacts of Carbon Constraints on Metal Production and Use on a Global Scale" (2021)	UACJ Corporation
		Aluminum price	• World Bank "World Bank Commodities Forecast"	UACJ Corporation
		Copper demand forecast	• Sebastiaan Deetman et al "Scenarios for demand growth of metals in electricity generation technologies, cars and electronic appliances"	Mitsui Mining & Smelting
		Zinc demand forecast	• World Bank "The Growing Role of Minerals and Metals for a Low Carbon Future"	Mitsui Mining & Smelting
		Lead demand forecast	• World Bank "The Growing Role of Minerals and Metals for a Low Carbon Future"	Mitsui Mining & Smelting
		cobalt, nickel, and platinum demand forecast	• World Bank "The Growing Role of Minerals and Metals for a Low Carbon Future"	Mitsui Mining & Smelting
		Aluminum demand forecast	• CM group, IAI "AN ASSESSMENT OF GLOBAL MEGATRENDS AND REGIONAL AND MARKET SECTOR GROWTH OUTLOOK FOR ALUMINIUM DEMAND" (2020)	UACJ Corporation
		Fuel price (Oil price, coal price, natural gas price)	• IEA WEO2020, NZE2050, WEO2021 • Agency for Natural Resources and Energy "Basic Energy Plan"	ASKUL Corporation, Kyushu Railway Company, Shin-Etsu Chemical, Mitsui Mining & Smelting, GUNZE, Nishi-Nippon Railroad, Fuji Oil Company, UACJ Corporation
		Iron price	• 2ii "The Transition Risk-o-Meter Reference Scenarios for Financial Analysis"	Kyushu Railway Company
		Energy intensity	• Japanese government	Shin-Etsu Chemical
		Smart city market size and M2M traffic	• SMART CITY PROJECT "Smart Cities, the world's most important national strategy" • Statista "Smart City Market revenue worldwide 2019 – 2025, by segment"	Shin-Etsu Chemical

※ The parameters surveyed during support program by the Ministry of the Environment are shown regardless of whether they are used by each company.

Parameters referenced in past support cases

Transition risk（4/5）

	Item	Parameter	Source	Reference: FY 2020~2021 supported companies
Transition risk	Changes in important products/ prices	Industrial robot market size in major countries	• Japanese Government and others	Shin-Etsu Chemical
		Sales of sustainable certified product	• Nielsen "Product Insider"	ASKUL Corporation, Nippon Paper Industries
		Purchase intention by ethical consumption	• Dentsu, "Ethical Consumption Awareness Survey 2020" • Deloitte, "Millennial Generation Z Annual Survey 2021"	GUNZE, UACJ Corporation
		Improvement rate of energy consumption intensity （Industrial sector)	• IEA WEO2019	YASKAWA Electric Corporation
		Market size of industrial robots	• IEA WEO2019 • International Federation of Robotics, World Robotics 2019 Industrial Robots	YASKAWA Electric Corporation
		Market size of AC servos for industrial robots	• Fuji Keizai "2020 Featured Mechatronics Parts Market Survey" • IEA WEO2019	YASKAWA Electric Corporation
		Market size of industrial inverters	• Research Station LCC, Global market forecast for inverters • Estimated from IEA WEO2019	YASKAWA Electric Corporation
		Neodymium dysprosium demand forecast	• Sebastiaan Deetman et al "Scenarios for demand growth of metals in electricity generation technologies, cars and electronic appliances"	YASKAWA Electric Corporation
		Server Market Trends	• IEA EV Outlook2021 • IDC Japan "Server Market Trend in Japan in FY2020"	SCSK Corporation
		Migratory Tuna Catch	• Johann D. Bell et al "Pathways to sustaining tuna-dependent Pacific Island economies during climate change"	Maruha Nichiro Corporation
		Bait fish stocks	• Ministry of Agriculture, Forestry and Fisheries "Future Prospects for Adaptation to Climate Change Impacts in FY2008"	Maruha Nichiro Corporation
		Fish size	• Global Change Biology "Sound physiological knowledge and principles in modeling shrinking of fishes under climate change"（August 2017）	Maruha Nichiro Corporation

※ The parameters surveyed during support program by the Ministry of the Environment are shown regardless of whether they are used by each company.

Parameters referenced in past support cases

Transition risk（5/5）

	Item	Parameter	Source	Reference: FY 2020~2021 supported companies
Transition risk	**Changes in customer reputation / behavior**	Changes in the volume of air passenger	• 2ii "The Transition Risk-o-Meter Reference Scenarios for Financial Analysis"	Kyushu Railway Company
		Number of engine-powered vehicles on the road	• IEA ETP2017	Fuji Oil Company
		Increase / decrease in rent due to environmental performance	• Xymax "Economic analysis of environmental management" • Smart Wellness Office Research Committee "Improving the sustainability of environmental real estate and its added value" • Japan Real Estate Institute "Investors' perceptions of real estate ESG investment" • JRE "Economy of ESG Investment" (DBJ FY2019 Seminar "Sustainability and ESG Investment in Real Estate- GRESB evaluation result announcement and real estate ESG Investment outlook-")	ORIX Asset Management Corporation
	Compliance with GHG emission regulations	Energy intensity of buildings	• IEA ETP2017 • MLIT "Energy consumption reduction targets in global warming countermeasure plans based on the Paris Agreement", p.1	ORIX Asset Management Corporation
		Zero emission target of Tokyo	• Tokyo	ORIX Asset Management Corporation
		Emission factor for grid electricity	• IEA WEO2020 • Ministry of Economy, Trade and Industry "Basic Energy Plan" • RITE "Scenario Analysis of Carbon Neutrality in 2050"	ORIX Asset Management Corporation, Fuji Oil Company
		Mandatory introduction of ZEB / ZEH（Government goal）	• IEA ETP2017 • Agency for Natural Resources and Energy General Energy Policy (July 2018) • METI	ORIX Asset Management Corporation

※ The parameters surveyed during support program by the Ministry of the Environment are shown regardless of whether they are used by each company.

Parameters referenced in past support cases

Physical risk（1/3）

	Item	Parameter	Source	Reference: FY 2020~2021 supported companies
Physical risk	Increases in the average temperature	Loss of labor productivity due to heat stress in the industrial sector	• ILO “Working on a warmer planet” (2019)	Mitsui Mining & Smelting, GUNZE, UACJ Corporation
		Increase of hot summer days	• WRI “The Aqueduct Global Flood analyzer” • World Bank “Climate Change Knowledge Portal”	ASKUL Corporation, Mitsui Mining & Smelting, UACJ Corporation
		Increase of temperature	• World Bank “Climate Change Knowledge Portal”	ASKUL Corporation, Kyushu Railway Company
		Relationship between temperature rise and electricity demand	• IEEJ • General Information Processing Center, Mie University "Visualization of Air Conditioning Efficiency by Power Analysis of Server Room"	Kyushu Railway Company, SCSK Corporation
		Relationship between temperature rise and air conditioner sales	• World Bank “Climate Change Knowledge Portal” (Temperature rise) • Ministry of the Environment, Ministry of Education, Culture, Sports, Science and Technology, Ministry of Agriculture, Forestry and Fisheries, Ministry of Land, Infrastructure, Transport and Tourism, Japan Meteorological Agency, "Climate Change Observation, Prediction and Impact Assessment Integrated Report 2018 - Climate Change in Japan and its Impacts"	UACJ Corporation
		Relationship between temperature rise and demand for beverage products	• National Observatory of Athens “The Impact of Climate Change on the Pattern of Demand for Bottled Water and Non-Alcoholic Beverages” (2014)	UACJ Corporation
		Increase in Aluminum Demand by Sector	• CM Group, IAI ”AN ASSESSMENT OF GLOBAL MEGATRENDS AND REGIONAL AND MARKET SECTOR GROWTH OUTLOOK FOR ALUMINIUM DEMAN” (2020)	UACJ Corporation
		Track buckling rate	• ELSEVIER “Impacts of climate change on operation of the US rail network” (2017)	Kyushu Railway Company
		Air conditioning cost	• IEA “The Future of Cooling”	ASKUL Corporation
		Forest fire outbreak situation	• AP-PLAT	ASKUL Corporation
		Forest fire incidence (Vietnam)	• Forest and Grass Fire Risk Assessment for Central Asia under Future Climate Scenarios	Nippon Paper Industries

※ The parameters surveyed during support program by the Ministry of the Environment are shown regardless of whether they are used by each company.

Parameters referenced in past support cases

Physical risk（2/3）

	Item	Parameter	Source	Reference: FY 2020~2021 supported companies
Physical risk	Increases in the average temperature	Forest fire incidence (Brazil)	• Effects of climate and land-use change scenarios on fire probability during the 21st century in the Brazilian Amazon	Nippon Paper Industries
		Forest fire incidence (Japan)	• Forestry Agency, "Recent Mountain Disasters"	Nippon Paper Industries
		Temperature rise: Underwear Sales	• World Bank “Climate Change Knowledge Portal”	GUNZE
		Temperature rise: Cotton Cultivation	• FAO “The future of food and agriculture Alternative pathways to 2050”	GUNZE
		Increase in insect infestation (Japan, Vietnam)	• The Potential Global Distribution of the White Peach Scale Pseudaulacaspis pentagona (Targioni Tozzetti) under Climate Change	Nippon Paper Industries
		Probability of heavy rainfall (Japan)	• Ministry of Education, Culture, Sports, Science and Technology and Japan Meteorological Agency "Climate Change in Japan 2020" (December 2020)	Nippon Paper Industries
		Probability of heavy rainfall (Vietnam)	• Projected changes in summer precipitation over East Asia with a high-resolution atmospheric general circulation model during 21st century	Nippon Paper Industries
		Probability of heavy rainfall (Brazil)	• Assessment of multi-model climate projections of water resources over South America CORDEX domain	Nippon Paper Industries
		Rise in sea water temperature	• IPCC AR6 ”Climate Change 2021 The Physical Science Basis”	Maruha Nichiro Corporation
		Changes in dissolved oxygen in seawater	• IPCC AR6 “Climate Change 2021 The Physical Science Basis”	Maruha Nichiro Corporation
		Ocean acidification	• IPCC AR6 “Climate Change 2021 The Physical Science Basis”	Maruha Nichiro Corporation
	Sea level rise	Sea level rise	• IPCC “Fifth Report”, “1.5°C Special Report”	SCSK, Nippon Paper Industries

※ The parameters surveyed during support program by the Ministry of the Environment are shown regardless of whether they are used by each company.

Physical risk（3/3）

	Item	Parameter	Source	Reference: FY 2020~2021 supported companies
Physical risk	**Increasing extreme weather conditions (typhoons, heavy rains, sediment, storm surges, etc.)**	Flood damage in urban areas	• WRI "The Aqueduct Global Flood Analyzer"	ASKUL Corporation, ORIX Asset Management Corporation, Kyushu Railway Company, Mitsui Mining & Smelting
		Frequency of floods, Flow rate	• Ministry of Land, Infrastructure, Transport and Tourism, "Proposals for Flood Control Plans Based on Climate Change"	ASKUL Corporation, ORIX Asset Management Corporation, Kyushu Railway Company, Mitsui Mining & Smelting, GUNZE, Nishi-Nippon Railroad, Fuji Oil Company, Maruha Nichiro Corporation
		Flood occurrence probability（Japan)	• Ministry of Land, Infrastructure, Transport and Tourism, "Impacts of Climate Change"	SCSK Corporation, Nippon Paper Industries, UACJ Corporation
		Occurrence of typhoons and cyclones	• MOE･JMA and Others 「Climate Change Observation / Forecast and Impact Assessment Integrated Report 2018 -Japan's Climate Change and Its Impact-」	ORIX Asset Management Corporation, Mitsui Mining & Smelting, Maruha Nichiro Corporation
		Number of days per year of torrential rainfall	• Tokyo District Meteorological Observatory Website • World Bank「Climate Change Knowledge Portal」	Nishi-Nippon Railroad
		Average sea level rise	• IPCC "Mitigation Pathways Compatible with 1.5°C in the Context of Sustainable Development" • MOE･JMA "Outline of IPCC Fifth Assessment Report -Working Group 1 Natural Science Basis-" (2014)（p.41)	ORIX Asset Management Corporation, Mitsui Mining & Smelting
		Water risk by base (flood, drought)	• WRI "The Aqueduct Global Flood analyzer" • Technical Study Group on Flood Plans Based on Climate Change "Study on Flood Control Plans Based on Climate Change"	Shin-Etsu Chemical, YASKAWA Electric Corporation, GUNZE, UACJ Corporation
		Sediment disaster occurrence probability	• A-PLAT, Climate Change Adaptation Information Platform	Kyushu Railway Company
		Domestic Disaster Response Product Market Trends	• Yano Research Institute "Research on Disaster Prevention Food Market" (2020)	Nippon Paper Industries

※ The parameters surveyed during support program by the Ministry of the Environment are shown regardless of whether they are used by each company.

IEA World Energy Outlook (WEO) Overview

A report on transition risk published by the IEA

What is the International Energy Agency (IEA)?

- Organization established in 1974 after the first oil crisis to avert oil supply crises (to establish a stable energy supply and demand structure) of the member countries.
- The objective is to promote energy security through collective response by members to the physical disruptions of oil supply.
- Energy-related surveys, statistical compilation, and publication of various reports and books.
- There are 30 members, including Japan.

World Energy Outlook（WEO）

- A report on energy supply and demand published every autumn.
- World Energy Outlook includes medium and long-term energy market forecasts.

Energy Technology Perspectives（ETP）

- Describes the process of energy technology innovation.
- Focusing on opportunities and challenges for expanding and accelerating clean energy technologies.
- Parameters on resources and supply chain are introduced.

Source: IEA, *World Energy Outlook 2024* (October 2024), IEA *Energy Technology Perspective 2024* (October 2024)

IEA WEO2024: Overview

Despite ongoing geopolitical tensions, clean energy adoption accelerates globally. Investment in developing nations is key to meeting climate targets.

WEO2022 Report Overview

- ✓ Energy markets remain unstable, with heightened geopolitical risks. The ongoing tensions in the Middle East and the continued impact of the Ukraine war have exposed vulnerabilities in energy supply networks14.
- ✓ The clean energy transition is accelerating, with rapid expansion of renewable energy expected. By 2030, global renewable energy generation capacity is projected to reach 10,000 GW, and electric vehicles are predicted to achieve a 50% global market share58.
- ✓ However, current policies are projected to result in a 2.4°C temperature rise by 2100, presenting significant challenges to achieving climate goals. Substantial increases in clean energy investments for developing countries are necessary to meet these targets58.
- ✓ In energy markets, we observe slowing growth in oil demand, expansion of LNG export capacity, and a surge in electricity demand. Sustainable energy transition requires international cooperation to improve investment conditions and facilitate technology transfer, with improving electricity access in developing countries being a crucial challenge

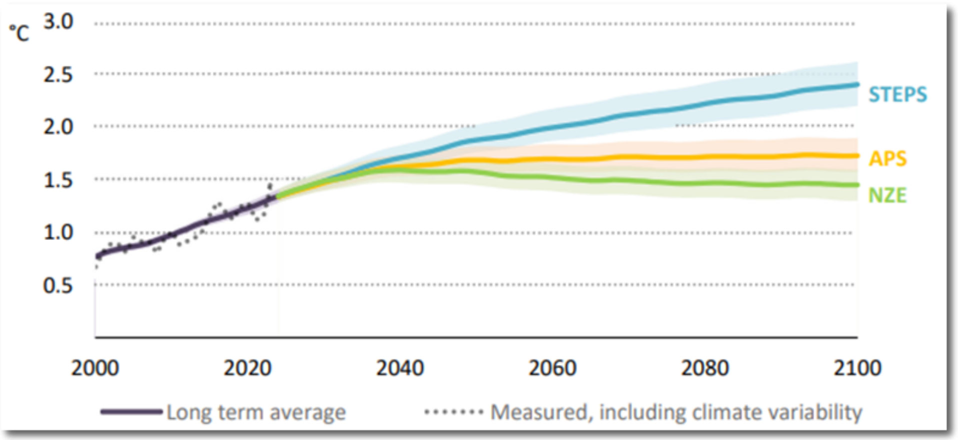
Table of Contents

Source : IEA, *World Energy Outlook 2024* (October 2024)

IEA WEO2024: Types of Scenarios

3 major scenarios were evaluated: NZE, which is a prescriptive scenario calculated backward from a specific results, and APS and STEPS, which are exploratory scenarios designed without targeting specific results

Global temperature rise in each WEO2024 scenario



※The maximum temperature is introduced with a 50% probability

Assumption

- ✓ **Temperature rise in 2100 will be 2.4°C in STEPS, and 1.7°C** in APS
- ✓ **Temperature rise in the NZE scenario peaks below 1.6°C around 2040 and then falls to around 1.5°C in2100**
- ✓ Demand, electricity and fuel conversion are modeled for 26 countries and regions, while the supply side is modeled for all major producers

Types of scenarios

The Stated Policies Scenario (STEPS) — Exploratory

- ✓ "Stated Policies Scenario
- ✓ The temperature rise in 2100 will be 2.4°C
- ✓ Realistically examines the current policy situation and indicates the direction of the energy system in the absence of new policies
- ✓ Based on detailed sector-by-sector review of the policies and measures that are in place or under development in variety of areas. Also assesses relevant regulatory, market, infrastructure and financial constraints. goals

The Announced Pledges Scenario (APS) — Exploratory

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

Net Zero Emissions by 2050 Scenario (NZE) — Prescriptive

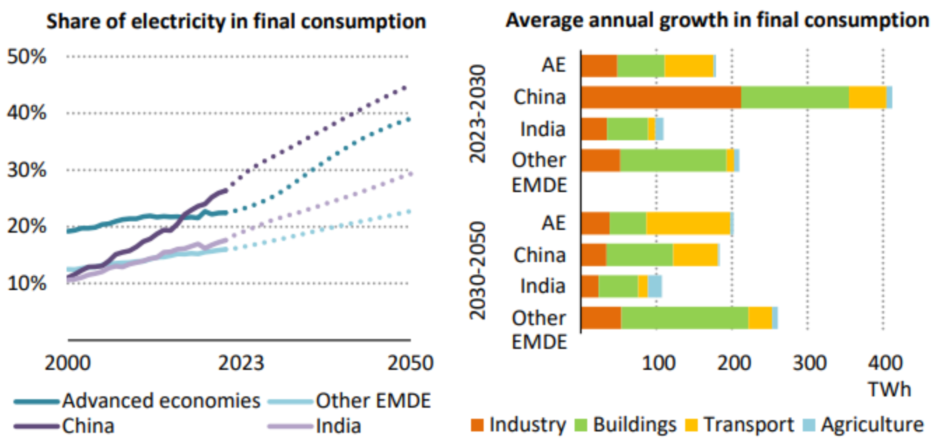
- ✓ "Net zero emission scenario"
- ✓ The temperature rise in 2100 will be 1.5°C
- ✓ With a rapid increase in clean energy policies and investments, leading developed countries will reach net zero faster than others
- ✓ Meet key elements of the UN Sustainable Development Goals for energy: achieving universal access to energy and significantly improving air quality by 2030

Source : IEA, *World Energy Outlook 2024* (October 2024)

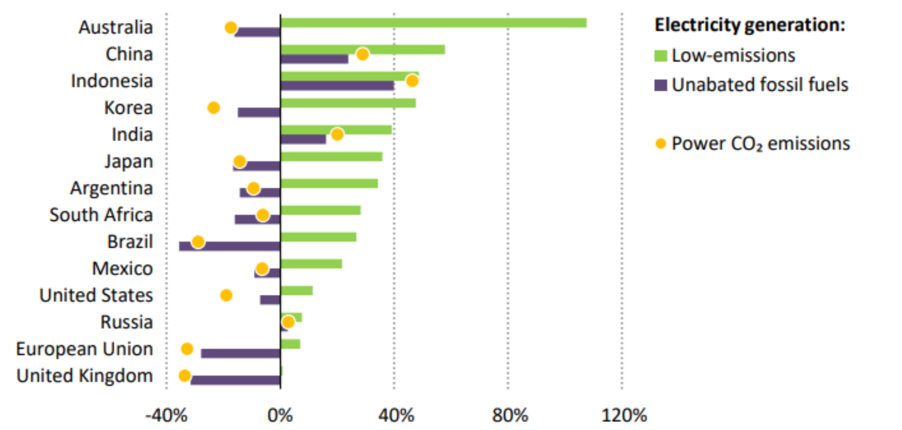
IEA WEO2024: Clean power generation

Global electricity demand is expected to nearly double by 2050, but the growth in clean power generation is not keeping pace with the demand, leading to increased use of coal and natural gas in countries such as China and Indonesia.

Electricity in total final consumption and demand growth in the STEPS to 2050



Change in electricity generation by source and power sector CO2 emissions in selected regions, 2018-2023



*Other EMDE： Developing countries other than China

✓ In the STEPS scenario, global electricity demand is expected to nearly double by 2050, rising from 26,000 TWh in 2023 to 50,000 TWh. The transport sector is projected to see the fastest growth, driven by the increasing share of EVs. Emerging markets and developing countries will account for about 80% of the demand growth by 2030, with China alone contributing over 45%.

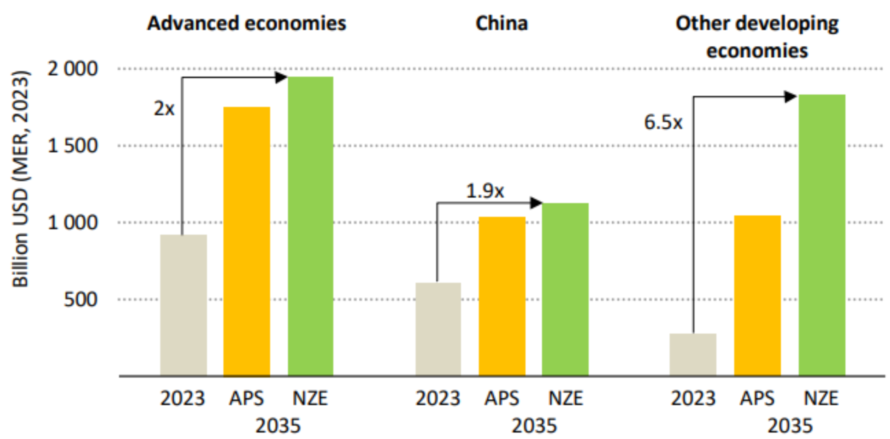
✓ Clean power generation is not keeping pace with demand. In some emerging markets and developing countries, low-emission sources failed to meet demand growth from 2018 to 2023, leading to increased coal and natural gas use. As China's electricity demand far exceeds other countries, the speed of its clean energy transition is crucial.

Source : IEA, *World Energy Outlook 2024* (October 2024) -Figure 1.10 ⊳ Electricity in total final consumption and demand growth in the STEPS to 2050 （P.40）、Figure 1.15 ⊳ Change in electricity generation by source and power sector CO2 emissions in selected regions, 2018-2023 （P.47）

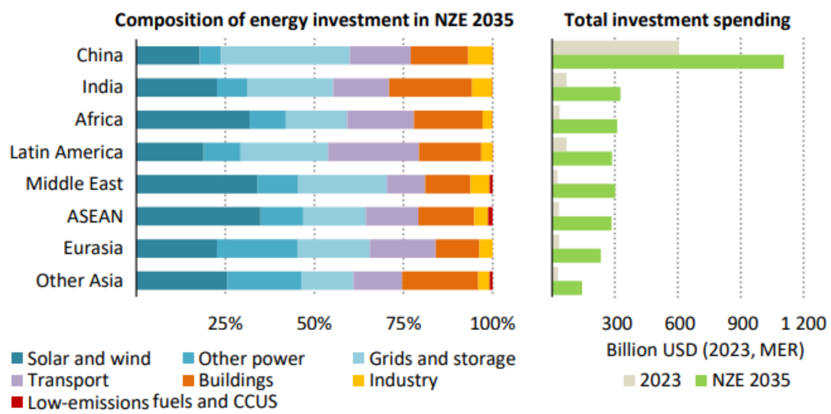
IEA WEO2024: Clean energy investment

Although investments in clean energy are expanding, the NZE scenario requires clean energy investments to double in advanced economies and China and increase more than sixfold in other developing countries by 2035

Clean energy investment by region in the APS and NZE Scenario to 2035



Clean energy spending by type and by selected regions in the NZE Scenario, 2023 and 2035



*Other EMDE： Developing countries other than China

- ✓ The recent increase in clean energy investments has been driven primarily by advanced economies and China, accounting for 85% of the total
- ✓ In contrast, investments from other emerging markets and developing countries, which represent two-thirds of the global population, remain at just 15%

- ✓ In the NZE scenario, clean energy investments must double in advanced economies and China and grow sixfold in other developing countries by 2035
- ✓ To close the investment gap, mobilizing capital, ensuring policy certainty, reliable data, strong governance, and expanding concessional international funding are essential

Source : IEA, *World Energy Outlook 2024* (October 2024) –Figure 1.26 ▹ Clean energy investment by region in the APS and NZE Scenario to 2035（P.62）、Figure 1.27 ▹ Clean energy spending by type and by selected regions in the NZE Scenario, 2023 and 2035 （P.63）

Comparison with WEO2023: Carbon price for each scenario

While IEA's calculated carbon prices by country show no major revisions from last year, 2035 values have been newly added

Unit: USD/t-CO2

IEA report	WEO2023			WEO2024			
Carbon prices	**2030**	**2040**	**2050**	**2030**	**2035**	**2040**	**2050**
Stated Policies Scenario (STEPS)							
Canada	130	150	155	126	126	126	126
Chile, Colombia	13	21	29	21	24	28	28
China	28	43	53	39	43	46	52
EU	120	129	135	140	145	149	158
South Korea	42	67	89	60	65	73	89
Announced Pledges Scenario (APS)							
Developed countries (countries with Net Zero pledges including OECD countries, except for Mexico)	135	175	200	135	160	175	200
Emerging market and developing economies with net zero emissions pledges (includes China, India, Indonesia, Brazil and South Africa)	40	110	160	40	65	110	160
Other emerging market countries and developing countries	-	17	47	-	6	17	47
Net Zero Emissions by 2050 Scenario (NZE)							
Developed countries (countries with Net Zero pledges)	140	205	250	140	180	205	250
Emerging market countries and developing countries (countries with Net Zero pledges, including China, India, Indonesia, Brazil, and South Africa)	90	160	200	90	125	160	200
Selected emerging market and developing economies (without net zero emissions pledges)	25	85	180	25	50	85	180
Other emerging market countries and developing countries	15	35	55	15	25	35	55

[Scenario types]

- Stated Policies Scenario (STEPS): A scenario for cases where policy takers do not make major changes to the country's course, which is not based on the premise that all targets announced by the governments of each country will be met
- Announced Pledges Scenario (APS): A scenario that assumes that all climate change-related pledges by governments around the world will be met completely and on time
- Net Zero Emissions by 2050 Scenario (NZE): A scenario for global achievement of net zero emissions by 2050

Source : IEA, *World Energy Outlook 2023* (October 2023) - Table B.2 CO2 prices for electricity, industry and energy production in selected regions by scenario（P.297）, IEA, *World Energy Outlook 2024* (October 2024) - Table B.2 CO2 prices for electricity, industry and energy production in selected regions by scenario（P.329）

Comparison with WEO2023: Fuel prices for each scenario (1/2)

While IEA's calculated oil, natural gas, and coal prices by country show no major changes from last year, 2040 values have been newly added

Unit (Oil price) : USD/barrel
Unit (Natural gas price) : USD/MBtu

IEA report	WEO2023		WEO2024		
Oil prices	**2030**	**2050**	**2030**	**2040**	**2050**
Stated Policies Scenario (STEPS)	85	83	79	77	75
Announced Pledges Scenario (APS)	74	60	72	63	58
Net Zero Emissions by 2050 Scenario (NZE)	42	25	42	30	25

Natural gas prices					
Stated Policies Scenario (STEPS)					
US	4.0	4.3	3.9	4.1	4.2
EU	6.9	7.1	6.5	7.6	7.7
China	8.4	7.7	7.2	8.2	8.3
Japan	9.4	7.8	8.3	8.8	8.7
Announced Pledges Scenario (APS)					
US	3.2	2.2	3.2	3.0	2.9
EU	6.5	5.4	6.0	5.2	5.2
China	7.8	6.3	6.9	6.2	6.2
Japan	8.3	7.4	6.8	6.1	6.2
Net Zero Emissions by 2050 Scenario (NZE)					
US	2.4	2.0	2.1	2.0	2.0
EU	4.3	4.1	4.4	4.1	4.0
China	5.9	5.3	5.0	4.8	4.8
Japan	5.5	5.3	5.0	4.8	4.8

Source :IEA, *World Energy Outlook 2023* (October 2023) - Table 2.2 Fossil fuel prices by scenario（P.96）, IEA, *World Energy Outlook 2024* (October 2024) - Table 2.3 Wholesale fossil fuel prices by scenario（P.90）

Comparison with WEO2023: Fuel prices for each scenario (2/2)

While IEA's calculated oil, natural gas, and coal prices by country show no major changes from last year, 2040 values have been newly added

Unit: USD/tonne

IEA report	WEO2023		WEO2024		
Coal prices	**2030**	**2050**	**2030**		**2050**
Stated Policies Scenario (STEPS)					
US	46	41	51	42	40
EU	67	69	68	69	64
China	98	77	105	86	82
Japan	96	80	101	88	82
Announced Pledges Scenario (APS)					
US	43	26	42	31	27
EU	68	53	64	51	48
China	80	59	81	66	61
Japan	79	62	78	67	61
Net Zero Emissions by 2050 Scenario (NZE)					
US	27	23	28	23	23
EU	57	43	57	43	39
China	65	47	66	53	49
Japan	64	49	64	54	49

Source :IEA, *World Energy Outlook 2023* (October 2023) - Table 2.2 Fossil fuel prices by scenario（P.96）, IEA, *World Energy Outlook 2024* (October 2024) - Table 2.3 Wholesale fossil fuel prices by scenario（P.90）

IEA WEO2024 Parameter List

Chapter 1 (1/3)

-Legend- Items with extracted parameters

Chapter	Specific Data	Time Horizon						Country/Region			Data Type	Page Number
		Single year	Several year	Past	’30	’40	’50	World	Particular country/ region	Japan	Free/ Charged	
Ch.1	Global energy mix by scenario to 2050		○	○			○	○	○		Charged	Figure 1.1 (p.24)
	Total final consumption per capita and per unit of GDP by scenario, 2000-2050		○	○			○		○		Charged	Figure 1.2 (p.25)
	Total final consumption by energy source in selected sectors by scenario, 2023 and 2050		○	○			○	○			Charged	Figure 1.3 (p.27)
	CO2 emissions and GDP per capita in selected countries/regions in the STEPS and APS		○	○		○	○	○	○		Charged	Figure 1.4 (p.28)
	Natural gas and crude oil imports to Asia and Europe in the STEPS and APS		○	○			○		○		Charged	Figure1.5 (p.30)
	Oil and natural gas price by scenario, 2010-2050		○	○			○		○		Charged	Figure 1.6 (p.31)
	Share of top-three suppliers of selected critical minerals and clean technologies based on announced projects, 2023 and 2030		○	○	○				○		Charged	Figure 1.7 (p.33)
	Selected support policies for electric vehicles		○	○	○	○	○		○	○	Charged	Table 1.1 (p.35)
	Global electric light-duty vehicle sales in the STEPS compared with other EV outlooks, 2023-2050		○	○	○		○	○			Charged	Figure 1.8 (p.36)
	Oil demand in road transport in the STEPS and savings from EVs, 2010-2035		○		○			○			Charged	Figure 1.9 (p.38)
	Electricity in total final consumption and demand growth in the STEPS to 2050		○	○			○		○		Charged	Figure 1.10 (p.40)
	Electricity demand growth by sector in the STEPS and selected buildings sector sensitivity analysis, 2023-2035		○	○					○		Charged	Figure 1.11 (p.41)

Source : IEA, *World Energy Outlook 2024* (October 2024)

IEA WEO2024 Parameter List

Chapter 1 (2/3)

-Legend- Items with extracted parameters

Chapter	Specific Data	Time Horizon						Country/Region			Data Type	Page Number
		Single year	Several year	Past	’30	’40	’50	World	Particular country/ region	Japan	Free/ Charged	
Ch.1	Electricity demand growth from selected clean energy technologies by region and scenario, 2023-2035		○	○					○		Charged	Figure 1.12 (p.43)
	Peak electricity demand by driver and region in the STEPS, 2023-2035		○	○					○		Charged	Figure 1.13 (p.44)
	Global installed clean power capacity and electricity generation, 2010-2023		○					○			Charged	Figure 1.14 (p.46)
	Change in electricity generation by source and power sector CO2 emissions in selected regions, 2018-2023		○	○					○	○	Charged	Figure 1.15 (p.47)
	Electricity generation by source in advanced economies and EMDE in the STEPS, 2023-2030		○	○	○				○		Charged	Figure1.16 (p.48)
	Global clean power generation increase by source in the STEPS and NZE Scenario, 2023-2035		○	○				○			Charged	Figure 1.17 (p.49)
	LNG export capacity additions by country to 2030		○	○	○				○		Charged	Figure 1.18 (p.51)
	LNG demand by region and scenario relative to existing and under construction export capacity, 2023-2050		○	○	○	○	○		○	○	Charged	Figure 1.19 (p.52)
	Factors that could lead to continued natural gas demand growth above the levels of the STEPS to 2040		○	○	○	○		○			Charged	Figure 1.20 (p.54)
	Population without access to modern energy 2000-2023 and in the STEPS to 2030		○	○	○				○		Charged	Figure 1.21 (p.55)
	Population without electricity access in 2023, and historical best versus progress in the NZE Scenario by country/region, 2024-2030		○	○	○				○		Charged	Figure 1.22 (p.57)
	Population without clean cooking access in 2023, and historical best versus progress in the NZE Scenario by country/region, 2024-2030		○	○	○				○		Charged	Figure 1.23 (p.58)

Source : IEA, *World Energy Outlook 2024* (October 2024)

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Chapter 1 (3/3), Chapter 2 (1/2)

-Legend- Items with extracted parameters

Chapter	Specific Data	Time Horizon						Country/Region			Data Type	Page Number
		Single year	Several year	Past	'30	'40	'50	World	Particular country/ region	Japan	Free/ Charged	
Ch.1	Average annual capital investment for energy access by scenario, and private capital in energy access projects, 2013-2019		○	○	○				○		Charged	Figure 1.24 (p.60)
Ch.1	Estimated energy investment by type in selected regions, 2024	○		○					○		Charged	Figure 1.25 (p.62)
Ch.1	Clean energy investment by region in the APS and NZE Scenario to 2035		○	○					○		Charged	Figure 1.26 (p.62)
Ch.1	Clean energy spending by type and by selected regions in the NZE Scenario, 2023 and 2035		○	○					○		Charged	Figure 1.27 (p.63)
Ch.1	Selected health, environment and employment indicators in emerging market and developing economies, 2023-2030		○	○	○				○		Charged	Figure 1.28 (p.64)
Ch.2	Global total energy supply, 2010-2023		○	○				○			Charged	Figure 2.1 (p.70)
Ch.2	Energy-related CO2 emissions and global average temperature rise above pre-industrial levels, 1950-2023		○	○				○			Charged	Figure 2.2 (p.72)
Ch.2	Inflation drivers in the Eurozone and United States, 2019-2024		○	○					○		Charged	Figure 2.3 (p.73)
Ch.2	Global population, GDP and clean energy investment, 2023		○	○				○			Charged	Figure 2.4 (p.75)
Ch.2	Share of world energy demand voting in national or regional elections, 2024	○		○				○	○		Charged	Figure 2.5 (p.76)
Ch.2	Oil import share from the Middle East in selected markets		○	○					○		Charged	Figure 2.6 (p.77)
Ch.2	Share of clean energy technology supply chains, 2023	○	○						○		Charged	Figure 2.7 (p.77)

Source : IEA, *World Energy Outlook 2024* (October 2024)

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Chapter 2 (2/2)

-Legend- Items with extracted parameters

Chapter	Specific Data	Time Horizon						Country/Region			Data Type	Page Number
		Single year	Several year	Past	'30	'40	'50	World	Particular country/ region	Japan	Free/ Charged	
Ch.2	Global energy-related CO2 emissions covered by policy changes, 2022 and 2023		○	○				○			Charged	Figure 2.8 (p.81)
	Government support announced for clean energy and energy affordability by budget allocation year, 2020 to first-half 2024		○	○	○			○			Charged	Figure 2.9 (p.82)
	Global direct government incentives for domestic manufacturing as part of clean energy support, 2020-2024		○	○				○			Charged	Figure 2.10 (p.83)
	Domestic direct manufacturing incentive schemes in selected governments enacted since 2020		○	○					○	○	Charged	Table 2.1 (p.84)
	Lifetime capital and operating costs of consumer equipment purchased in selected countries, 2023	○		○					○		Charged	Figure 2.11 (p.86)
	GDP average growth assumptions by region		○	○			○		○	○	Charged	Table 2.2 (p.88)
	Projected change of population in urban and rural areas by region, 2023 to 2050		○	○			○		○		Charged	Figure 2.12 (p.88)
	Fertility rates by country and region, 2023	○		○					○	○	Charged	Figure 2.13 (p.89)
	Wholesale fossil fuel prices by scenario		○	○	○	○	○		○	○	Charged	Table 2.3 (p.90)
	Average natural gas, gasoline and electricity wholesale and retail prices in selected regions, 2022	○		○					○		Charged	Figure 2.14 (p.93)
	IEA indices for clean energy and upstream oil and gas, and global average price of selected clean energy technologies		○	○				○			Charged	Figure2.15 (p.94)
	Global average lithium-ion battery pack price and share of cathode raw material cost, 2013-2023		○	○				○			Charged	Figure2.16 (p.95)

Source : IEA, *World Energy Outlook 2024* (October 2024)

IEA WEO2024 Parameter List

Chapter 3 (1/5)

-Legend- Items with extracted parameters

Chapter	Specific Data	Time Horizon						Country/Region			Data Type	Page Number
		Single year	Several year	Past	’30	’40	’50	World	Particular country/ region	Japan	Free/ Charged	
Ch.3	Global total energy supply by source and fossil fuel share by scenario, 2000-2050		○	○			○	○			Charged	Figure3.1 (p.100)
	Global annual energy intensity improvements, 2000-2030, and cumulative energy savings by lever and scenario, 2023-2030		○	○	○			○			Charged	Figure3.2 (p.102)
	Global installed capacity of renewables, 2010-2030, and emissions reductions by scenario, 2023-2030		○	○	○			○			Charged	Figure3.3 (p.103)
	Total energy-related CO2 emissions and from coal use in the Stated Policies Scenario, 1990-2030		○	○	○			○			Charged	Figure 3.4 (p.105)
	Total final consumption by end-use sector and scenario, 2023, 2030 and 2050		○	○	○		○	○	○		Charged	Figure 3.5 (p.106)
	CO2 emissions and emissions intensity by end-use sector and scenario, 2023, 2030 and 2050		○	○	○		○	○			Charged	Figure3.6 (p.107)
	Total final consumption by fuel and scenario, 2023-2050		○	○			○	○			Charged	Figure 3.7 (p.108)
	Share of electricity in total final consumption by end-use sector and scenario, 2010-2050		○	○			○	○			Charged	Figure 3.8 (p.109)
	Energy demand in transport by fuel and scenario, 2023-2050		○	○	○		○	○			Charged	Figure 3.9 (p.110)
	Low-emissions fuels in transport by type in the Stated Policies and Announced Pledges scenarios, 2010-2050		○	○			○	○			Charged	Figure 3.10 (p.111)
	E-bike sales and displaced oil demand, 2015-2023		○	○				○	○		Charged	Figure 3.11 (p.113)
	Energy demand in buildings by fuel and scenario, 2023-2050		○	○	○			○			Charged	Figure 3.12 (p.114)

Source : IEA, *World Energy Outlook 2024* (October 2024)

IEA WEO2024 Parameter List

Chapter 3 (2/5)

-Legend- tems with extracted parameters

Chapter	Specific Data	Time Horizon						Country/Region			Data Type	Page Number
		Single year	Several year	Past	’30	’40	’50	World	Particular country/ region	Japan	Free/ Charged	
Ch.3	Energy demand in buildings by end-use and scenario, and equipment ownership rates, 2023-2050		○	○	○	○	○		○		Charged	Figure 3.13 (p.115)
	Residential cooling demand in emerging market and developing economies by driver and scenario, 2023-2050		○	○			○		○		Charged	Figure 3.14 (p.117)
	Energy demand in industry by fuel and scenario, 2023-2050		○	○	○		○	○			Charged	Figure 3.15 (p.118)
	Energy demand by temperature level and fossil fuel use in industry by type and scenario, 2010-2050		○	○	○	○	○	○			Charged	Figure 3.16 (p.119)
	Chemicals oil demand and plastic recycling by region and scenario, 2023-2050		○				○		○		Charged	Figure 3.17 (p.120)
	Electricity demand by country/region and scenario, 2023, 2030 and 2050		○	○	○		○		○		Charged	Figure 3.18 (p.122)
	Electricity demand growth by application and scenario, 2023-2035		○	○					○		Charged	Figure 3.19 (p.123)
	Daily average electricity demand by end-use in European Union and India in the STEPS, 2023 and 2050		○		○		○		○		Charged	Figure 3.20 (p.125)
	Global electricity generation by source and scenario, 1990-2050		○	○			○	○			Charged	Figure 3.21 (p.126)
	Share of global coal electricity generation with phase-out commitments in 2023, and renewables targets in selected countries/regions		○	○	○				○	○	Charged	Figure 3.22 (p.127)
	Change in electricity generation by source and country/region in the STEPS and APS, 2023-2035		○	○					○		Charged	Figure 3.23 (p.128)
	Share of renewables in electricity generation by country/region and scenario, 2015-2035		○	○					○		Charged	Figure 3.24 (p.129)

Source : IEA, *World Energy Outlook 2024* (October 2024)

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Chapter 3 (3/5)

-Legend- Items with extracted parameters

Chapter	Specific Data	Time Horizon						Country/Region			Data Type	Page Number
		Single year	Several year	Past	'30	'40	'50	World	Particular country/ region	Japan	Free/ Charged	
Ch.3	Change in coal-fired power generation by country/region in the Stated Policies and Announced Pledges scenarios, 2023-2035		○	○	○				○		Charged	Figure 3.25 (p.130)
	Global power sector CO2 emissions and CO2 intensity of electricity generation by region and scenario, 2010-2050		○	○	○	○	○	○			Charged	Figure 3.26 (p.132)
	Power sector investment by technology and scenario, and share in emerging market and developing economies, 2019-2035		○	○	○				○		Charged	Figure 3.27 (p.133)
	Global average electricity grid replacements and extensions by type, region and scenario, 2019-2030		○	○	○				○		Charged	Figure 3.28 (p.135)
	Average annual investment in fuel supply by type and scenario, 2013-2050		○	○	○	○	○	○			Charged	Figure 3.29 (p.136)
	Global liquids demand and supply by scenario (mb/d)		○	○	○		○	○			Charged	Table 3.1 (p.137)
	Oil demand by region, sector and scenario, 2000-2050		○	○			○		○		Charged	Figure 3.30 (p.138)
	Oil demand by selected sectors and by country/region in the Stated Policies and Announced Pledges scenarios, 2023-2035		○	○					○		Charged	Figure 3.31 (p.139)
	Oil demand and global oil feedstock demand by country/region in the Stated Policies Scenario, 2010-2035		○	○	○	○	○		○		Charged	Figure 3.32 (p.140)
	Average annual change in oil production by region in the Stated Policies and Announced Pledges scenarios, 2013-2050		○	○	○	○	○		○		Charged	Figure 3.33 (p.141)
	Demand for selected oil products by scenario, 2020-2050		○	○			○		○		Charged	Figure 3.34 (p.142)
	Global gas demand, production and trade by scenario		○	○	○		○	○			Charged	Table 3.2 (p.144)

Source : IEA, *World Energy Outlook 2024* (October 2024)

Chapter 3 (4/5)

-Legend- Items with extracted parameters

Chapter	Specific Data	Time Horizon						Country/Region			Data Type	Page Number
		Single year	Several year	Past	'30	'40	'50	World	Particular country/ region	Japan	Free/ Charged	
Ch.3	Natural gas demand by sector and scenario, 2000-2050		○	○	○		○	○			Charged	Figure 3.35 (p.145)
	Change in average annual natural gas demand by selected region and scenario, 2013-2050		○	○	○		○		○	○	Charged	Figure 3.36 (p.146)
	Average annual change in natural gas production by region and scenario, 2013-2050		○	○			○		○		Charged	Figure 3.37 (p.147)
	Change in long-distance natural gas trade by region and scenario, 2023-2035		○	○					○	○	Charged	Figure 3.38 (p.148)
	Global coal demand, production and trade by scenario (Mtce)		○	○			○	○			Charged	Table 3.3 (p.149)
	Change in coal production by county/region and scenario, 2023-2050		○	○			○		○		Charged	Figure 3.39 (p.151)
	Investment in coal supply and coal-fired generation, 2010-2050		○	○			○	○			Charged	Figure 3.40 (p.152)
	Modern bioenergy demand by type and scenario, 2023-2050		○	○			○	○			Charged	Figure 3.41 (p.153)
	Clean energy technology contribution to energy combustion CO2 emissions reduction in the APS, 2023-2050		○	○	○		○	○			Charged	Figure 3.42 (p.155)
	Solar PV capacity by scenario, 2010-2035		○	○	○			○			Charged	Figure 3.43 (p.156)
	Wind power capacity by scenario, 2010-2035		○	○	○			○			Charged	Figure 3.44 (p.157)
	Annual average nuclear power capacity additions by scenario, 2010-2035		○	○	○			○			Charged	Figure 3.45 (p.158)

Source : IEA, *World Energy Outlook 2024* (October 2024)

IEA WEO2024 Parameter List

Chapter 3 (5/5), Chapter 4 (1/2)

-Legend- tems with extracted parameters

Chapter	Specific Data	Time Horizon						Country/Region			Data Type	Page Number
		Single year	Several year	Past	’30	’40	’50	World	Particular country/ region	Japan	Free/ Charged	
Ch.3	Global market share of zero-emissions vehicles by type and scenario, and share in stock, 2023-2035	○						○			Charged	Figure 3.46 (p.159)
	Global heat pump sales and stock by scenario, 2020-2035		○	○				○			Charged	Figure 3.47 (p.161)
	Global hydrogen production by technology and scenario, 2023-2050		○	○			○	○			Charged	Figure 3.48 (p.162)
	Global annual CO2 emissions captured by sector and scenario, 2023-2050		○	○			○	○			Charged	Figure 3.49 (p.164)
	Overview of sensitivity cases								○		Charged	Table 4.1 (p.170)
	Demand changes by fuel for selected sensitivity cases							○			Charged	Figure 4.1 (p.171)
	Energy-related CO2 emissions in the STEPS and collectively for the sensitivity cases, 2015-2035		○	○	○			○			Charged	Figure 4.2 (p.172)
	Global oil demand in the STEPS and key sensitivities, 2015-2035		○	○	○			○			Charged	Figure 4.3 (p.173)
	Variations in oil demand related to rate of EV uptake in selected regions relative to the STEPS, 2023-2035		○	○					○		Charged	Figure 4.4 (p.175)
	Global electric car sales and their market share by sensitivity case and in the STEPS, 2030 and 2035		○	○	○			○			Charged	Figure 4.5 (p.176)
	Global natural gas demand in the STEPS and key sensitivities, 2015-2035		○	○	○				○		Charged	Figure 4.6 (p.179)
	LNG trade by scenario relative to existing and under construction export capacity to 2050		○	○	○	○	○	○			Charged	Figure 4.7 (p.180)

Source : IEA, *World Energy Outlook 2024* (October 2024)

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Chapter 4 (2/2), Chapter 5 (1/4)

-Legend- tems with extracted parameters

Chapter	Specific Data	Time Horizon						Country/Region			Data Type	Page Number
		Single year	Several year	Past	'30	'40	'50	World	Particular country/ region	Japan	Free/ Charged	
Ch.4	Additional natural gas demand potential from sensitivity cases based on the STEPS, 2030	○			○				○		Charged	Figure 4.8 (p.182)
	Wind power capacity expansion in the STEPS and delayed wind deployment case, 2023-2035		○	○	○				○		Charged	Figure 4.9 (p.183)
	Global electricity demand in the STEPS and key sensitivities, 2015-203		○	○	○				○		Charged	Figure 4.10 (p.185)
	Electricity demand growth by end-use in the STEPS, 2023-2030, and data centre sensitivity cases		○	○	○				○		Charged	Figure 4.11 (p.187)
	Spatial concentration of selected types of facilities, United States								○		Charged	Figure 4.12 (p.189)
	Cooling demand in the buildings sector due to variations in heat waves relative to growth in the STEPS, 2023-2035		○	○					○		Charged	Figure 4.13 (p.190)
	Sensitivity cases on appliance efficiencies in EMDE electricity demand relative to the growth in the STEPS, 2023-2035		○	○					○		Charged	Figure 4.14 (p.192)
	Increase in global electricity supply to meet the high cases by energy source, 2024-2035		○	○	○			○			Charged	Figure 4.15 (p. 193)
Ch.5	OPEC market share and LNG utilisation by scenario		○	○				○			Charged	Figure5.1 (p. 199)
	Annual investment in fossil fuels and clean energy by scenario, 2021-2035		○	○	○			○			Charged	Figure 5.2 (p. 201)
	Involvement of top-seven EV and battery makers in the critical minerals supply chain		○	○			○		○	○	Charged	Figure 5.3 (p.202)
	Asian crude oil imports through chokepoints and oil trade volume via major chokepoints in the STEPS		○	○			○		○	○	Charged	Figure 5.4 (p.203)

Source : IEA, *World Energy Outlook 2024* (October 2024)

IEA WEO2024 Parameter List

Chapter 5 (2/4)

-Legend- Items with extracted parameters

Chapter	Specific Data	Time Horizon						Country/Region			Data Type	Page Number
		Single year	Several year	Past	'30	'40	'50	World	Particular country/ region	Japan	Free/ Charged	
Ch.5	Temperature and precipitation change relative to pre-industrial level in the Middle East in the STEPS, 2041-2060		○						○		Charged	Figure 5.5 (p.205)
	Global hydrogen transmission pipeline length and underground storage capacity in the NZE Scenario, 2020-2035		○	○	○			○			Charged	Figure 5.6 (p.206)
	Peak electricity demand by sector and driver in the STEPS, 2023-2035		○	○					○		Charged	Figure 5.7 (p.207)
	Dispatchable capacity additions by type in the STEPS and APS, 2023-2035		○	○					○		Charged	Figure 5.8 (p.209)
	Power system flexibility needs in selected regions and global flexibility supply in the STEPS and APS		○	○			○		○		Charged	Figure 5.9 (p.210)
	Duration curve of hourly capacity factors of natural gas plants in Europe and coal plants in India in the STEPS, 2023, 2035 and 2050		○	○			○		○		Charged	Figure 5.10 (p.211)
	Demand flexibility potential and activation in the STEPS, 2050	○							○		Charged	Figure 5.11 (p.212)
	Current and announced battery cell and component manufacturing capacity, 2023 and 2030		○	○	○				○		Charged	Figure 5.12 (p.214)
	Estimated capital costs for clean technology manufacturing facilities in selected countries, 2023	○		○					○		Charged	Figure 5.13 (p.215)
	Primary supply requirements for critical minerals and expected supply from existing and announced projects by scenario, 2035	○						○			Charged	Table 5.14 (p.216)
	Lead producing country in new refined capacity growth for selected minerals, 2023-2035		○	○				○			Charged	Figure 5.15 (p.217)
	Annual household expenditure on residential energy and transport fuels by income decile, average for 2019-2023		○	○	○	○	○		○		Charged	Figure 5.16 (p.219)

Source : IEA, *World Energy Outlook 2024* (October 2024)

IEA WEO2024 Parameter List

Chapter 5 (3/4)

-Legend- Items with extracted parameters

Chapter	Specific Data	Time Horizon						Country/Region			Data Type	Page Number
		Single year	Several year	Past	’30	’40	’50	World	Particular country/ region	Japan	Free/ Charged	
Ch.5	Average annual household energy expenditure by economic grouping and scenario, 2018-2050		○	○			○		○		Charged	Figure 5.17 (p.220)
	Annual household energy bills and key clean technology payback periods by urban and rural areas, 2023		○	○					○		Charged	Figure 5.18 (p.221)
	Clean energy job increases and significance in economy-wide job growth by economic grouping, 2023	○		○					○	○	Charged	Figure 5.19 (p.223)
	Energy employment by technology and scenario, 2023 and 2030		○	○	○			○			Charged	Figure 5.20 (p.224)
	Global population without access to electricity and clean cooking and status of access policies, 2023	○		○				○			Charged	Figure 5.21 (p.226)
	Population without access to electricity and clean cooking by region and scenario, 2018-2030		○	○	○				○		Charged	Figure 5.22 (p.227)
	CO2 emissions reductions from behavioural change by measure and scenario, 2035	○									Charged	Figure 5.23 (p.229)
	Passenger transport by mode in selected cities,1985-2023		○	○					○		Charged	Figure 5.24 (p.230)
	Energy-related CO2 emissions in advanced and emerging market and developing economies by scenario, 2020-2050		○	○			○		○		Charged	Figure 5.25 (p.231)
	Global average temperature rise including natural variability since 2000 and long-term average temperature rise by scenario		○	○	○	○		○			Charged	Figure 5.26 (p.232)
	Annual costs of climate impacts to hydropower capacity and increased cooling demand		○	○				○			Charged	Figure 5.27 (p.234)
	Methane emissions from fossil fuel operations and related intensities by scenario, 2023-2050		○	○			○	○			Charged	Figure 5.28 (p.235)

Source : IEA, *World Energy Outlook 2024* (October 2024)

IEA WEO2024 Parameter List

Chapter 5 (4/4), Chapter 6 (1/2)

-Legend- Items with extracted parameters

Chapter	Specific Data	Time Horizon						Country/Region			Data Type	Page Number
		Single year	Several year	Past	'30	'40	'50	World	Particular country/ region	Japan	Free/ Charged	
Ch.5	Methane emissions from fossil fuel consumption in selected countries/regions, 2023	○		○					○	○	Charged	Figure 5.29 (p.236)
	Change in PM2.5 emissions by sector and premature deaths from ambient and household air pollution by scenario, 2023-2050		○	○			○	○			Charged	Figure 5.30 (p.237)
	Annual energy sector investment by sector and scenario, 2024 and 2035		○	○				○			Charged	Figure 5.31 (p.239)
	Annual energy sector investment in selected emerging market and developing economies by scenario, 2023 and 2035	○	○						○		Charged	Figure 5.32 (p.240)
	Power sector investment by type and scenario, 2023-2050		○	○			○	○			Charged	Figure 5.33 (p.241)
	Characteristics of energy sector financing in the APS and NZE Scenario, 2023 and 2035	○	○	○					○		Charged	Figure 5.34 (p.242)
Ch.6	Key economic and energy indicators by country/region, 2023	○		○					○	○	Charged	Table 6.1 (p.247)
	Electricity demand growth and changes in electricity generation in the United States in the STEPS, 2023-2035	○	○	○	○				○		Charged	Figure 6.1 (p.251)
	Liquid biofuels and low-emissions hydrogen production in Latin America and the Caribbean in the STEPS and APS, 2023-2050		○	○			○	○	○		Charged	Figure 6.2 (p.254)
	Modern biomass by source in Latin America and the Caribbean in the STEPS and APS, 2023-2050		○	○			○		○		Charged	Figure 6.3 (p.255)
	Total electricity system costs by component, region and scenario, 2019-2035		○	○	○		○		○		Charged	Figure 6.4 (p.258)
	Production of selected minerals in Africa in the STEPS, 2023 and 2030		○	○	○				○		Charged	Figure 6.5 (p.262)
	Financing clean cooking projects, 2019-2022		○	○					○		Charged	Figure 6.6 (p.263)

Source : IEA, *World Energy Outlook 2024* (October 2024)

IEA WEO2024 Parameter List

Chapter 2 (2/2), Annex (1/6)

-Legend- Items with extracted parameters

Chapter	Specific Data	Time Horizon						Country/Region			Data Type	Page Number
		Single year	Several year	Past	’30	’40	’50	World	Particular country/ region	Japan	Free/ Charged	
Ch.6	Energy investment, electricity generation and methane emissions in the Middle East in the STEPS and APS, 2023 and 2035		○	○					○		Charged	Figure 6.7 (p.267)
Ch.6	Natural gas demand savings from energy efficiency improvements in the Caspian and share of total exports in the APS, 2030 and 2035		○	○	○				○		Charged	Figure 6.8 (p.271)
Ch.6	GDP and electricity demand growth in China, 2015-2023, and electricity demand growth by sector, 2019-2023		○	○					○		Charged	Figure 6.9 (p.274)
Ch.6	Per capita electricity consumption by sector and region in the STEPS, 2030	○			○				○		Charged	Figure 6.10 (p.275)
Ch.6	EV sales, oil demand and emissions from passenger road transport in India in the STEPS and APS, 2023-2035		○	○					○		Charged	Figure 6.11 (p.279)
Ch.6	Electricity generation by fuel in Japan and Korea in the STEPS and APS, 2023-2050		○	○			○		○	○	Charged	Figure 6.12 (p.282)
Ch.6	Installed solar PV capacity per non-forested land area in selected countries, 2023	○		○					○	○	Charged	Figure 6.13 (p.283)
Ch.6	Installed coal-fired generation capacity and average capacity factor in Southeast Asia in the STEPS and APS, 2023-2050		○	○			○		○		Charged	Table 6.14 (p.287)
Ch.6	Average annual change in coal-fired power plant emissions by technology type in Southeast Asia in the STEPS and APS, 2023-35		○	○					○		Charged	Figure 6.15 (p.287)
Annex	World energy supply	○							○		Free	Table A.1a (p.296)
Annex	World final energy consumption		○	○	○	○	○	○			Free	Table A.2a. (p.297-298)
Annex	World electricity sector		○	○	○	○	○	○			Free	Table A.3a (p.299)

Source : IEA, *World Energy Outlook 2024* (October 2024)

IEA WEO2024 Parameter List

Annex (2/6)

-Legend- Items with extracted parameters

Chapter	Specific Data	Time Horizon						Country/Region			Data Type	Page Number
		Single year	Several year	Past	'30	'40	'50	World	Particular country/ region	Japan	Free/ Charged	
Annex	World CO2 emissions		○	○	○	○	○	○			Free	Table A.4a (p.300)
	World economic and activity indicators		○	○	○	○	○	○			Free	Table A.5a (p.301)
	World energy supply		○	○	○	○	○	○			Free	Table A.1b (p.302)
	World final energy consumption		○	○	○	○	○	○			Free	Table A.2b (p.303-304)
	World electricity sector		○	○	○	○	○	○			Free	Table A.3b (p.305)
	World CO2 emissions		○	○	○	○	○	○			Free	Table A.4b (p.306)
	World economic and activity indicators		○	○	○	○	○	○			Free	Table A.5b (p.307)
	World energy supply		○	○	○	○	○	○			Free	Table A.1c. (p.308)
	World final energy consumption		○	○	○	○	○	○			Free	Table A.2c (p.309-310)
	World electricity sector		○	○	○	○	○	○			Free	Table A.3c (p.311)
	World CO2 emissions		○	○	○	○	○	○			Free	Table A.4c (p.312)
	World economic and activity indicators		○	○	○	○	○	○			Free	Table A.5c (p.313)

Source : IEA, *World Energy Outlook 2024* (October 2024)

IEA WEO2024 Parameter List

Annex (3/6)

-Legend- Items with extracted parameters

Chapter	Specific Data	Time Horizon						Country/Region			Data Type	Page Number
		Single year	Several year	Past	'30	'40	'50	World	Particular country/ region	Japan	Free/ Charged	
Annex	Total energy supply (EJ)		○	○	○	○	○	○	○	○	Free	Table A.6 (p.314)
	Renewables energy supply (EJ)		○	○		○	○	○	○	○	Free	Table A.7 (p.314)
	Oil production (mb/d)		○	○		○	○	○	○		Free	Table A.8 (p.315)
	Oil demand (mb/d)		○	○		○	○	○	○	○	Free	Table A.9 (p.315)
	World liquids demand (mb/d)		○	○	○		○	○			Free	Table A.10 (p.316)
	Refining capacity and runs (mb/d)		○	○	○		○		○	○	Free	Table A.11 (p.316)
	Natural gas production (bcm)		○	○	○		○	○	○		Free	Table A.12 (p.317)
	Natural gas demand (bcm)		○	○	○		○	○	○	○	Free	Table A.13 (p.317)
	Coal production (Mtce)		○	○	○		○	○	○	○	Free	Table A.14 (p.318)
	Coal demand (Mtce)		○	○	○		○	○	○	○	Free	Table A.15 (p.318)
	Electricity generation (TWh)		○	○	○		○	○	○	○	Free	Table A.16 (p.319)
	Renewables generation (TWh)		○	○	○		○	○	○	○	Free	Table A.17 (p. 319)

Source : IEA, *World Energy Outlook 2024* (October 2024)

Annex (4/6)

-Legend- Items with extracted parameters

Chapter	Specific Data	Time Horizon						Country/Region			Data Type	Page Number
		Single year	Several year	Past	’30	’40	’50	World	Particular country/ region	Japan	Free/ Charged	
Annex	Solar PV generation (TWh)		○	○	○		○	○	○	○	Free	Table A.18 (p.320)
	Wind generation (TWh)		○	○	○		○	○	○	○	Free	Table A.19 (p.320)
	Nuclear generation (TWh)		○	○	○		○	○	○	○	Free	Table A.20 (p.321)
	Natural gas generation (TWh)		○	○	○		○	○	○	○	Free	Table A.21 (p.321)
	Coal generation (TWh)		○	○	○		○	○	○	○	Free	Table A.22 (p.322)
	Total final consumption (EJ)		○	○	○		○	○	○	○	Free	Table A.23 (p.322)
	Industry consumption (EJ)		○	○	○		○	○	○	○	Free	Table A.24 (p.323)
	Transport consumption (EJ)		○	○	○		○	○	○	○	Free	Table A.25 (p. 323)
	Buildings consumption (EJ)		○	○	○		○	○	○	○	Free	Table A.26 (p.324)
	Hydrogen demand (PJ)		○	○	○		○	○	○	○	Free	Table A.27 (p.324)
	Low-emissions hydrogen balance (Mt H2 equivalent)		○	○	○		○				Free	Table A.28 (p.325)
	Total CO_2 emissions* (Mt CO_2)		○	○	○		○	○	○	○	Free	Table A.29 (p. 325)

Source : IEA, *World Energy Outlook 2024* (October 2024)

IEA WEO2024 Parameter List

Annex (5/6)

-Legend- Items with extracted parameters

Chapter	Specific Data	Time Horizon						Country/Region			Data Type	Page Number
		Single year	Several year	Past	'30	'40	'50	World	Particular country/ region	Japan	Free/ Charged	
Annex	Electricity and heat sectors CO_2 emissions (Mt CO_2)		○	○	○		○		○	○	Free	Table A.30 (p.326)
	Total final consumption CO_2 emissions* (Mt CO_2)		○	○	○		○		○	○	Free	Table A.31 (p. 326)
	Population assumptions by region		○	○	○		○		○	○	Free	Table B.1 (p. 328)
	CO2 prices for electricity, industry and energy production in selected regions by scenario		○	○	○	○	○		○	○	Free	Table B.2 (p. 329)
	Remaining technically recoverable fossil fuel resources, 2023	○		○					○		Free	Table B.3 (p. 331)
	Technology costs in selected regions in the Stated Policies Scenario		○	○	○		○		○		Free	Table B.4a (p. 333)
	Technology costs in selected regions in the Announced Pledges Scenario		○	○	○		○		○		Free	Table B.4b (p. 334)
	Technology costs in selected regions in the Net Zero Emissions by 2050 Scenario		○	○	○		○		○		Free	Table B.4c (p. 335)
	Costs for selected technologies by scenario		○	○	○		○				Free	Table B.5 (p. 337)
	Cross-cutting policy assumptions for selected regions/countries by scenario		○		○		○		○	○	Free	Table B.6 (p. 340-343)
	Electricity sector policies and measures as modelled by scenario for selected regions/countries		○		○	○	○		○		Free	Table B.7 (p. 344-345)

Source : IEA, *World Energy Outlook 2024* (October 2024)

Annex (6/6)

-Legend- Items with extracted parameters

Chapter	Specific Data	Time Horizon						Country/Region			Data Type	Page Number
		Single year	Several year	Past	'30	'40	'50	World	Particular country/ region	Japan	Free/ Charged	
Annex	Industry sector policies and measures as modelled by scenario for selected regions/countries				○				○		Free	Table B.8 (p. 346-347)
Annex	Buildings sector policies and measures as modelled by scenario for selected regions/countries				○				○	○	Free	Table B.9 (p. 348-349)
Annex	Transport sector policies and measures as modelled by scenario for selected regions/countries				○	○	○		○	○	Free	Table B.10 (p. 350-352)
Annex	Industry and intergovernmental-led initiatives and manufacturing targets by scenario				○	○	○	○	○		Free	Table B.11 (p. 353)

Source : IEA, *World Energy Outlook 2024* (October 2024)

Parameters in IEA WEO2024

CO2 prices

Category	Datasets	Scenario	Time Horizon		Country / Region		Sector
• CO2 prices	• CO2 prices for electricity, industry and energy production in selected regions by scenario	• NZE • APS • STEPS	Past • -	Future • 2030 • 2035 • 2040 • 2050	Global • Advanced economies with net zero emissions pledges • Emerging market and developing economies with net zero emissions pledges • Other emerging market and developing economies	Region • Canada • Chile • Colombia • China • EU • Korea	• All sector

UnitUSD/tCO2

Country / Region	Net Zero Emissions by 2050 Scenario (NZE)				Announced Pledges Scenario (APS)				Stated Policies Scenario (STEPS)			
	2030	2035	2040	2050	2030	2035	2040	2050	2030	2035	2040	2050
Canada	-	-	-	-	-	-	-	-	126	126	126	126
Chile, Columbia	-	-	-	-	-	-	-	-	21	24	28	28
China	-	-	-	-	-	-	-	-	39	43	46	52
EU	-	-	-	-	-	-	-	-	140	145	149	158
Korea	-	-	-	-	-	-	-	-	56	65	73	89
Advanced economies with net zero emissions pledges	140	180	205	250	135	160	175	200	-	-	-	-
Emerging market and developing economies with net zero emissions pledges	90	125	160	200	40	65	110	160	-	-	-	-
Selected emerging market and developing economies without net zero emissions pledges	25	50	85	180	-	-	-	-	-	-	-	-
Other emerging market and developing economies	15	25	35	55	-	6	17	47	-	-	-	-

Source : IEA, *World Energy Outlook 2024* (October 2024) - Table B.2 “CO2 prices for electricity, industry and energy production in selected regions by scenario” （P.329）

Parameters in IEA WEO2024

Price of key commodities/products (crude oil, natural gas, coal prices)

Category	Datasets	Scenario	Time Horizon		Country / Region		Sector
• Price of key commodities/products	• Fossil fuel prices by scenario	• NZE • APS • STEPS	Past • 2023	Future • 2030 • 2040 • 2050	Global • World	Region • United States • EU • China • Japan	• All sector

UnitCrude oil：USD/barrel、Natural gas：USD/Mbtu、Steam coal：USD/tonne

Category	Country/ region	Past	Net Zero Emissions by 2050 Scenario (NZE)			Announced Pledges Scenario (APS)			Stated Policies Scenario (STEPS)		
		2023	2030	2040	2050	2030	2040	2050	2030	2040	2050
Crude oil	World	82	42	30	25	72	63	58	79	77	75
Natural gas	United States	2.7	2.1	2.0	2.0	3.2	3.0	2.9	3.9	4.1	4.2
	EU	12.1	4.4	4.1	4.0	6.0	5.2	5.2	6.5	7.6	7.7
	Japan	13.0	5.0	4.8	4.8	6.8	6.1	6.2	8.3	8.8	8.7
	China	11.5	5.0	4.8	4.8	6.9	6.2	6.2	7.2	8.2	8.3
Steam coal	United States	57	28	23	23	42	31	27	51	42	40
	EU	129	57	43	39	64	51	48	68	69	64
	Japan	174	66	53	49	81	66	61	105	86	82
	Coastal China	150	64	54	49	78	67	61	101	88	82

Source : IEA, *World Energy Outlook 2024* (October 2024) - Table 2.3 “Wholesale fossil fuel prices by scenario”（P.90）

Parameters in IEA WEO2024

Energy supply and demand (Low-emissions hydrogen and low-emissions hydrogen based fuel demand and supply)

Category	Datasets	Scenario	Time Horizon		Country / Region		Sector
• Energy demand and supply	• Low-emissions hydrogen and low-emissions hydrogen based fuel demand and supply	• NZE • APS • STEPS	Past • 2023	Future • 2030 • 2035 • 2050	Global • World	Region • -	• All

UnitMt H2 equivalent

Category	Past	Net Zero Emissions by 2050 Scenario (NZE)			Announced Pledges Scenario (APS)			Stated Policies Scenario (STEPS)		
	2023	2030	2035	2050	2030	2035	2050	2030	2035	2050
Low-emissions hydrogen production	**1**	**66**	**152**	**401**	**25**	**78**	**260**	**7**	**15**	**46**
Water electrolysis	0	49	118	326	18	61	203	5	11	37
Fossil fuels with CCUS	1	17	33	74	7	17	57	2	4	9
Bioenergy and other	0	0	0	1	0	0	0	0	0	0
Transformation of hydrogen	**0**	**41**	**91**	**201**	**16**	**48**	**140**	**4**	**9**	**26**
To power generation	-	17	30	44	4	11	20	1	2	3
To hydrogen-based fuels	0	16	50	148	7	30	109	1	4	17
in oil refining	0	6	8	5	3	5	7	2	2	5
To biofuels	0	2	3	4	2	2	3	0	0	1
Hydrogen demand for end-use sectors	**0**	**24**	**59**	**191**	**9**	**29**	**117**	**2**	**6**	**20**
Low-emissions hydrogen-based fuels	**-**	**15**	**48**	**145**	**7**	**29**	**108**	**1**	**3**	**17**
Total final consumption	-	10	33	127	6	27	91	0	2	15
Power generation	-	5	14	18	0	2	17	0	1	2
Trade	0	18	32	71	7	22	59	2	7	22
Trade as share of demand	0%	28%	21%	18%	27%	28%	23%	30%	48%	50%

Source : IEA, *World Energy Outlook 2024* (October 2024) - Table A.28 “Low-emissions hydrogen balance”（P.325）

Parameters in IEA WEO2024

Energy demand and supply (Global liquids demand and supply)

Category	Datasets	Scenario	Time Horizon		Country / Region		Sector
• Energy demand and supply	• Global liquids demand and supply	• NZE • APS • STEPS	Past • 2023	Future • 2030 • 2035 • 2050	Global • World	Region • -	• All • Transport • Buildings etc.

Unit mb/d

Category	Past	Net Zero Emissions by 2050 Scenario (NZE)			Announced Pledges Scenario (APS)			Stated Policies Scenario (STEPS)		
	2023	2030	2035	2050	2030	2035	2050	2030	2035	2050
Road transport	42.7	31.9	20.1	2.3	40.5	34.1	16.8	43.3	40.2	34.8
Aviation and shipping	11.6	9.3	7.0	1.8	11.0	10.1	7.5	13.0	13.5	14.5
Industry and petrochemicals	20.0	19.7	18.2	11.1	21.4	20.9	17.5	23.3	24.6	25.3
Buildings and power	11.4	6.6	3.6	0.4	8.1	6.1	3.6	9.0	7.7	6.1
Other sectors	13.4	10.8	8.9	5.3	11.8	10.9	8.4	13.1	13.1	12.5
World oil demand	99.1	78.3	57.8	23.0	92.8	82.0	53.7	101.7	99.1	93.1
Liquid biofuels	2.3	6.0	6.8	5.9	4.9	6.3	7.0	2.9	3.2	4.1
Low-emissions hydrogen-based fuels	0.0	0.7	2.0	5.6	0.3	1.4	4.6	0.0	0.1	0.6
World liquids demand	101.4	85.0	66.6	34.5	98.0	89.7	65.4	104.7	102.4	97.9
Conventional crude oil	62.7	48.6	35.7	15.3	54.9	46.6	28.9	59.4	57.0	54.3
Tight oil	9.1	8.4	6.4	1.6	10.8	10.4	7.2	11.2	11.8	10.7
Natural gas liquids	20.2	15.4	11.0	4.1	19.8	18.4	13.1	23.1	22.1	19.2
Extra-heavy oil and bitumen	3.9	3.2	2.5	1.3	3.9	3.6	2.7	4.6	4.6	5.1
Other production	1.0	0.4	0.3	0.1	0.9	0.9	0.3	1.0	1.0	1.0
World oil production	**96.9**	**76.0**	**55.9**	**22.4**	**90.4**	**79.9**	**52.1**	**99.2**	**96.5**	**90.3**
OPEC share	34%	35%	39%	51%	34%	36%	41%	33%	34%	40%
World processing gains	2.4	2.3	1.9	0.7	2.4	2.2	1.6	2.5	2.6	2.8
World oil supply	**99.2**	**78.3**	**57.8**	**23.0**	**92.8**	**82.0**	**53.7**	**101.7**	**99.1**	**93.1**
IEA crude oil price	**82**	**42**	**33**	**25**	**72**	**67**	**58**	**79**	**78**	**75**

Source : IEA, *World Energy Outlook 2024* (October 2024) - Table 3.5 “Global liquids demand and supply by scenario (mb/d)”（P.137）

Parameters in IEA WEO2024

Energy demand and supply (Global liquids demand)

Category	Datasets	Scenario	Time Horizon		Country / Region		Sector
• Energy demand and supply	• Global liquids demand and supply	• APS • STEPS	Past • 2022 • 2023	Future • 2030 • 2035 • 2050	Global • World	Region • -	• All sector

Unit Mb/d

Category	Past		Announced Pledges Scenario (APS)			Stated Policies Scenario (STEPS)		
	2022	2023	2030	2035	2050	2030	2035	2050
Total liquids	**99.3**	**101.4**	**97.9**	**89.3**	**64.7**	**104.6**	**102.4**	**97.8**
Biofuels	2.2	2.3	4.9	6.3	7.0	2.9	3.2	4.1
Low-emissions hydrogen-based fuels	-	-	0.2	1.0	4.0	-	0.1	0.6
Total oil	**97.1**	**99.1**	**92.8**	**82.0**	**53.7**	**101.7**	**99.1**	**93.1**
CT*, GTL** and additives	0.9	1.0	0.9	0.7	0.3	0.9	1.0	0.9
Direct use of crude oil	1.0	0.9	0.3	0.2	0.1	0.4	0.3	0.1
Oil products	**95.2**	**97.2**	**91.6**	**81.1**	**53.3**	**100.4**	**97.8**	**92.1**
LPG and ethane	14.0	14.0	13.9	13.5	11.3	16.4	17.3	17.8
Naphtha	6.8	7.0	6.0	6.2	6.0	7.7	8.3	9.2
Gasoline	24.4	25.0	22.2	17.7	7.6	23.9	21.3	17.1
Kerosene	6.2	7.1	7.9	7.9	6.8	8.5	9.1	10.6
Diesel	27.3	27.3	25.4	22.2	12.5	28.5	27.8	25.5
Fuel oil	6.5	6.5	4.1	3.0	1.1	5.7	5.4	4.5
Other products	10.0	10.3	12.1	10.6	8.0	9.7	8.6	7.4
Fractionated products from NGLs***	12.2	12.8	12.5	11.5	8.2	14.3	13.3	11.1
Refinery products	83.0	84.4	79.1	69.6	45.1	86.1	84.5	81.0
Refinery market share	84%	83%	81%	78%	70%	82%	83%	83%

*CT：coal-to-liquids;、**GTL：gas-toliquids、***NGL：natural gas liquids

Source : IEA, *World Energy Outlook 2024* (October 2024) - Table A.10: World liquids demand (mb/d)（P.316）

Parameters in IEA WEO2024

Energy demand and supply (Global gas demand) (1/2)

Category	Datasets	Scenario	Time Horizon		Country / Region		Sector
• Energy demand and supply	• Global gas demand	• NZE • APS • STEPS	Past • 2023	Future • 2030 • 2035 • 2050	Global • World	Region • -	• All • Power • Industry etc.

Unit bcme

Category	Past	Net Zero Emissions by 2050 Scenario (NZE)			Announced Pledges Scenario (APS)			Stated Policies Scenario (STEPS)		
	2023	2030	2035	2050	2030	2035	2050	2030	2035	2050
Natural gas demand (bcm)	**4,186**	**3,617**	**2,257**	**882**	**4,003**	**3,493**	**2,466**	**4,430**	**4,422**	**4,377**
Power	1,642	1,537	773	136	1,519	1,258	786	1,657	1,602	1,513
Industry	936	852	711	338	941	888	674	1,037	1,080	1,136
Buildings	809	570	307	1	780	649	418	877	868	855
Transport	151	113	67	7	143	116	56	183	191	191
Low-emissions H2 production inputs	-	64	120	246	25	66	219	5	13	31
Other	647	482	279	156	593	510	302	671	668	651
of which abated with CCUS	14	144	247	463	69	134	356	29	43	74
Natural gas production (bcm)	**4,218**	**3,617**	**2,257**	**882**	**4,003**	**3,493**	**2,466**	**4,430**	**4,422**	**4,377**
Conventional gas	2,908	2,526	1800	635	2,818	2,560	1,969	2,982	2,996	3,076
Unconventional gas	1,310	1,091	457	247	1,185	932	497	1,449	1,425	1,301
Natural gas trade (bcm)	**1,039**	**826**	**517**	**195**	**1,044**	**863**	**466**	**1,189**	**1,214**	**1,234**
LNG	546	539	339	145	653	597	290	690	719	830
Pipeline	493	287	179	50	391	266	176	499	495	403

Source : IEA, *World Energy Outlook 2024* (October 2024) - Table 3.2 “Global gas demand, production and trade by scenario”（P.144）

Parameters in IEA WEO2024

Energy demand and supply (Global gas demand) (2/2)

Category	Datasets	Scenario	Time Horizon		Country / Region		Sector
• Energy demand and supply	• Global gas demand	• NZE • APS • STEPS	Past • 2023	Future • 2030 • 2035 • 2050	Global • World	Region • -	• All • Power • Industry etc.

Unit bcme

Category and Country / Region	Past	Net Zero Emissions by 2050 Scenario (NZE)			Announced Pledges Scenario (APS)			Stated Policies Scenario (STEPS)		
	2023	2030	2035	2050	2030	2035	2050	2030	2035	2050
Natural gas price										
United States	2.7	2.1	2.1	2	3.2	3.1	2.9	3.9	4.0	4.2
EU	12.1	4.4	4.2	4	6	5.5	5.2	6.5	6.5	7.7
Japan	13	5	4.9	4.8	6.8	6.2	6.2	7.2	7.1	8.3
China	11.5	5	4.9	4.8	6.9	6.4	6.2	8.3	7.8	8.7
Low-emission gas	**36**	**349**	**643**	**1,397**	**175**	**375**	**1,023**	**78**	**125**	**362**
Low-emission hydrogen	0	172	397	1,052	65	210	688	18	37	128
Biogas	26	51	74	125	43	59	107	36	48	80
Bio methane	10	126	172	221	67	106	228	24	40	154

Source : IEA, *World Energy Outlook 2024* (October 2024) - Table 3.2 “Global gas demand, production and trade by scenario” (P.144)

Parameters in IEA WEO2024

Energy demand and supply (Global coal demand)

Category	Datasets	Scenario	Time Horizon		Country / Region		Sector
• Energy demand and supply	• Global coal demand	• NZE • APS • STEPS	Past • 2023	Future • 2030 • 2035 • 2050	Global • World	Region • -	• All • Power • Industry

Unit Mtce、EJ

Category	Past	Net Zero Emissions by 2050 Scenario (NZE)			Announced Pledges Scenario (APS)			Stated Policies Scenario (STEPS)		
	2023	2030	2035	2050	2030	2035	2050	2030	2035	2050
World coal demand	**5,986**	**3,440**	**1,743**	**501**	**4,702**	**3,231**	**1,370**	**5,307**	**4,453**	**3,191**
Power	3,916	2,015	738	228	2,944	1,800	686	3,349	2,609	1,612
Industry	1,606	1,199	864	219	1,396	1,175	608	1,581	1,539	1,367
Other sectors	464	226	140	54	362	257	76	377	305	213
of which abated with CCUS	0%	2%	13%	77%	0%	4%	25%	0%	0%	1%
Advanced economies	878	249	122	53	336	196	75	502	357	219
Emerging market and developing economies	5,108	3,191	1,620	447	4,365	3,035	1,295	4,806	4,096	2,973
World coal production	**6,278**	**3,441**	**1,743**	**501**	**4,702**	**3,231**	**1,370**	**5,308**	**4,454**	**3,191**
Steam coal	5,079	2,619	1,192	409	3,743	2,423	985	4,262	3,479	2,398
Coking coal	970	759	533	89	851	724	346	911	861	711
Peat and lignite	229	62	18	3	107	84	39	135	114	82
Advanced economies	1,041	310	198	36	451	332	127	628	519	412
Emerging market and developing economies	5,237	3,131	1,544	465	4,251	2,899	1,243	4,680	3,934	2,779
World coal trade	**1,144**	**612**	**368**	**97**	**797**	**629**	**307**	**965**	**877**	**712**

Source : IEA, *World Energy Outlook 2024* (October 2024) - Table 3.3 “Global coal demand, production and trade, and solid bioenergy use by scenario (Mtce)”（P.149）

Parameters in IEA WEO2024

Energy demand and supply (Global coal demand by region)

Category	Datasets	Scenario	Time Horizon		Country / Region		Sector
• Energy demand and supply	• Global coal demand by region	• APS • STEPS	Past • 2010 • 2022 • 2023	Future • 2030 • 2035 • 2050	Global • World	Region • North America • Central and South America • Europe • Africa • Middle East • Eurasia • Asia Pacific	• All

Unit Mtce

Region	Country	Past			Announced Pledges Scenario (APS)			Stated Policies Scenario (STEPS)		
		2010	2022	2023	2030	2035	2050	2030	2035	2050
World	–	**5,216**	**5,879**	**5,986**	**4,702**	**3,231**	**1,370**	**5,307**	**4,453**	**3,191**
North America	–	769	366	308	69	32	16	137	68	26
	United States	717	342	284	59	25	11	125	58	16
Central and South America	–	**38**	**41**	**38**	**26**	**24**	**15**	**37**	**38**	**42**
	Brazil	21	20	20	16	15	10	22	23	25
Europe	–	**539**	**352**	**299**	**142**	**85**	**40**	**195**	**155**	**125**
	European Union	361	238	188	62	28	9	94	61	36
Africa	–	**155**	**150**	**147**	**106**	**80**	**30**	**124**	**108**	**89**
Middle East	–	**3**	**5**	**5**	**6**	**6**	**4**	**6**	**7**	**8**
Eurasia	–	203	250	257	213	186	134	232	214	179
	Russia	151	191	197	167	149	106	173	159	123
Asia Pacific	–	**3,509**	**4,715**	**4,931**	**4,139**	**2,818**	**1,129**	**4,576**	**3,863**	**2,724**
	China	2,565	3,329	3,469	2,748	1,731	572	3,029	2,358	1,413
	India	392	665	721	761	590	336	832	800	645
	Japan	**165**	**156**	**151**	**99**	**75**	**24**	**107**	**93**	**60**
	Southeast Asia	122	297	320	353	280	103	388	418	438

Source : IEA, *World Energy Outlook 2024* (October 2024) - Table A.15 “Coal demand (Mtce)”（P.318）

Parameters in IEA WEO2024

Energy demand and supply (Oil Production) (1/2)

Category	Datasets	Scenario	Time Horizon		Country / Region		Sector
• Energy supply and demand	• Oil production by scenario and region	• APS • STEPS	Past • 2010 • 2022 • 2023	Future • 2030 • 2035 • 2050	Global • World	Region • North America • Central and South America • Europe • Africa • Middle East • Eurasia • Asia Pacific	• All sector

Unit mb/d

Category	Past			Announced Pledges Scenario (APS)			Stated Policies Scenario (STEPS)		
	2010	2022	2023	2030	2035	2050	2030	2035	2050
World supply	**85.1**	**97.4**	**99.2**	**92.8**	**82.0**	**53.7**	**101.7**	**99.1**	**93.1**
Process gains	2.1	2.3	2.4	2.4	2.2	1.6	2.5	2.6	2.8
World production	**83.2**	**95.1**	**96.9**	**90.4**	**79.9**	**52.1**	**99.2**	**96.5**	**90.3**
Conventional	66.8	62.9	62.7	54.9	46.6	28.9	59.4	57.0	54.3
Tight oil	0.7	8.2	9.1	10.8	10.4	7.2	11.2	11.8	10.7
Natural gas liquids	12.7	19.3	20.2	19.8	18.4	13.1	23.1	22.1	19.2
Extra-heavy oil & bitumen	2.6	3.8	3.9	3.9	3.6	2.7	4.6	4.6	5.1
Non-OPEC	**51.7**	**61.8**	**63.9**	**60.0**	**51.5**	**30.8**	**66.8**	**63.9**	**54.2**
OPEC	**31.5**	**33.3**	**33.0**	**30.4**	**28.3**	**21.3**	**32.4**	**32.6**	**36.1**

Source : IEA, *World Energy Outlook 2024* (October 2024) - Table A.8 “Oil production (mb/d)”（P.315）

Parameters in IEA WEO2024

Energy demand and supply (Oil Production) (2/2)

Category	Datasets	Scenario	Time Horizon		Country / Region		Sector
• Energy supply and demand	• Oil production by scenario and region	• APS • STEPS	Past • 2010 • 2022 • 2023	Future • 2030 • 2035 • 2050	Global • World	Region • North America • Central and South America • Europe • Africa • Middle East • Eurasia • Asia Pacific	• All sector

Unit mb/d

Country / Region	Past			Announced Pledges Scenario (APS)			Stated Policies Scenario (STEPS)		
	2010	2022	2023	2030	2035	2050	2030	2035	2050
North America	**14.0**	**25.7**	**27.4**	**26.3**	**23.5**	**14.8**	**29.5**	**28.5**	**23.8**
Central and South America	**7.4**	**6.4**	**7.0**	**8.1**	**7.3**	**5.0**	**8.8**	**9.4**	**9.1**
Europe	**4.4**	**3.3**	**3.4**	**2.6**	**1.8**	**0.5**	**2.9**	**2.2**	**1.2**
European Union	**0.7**	**0.5**	**0.5**	**0.3**	**0.2**	**0.1**	**0.3**	**0.3**	**0.3**
Africa	**10.3**	**7.2**	**7.4**	**5.7**	**4.5**	**2.7**	**6.6**	**5.9**	**5.3**
Middle East	**25.4**	**31.1**	**30.4**	**29.4**	**27.8**	**21.5**	**31.2**	**32.1**	**35.8**
Eurasia	**13.4**	**13.9**	**13.8**	**12.4**	**10.2**	**5.4**	**13.8**	**12.6**	**11.1**
Asia Pacific	**8.4**	**7.5**	**7.5**	**5.9**	**4.7**	**2.2**	**6.4**	**5.8**	**4.1**
Southeast Asia	2.6	1.8	1.8	1.3	1.0	0.5	1.4	1.2	1.0

Source : IEA, *World Energy Outlook 2024* (October 2024) - Table A.8 “Oil production (mb/d)”（P.315）

Parameters in IEA WEO2024

Energy demand and supply (Oil demand) (1/2)

Category	Datasets	Scenario	Time Horizon		Country / Region		Sector
• Energy supply and demand	• Oil demand	• APS • STEPS	Past • 2010 • 2022 • 2023	Future • 2030 • 2035 • 2050	Global • World	Region • North America • Central and South America • Europe • Africa • Middle East • Eurasia • Asia Pacific • International bunkers	• All sector

Unit mb/d

Category	Past			Announced Pledges Scenario (APS)			Stated Policies Scenario (STEPS)		
	2010	2022	2023	2030	2035	2050	2030	2035	2050
World	**87.2**	**97.1**	**99.1**	**92.8**	**82**	**53.7**	**101.7**	**99.1**	**93.1**
North America	**22.2**	**22**	**22.1**	**18.8**	**14.7**	**6.3**	**21**	**18.6**	**14.5**
United States	**17.8**	**18.1**	**18.2**	**15.6**	**12.1**	**4.8**	**17.2**	**15.1**	**11.3**
Central and South America	**5.5**	**5.5**	**5.6**	**5.2**	**4.8**	**2.9**	**5.8**	**6**	**6.6**
Brazil	2.2	2.4	2.5	2.3	2.1	1.2	2.5	2.6	2.8
Europe	**13.6**	**12.4**	**12.1**	**9.6**	**7**	**2.4**	**10.7**	**9**	**5.3**
EU	10.3	9.3	9	6.9	4.9	1.4	7.8	6.3	3
Africa	**3.3**	**4.3**	**4.2**	**4.8**	**5.1**	**5.8**	**4.9**	**5.6**	**7.9**
Middle East	**7**	**8.1**	**8.1**	**7.7**	**7.8**	**7.4**	**8.1**	**8.5**	**10.2**

Source : IEA, *World Energy Outlook 2024* (October 2024) - Table A.9 “Oil demand (mb/d)”（P.315）

Parameters in IEA WEO2024

Energy demand and supply (Oil demand) (2/2)

Category	Datasets	Scenario	Time Horizon		Country / Region		Sector
• Energy supply and demand	• Oil demand	• APS • STEPS	Past • 2010 • 2022 • 2023	Future • 2030 • 2035 • 2050	Global • World	Region • North America • Central and South America • Europe • Africa • Middle East • Eurasia • Asia Pacific • International bunkers	• All sector

Unit mb/d

Category	Past			Announced Pledges Scenario (APS)			Stated Policies Scenario (STEPS)		
	2010	2022	2023	2030	2035	2050	2030	2035	2050
Eurasia	**3.5**	**4.3**	**4.4**	**4.3**	**4.2**	**3.9**	**4.6**	**4.7**	**5**
Russia	3	3.5	3.5	3.4	3.3	2.9	3.6	3.6	3.6
Asia Pacific	**25.1**	**33.3**	**34.8**	**35.2**	**32**	**20.2**	**38.1**	**37.9**	**34.4**
China	8.8	14.8	16.2	16.1	14.1	7.8	17.4	16.4	11.8
India	3.3	5	5.2	6.2	6.1	4.5	6.6	7.1	7.6
Japan	4.2	3.1	3.1	2.3	1.7	0.7	2.6	2.3	1.7
Southeast Asia	4	4.9	5	5.5	5.2	3.8	6	6.4	7
International bunkers	**7**	**7.1**	**7.7**	**7.1**	**6.4**	**4.9**	**8.6**	**8.9**	**9.3**

Source : IEA, *World Energy Outlook 2024* (October 2024) - Table A.9 “Oil demand (mb/d)”（P.315)

Parameters in IEA WEO2024

Energy demand and supply (Gas production by region)

Category	Datasets	Scenario	Time Horizon		Country / Region		Sector
• Energy supply and demand	• Natural gas production	• APS • STEPS	Past • 2010 • 2022 • 2023	Future • 2030 • 2035 • 2050	Global • World	Region • North America • Central and South America • Europe • Africa • Middle East • Eurasia • Asia Pacific	• All sector

Unit bcm

Region	Past			Announced Pledges Scenario (APS)			Stated Policies Scenario (STEPS)		
	2010	2022	2023	2030	2035	2050	2030	2035	2050
World	**3,286**	**4,210**	**4,218**	**4,003**	**3,493**	**2,466**	**4,430**	**4,422**	**4,377**
Conventional gas	2,781	2,941	2,908	2,818	2,560	1,969	2,982	2,996	3,076
Tight gas	274	312	314	213	138	39	242	195	120
Shale gas	154	861	896	890	728	429	1,106	1,128	1,082
Coalbed methane	77	85	86	58	49	29	77	78	73
North America	**815**	**1,272**	**1,323**	**1,153**	**863**	**409**	**1,319**	**1,241**	**1,073**
Central and South America	**163**	**161**	**160**	**150**	**139**	**102**	**164**	**170**	**176**
Europe	**341**	**253**	**236**	**172**	**127**	**57**	**198**	**181**	**133**
European Union	148	47	37	17	9	2	31	29	23
Africa	**210**	**254**	**262**	**261**	**240**	**211**	**284**	**298**	**314**
Middle East	**464**	**687**	**698**	**849**	**860**	**777**	**903**	**962**	**1,152**
Eurasia	**807**	**896**	**851**	**793**	**715**	**577**	**891**	**896**	**873**
Asia Pacific	**487**	**686**	**688**	**625**	**549**	**332**	**671**	**675**	**655**
	215	196	193	156	130	81	172	152	122

Source : IEA, *World Energy Outlook 2024* (October 2024) - Table A.12 "Natural gas production (bcm)"（P.317）

Parameters in IEA WEO2024

Energy demand and supply (Gas demand by region) (1/2)

Category	Datasets	Scenario	Time Horizon		Country / Region		Sector
• Energy demand and supply	• Global gas demand	• APS • STEPS	Past • 2010 • 2022 • 2023	Future • 2030 • 2035 • 2050	Global • World	Region • North America • Central and South America • Europe • Africa • Middle East • Eurasia • Asia Pacific	• All sector

Unit bcme

Region	Country	Past			Announced Pledges Scenario (APS)			Stated Policies Scenario (STEPS)		
		2010	2022	2023	2030	2035	2050	2030	2035	2050
World	–	**3,312**	**4,166**	**4,186**	**4,003**	**3,493**	**2,466**	**4,430**	**4,422**	**4,377**
North America	–	**838**	**1,167**	**1,175**	**957**	**674**	**367**	**1,121**	**1,028**	**811**
	United States	678	939	940	760	506	260	883	791	578
Central and South America	–	**150**	**156**	**156**	158	152	102	168	180	183
	Brazil	28	32	30	27	26	20	34	35	32
Europe	–	**607**	**544**	**507**	**409**	**281**	**86**	**462**	**407**	**301**
	European Union	446	358	331	264	187	29	296	257	166
Africa	–	**107**	**176**	**182**	**181**	**180**	**185**	**203**	**219**	**290**
Middle East	–	**370**	**566**	**578**	**674**	**692**	**678**	**702**	**750**	**880**

Source : IEA, *World Energy Outlook 2024* (October 2024) - Table A.13: "Natural gas demand (bcm)" (P.317)

Parameters in IEA WEO2024

Energy demand and supply (Gas demand by region) (2/2)

Category	Datasets	Scenario	Time Horizon		Country / Region		Sector
• Energy demand and supply	• Global gas demand	• APS • STEPS	Past • 2010 • 2022 • 2023	Future • 2030 • 2035 • 2050	Global • World	Region • North America • Central and South America • Europe • Africa • Middle East • Eurasia • Asia Pacific	• All sector

Unit bcme

Region	Country	Past			Announced Pledges Scenario (APS)			Stated Policies Scenario (STEPS)		
		2010	2021	2022	2030	2035	2050	2030	2035	2050
Eurasia	**—**	**573**	**652**	**660**	**617**	**575**	**490**	**671**	**671**	**669**
	Russia	467	515	523	479	444	371	521	513	485
Asia Pacific	**—**	**577**	**904**	**928**	**992**	**928**	**559**	**1,075**	**1,131**	**1,191**
	China	110	370	398	448	397	213	499	522	523
	India	64	60	64	91	107	107	99	125	172
	Japan	**95**	**94**	**85**	**57**	**45**	**22**	**61**	**49**	**41**
	Southeast Asia	149	167	175	191	189	115	209	231	265
International bunkers		-	-	-	16	11-		27	36	51

Source : IEA, *World Energy Outlook 2024* (October 2024) - Table A.13: “Natural gas demand (bcm)”（P.317）

Parameters in IEA WEO2024

Energy demand and supply (Coal Production)

Category	Datasets	Scenario	Time Horizon		Country / Region		Sector
• Energy demand and supply	• Coal Production	• APS • STEPS	Past • 2010 • 2022 • 2023	Future • 2030 • 2035 • 2050	Global • World	Region • North America • Central and South America • Europe • Africa • Middle East • Eurasia • Asia Pacific	• All sector

Unit Mtce

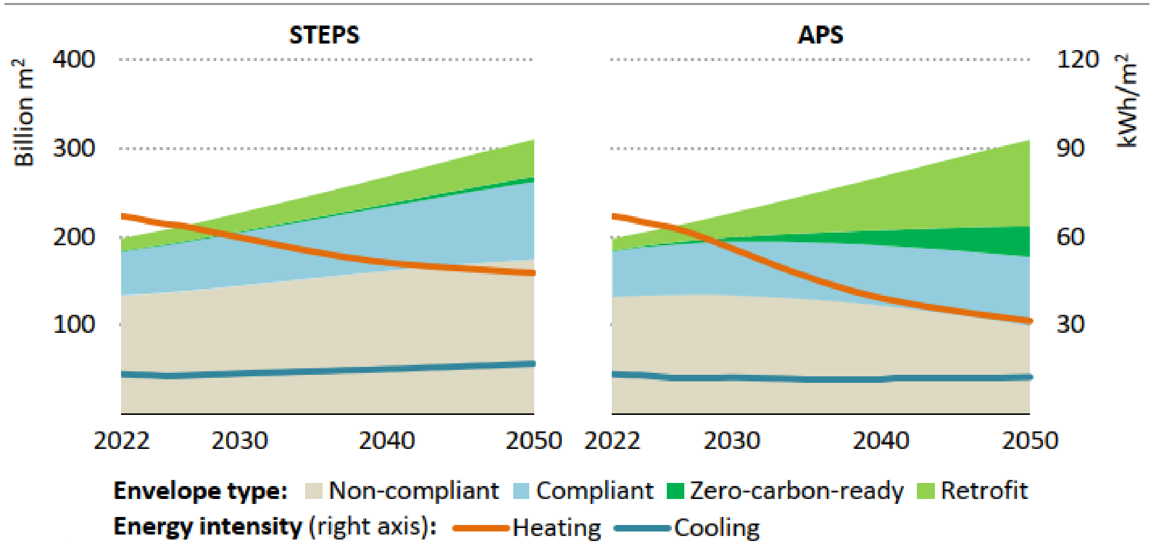
Country/Region	Past			Announced Pledges Scenario (APS)			Stated Policies Scenario (STEPS)		
	2010	2022	2023	2030	2035	2050	2030	2035	2050
World	**5,243**	**6,060**	**6,278**	**4,702**	**3,231**	**1,370**	**5,308**	**4,454**	**3,191**
Steam coal	4,076	4,848	5,079	3,743	2,423	985	4,262	3,479	2,398
Coking coal	867	961	970	851	724	346	911	861	711
Lignite and peat	300	251	229	107	84	39	135	114	82
North America	**818**	**453**	**444**	**132**	**83**	**34**	**214**	**139**	**89**
Central and South America	**81**	**67**	**58**	**20**	**19**	**4**	**32**	**33**	**18**
Europe –	**331**	**196**	**163**	**45**	**23**	**5**	**74**	**54**	**33**
European Union	220	137	109	23	8	1	36	20	6
Africa –	**211**	**204**	**206**	**153**	**114**	**35**	**180**	**162**	**138**
Middle East –	**1**	**1**	**1**	**1**	–	–	**1**	**1**	**1**
Eurasia –	**309**	**426**	**422**	**318**	**281**	**194**	**355**	**343**	**273**
Asia Pacific –	**3,493**	**4,714**	**4,985**	**4,035**	**2,713**	**1,098**	**4,451**	**3,723**	**2,639**
Southeast Asia	318	564	626	481	352	182	573	523	437

Source : IEA, *World Energy Outlook 2024* (October 2024) - Table A.14 “Coal production（Mtce)”（P.318）

Energy demand in the building sector（By source and end use）、2022-2050

Zero-carbon-ready building stock will reach 45% in STEPS, 65% in APS, and 80% in NZE in 2050, and 100% in NZE after 2030 for new construction and large-scale repair.

STEPS scenario	APS scenario	NZE scenario



	2022	2030	2035	2050
new construction and large-scale repair	<1%	100%	100%	100%
building stock	<5%	20%	35%	80%

By 2050,
around 45% of the building stock in the STEPS scenario and around 65% of the building stock in the APS scenario will be constructed or retrofitted in compliance with national building energy codes or zero-carbon-ready standards.

In the NZE scenario, 100% of new buildings and buildings after large-scale repair are zero-carbon-ready after 2030. And 20% of the building stock is zero-carbon-ready in 2030, 35% in 2035, and 80% in 2050.

(supplement) IEA definition of “Zero-carbon-ready buildings” : Zero-carbon-ready buildings are buildings that are highly energy efficient and use energy that can be completely decarbonized through direct use of renewable energy or district heating.

Source : IEA, *World Energy Outlook 2024* (October 2024), IEA *Net Zero Roadmap A Global Pathway to Keep the 1.5°C Goal in Reach* (September 2023)

IEA ETP2024：Overview

Supply chains for clean energy technologies are concentrated in certain areas, emphasizing the need for supply chain diversity

ETP2023 Report Overview

- ✓ ETP2023 provides a comprehensive inventory of the current state of the global clean energy supply chain, **using the Stated Policies Scenario (STEPS) the Announced Pledges Scenario (APS).** The report refers to the supply of materials such as lithium, copper, nickel, steel, cement, aluminum, and plastic, as well as the production and adoption of key technologies
- ✓ **Emphasizes that manufacturing and trade are foundational for the new clean energy economy** and expects that the market for key clean technologies is set to nearly triple by 2035, to more than USD 2 trillion. A major wave of manufacturing investment in clean technologies is underway, with many new factories being built across the world. As for trade, European Union's total imports bill of fossil fuels and clean energy technologies tilts towards a higher share of clean energy technologies, from less than 10% in 2023 to 35% in 2035, at the expense of fossil fuels. Traffic through some of the busiest maritime chokepoints such as the Strait of Malacca increases, despite growth in overall shipping activity slowing down.
  - ✓ Industrial strategies in Europe and the United States, **especially that of EV** are set to alter the outlook
  - ✓ **China remains the world's manufacturing powerhouse and India makes major strides, becoming a net exporter in 2035**
  - ✓ **Emerging and developing economies in Latin America, Africa and Southeast Asia** account for less than 5% of the value generated from producing clean technologies today, **but the opportunities exist**
- ✓ **Claims the necessity of industrial strategies which takes into account the new parameters and objectives of international trade in clean technology supply chains** for clean energy transitions to continue gathering pace

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※Excel data of the parameters are not available as of February 21st, 2023

Source : IEA *Energy Technology Perspective 2023* (January 2023)

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Source : IEA *Energy Technology Perspective 2024* (November 2024)

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Source : IEA *Energy Technology Perspective 2024* (November 2024)

[What is the NGFS (Network for Greening the Financial System)]

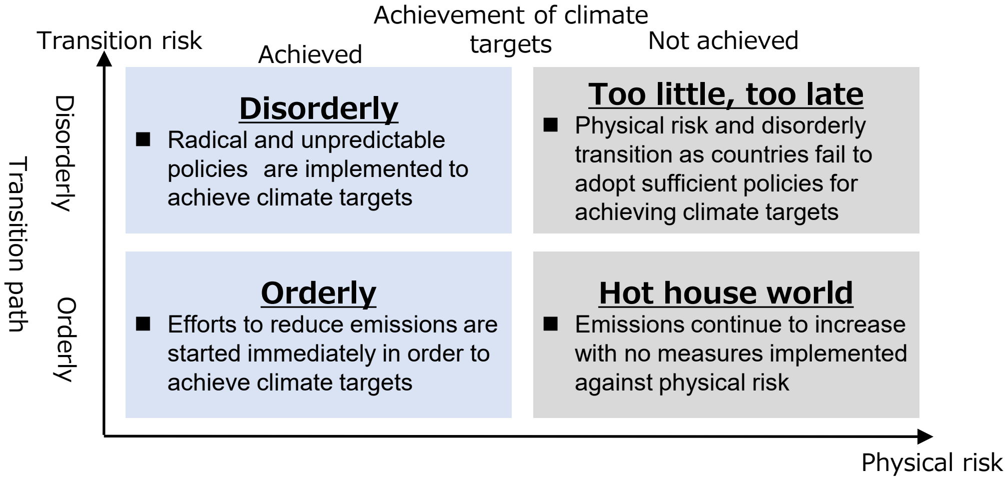
NGFS was established as an international climate risk management platform for central banks and regulatory authorities; it released its Phase III scenarios in September '22, which were updated with pledges and renewable energy trends in each country from COP26

Background behind establishment	■ Established in December 2017 through efforts led by central banks and financial supervisors. It was established to be an **international platform for central banks and financial supervisors** to consider financial supervisory measures toward climate change-related risk management. Japanese participants are the Financial Services Agency and Bank of Japan
Description of activities	■ Description of activities: Release of six recommendations for measures against climate change risk (April 2019) and climate change scenarios (June 2020); **the Phase III climate change scenarios were announced in September 2022**
Targets	■ **Central banks, financial supervisors, policy makers**
Scenario overview	■ For the NGFS Phase III scenarios made public in September 2022, the scenarios were released after **updating the database forming the basis of the scenario assumptions with information such as pledges and the latest trends for renewable energy sources from COP26, and macroeconomic impact of loss due to extreme weather and chronic physical risks, which includes the latest GDP and demographic information** (does not take into account the Russian invasion of Ukraine and its aftermath, as these are still unclear and thus difficult to model)
Assumed activity scope for NGFS scenarios	■ Since the assumed readers are central banks, financial supervisors, and policy makers, NGFS scenarios are not expected to be used frequently for scenario analysis by private companies in non-financial sectors ➢ For transition risk parameters that are referenced frequently such as carbon price, energy mix, fuel prices, the information from IEA scenario (NZE, APS, STEPS) are also available ➢ IEA, SSP, PRI`s transition risk parameters can be used as a complement ➢ Although the number of physical risk parameters are limited, it may be used together with water risk tools (AQUEDUCT) and RCP ■ On the other hand, the opportunities to reference NGSF scenarios for climate change-related risk management in financial institutions may increase

Source : Complied by Ministry of Environment from NGFS, *NGFS publishes the third vintage of climate scenarios for forward looking climate risks assessment* (6 September 2022)

In 2021, the NGFS recategorized scenarios into 6 types; the same categories will also be used in 2022 Climate scenario framework

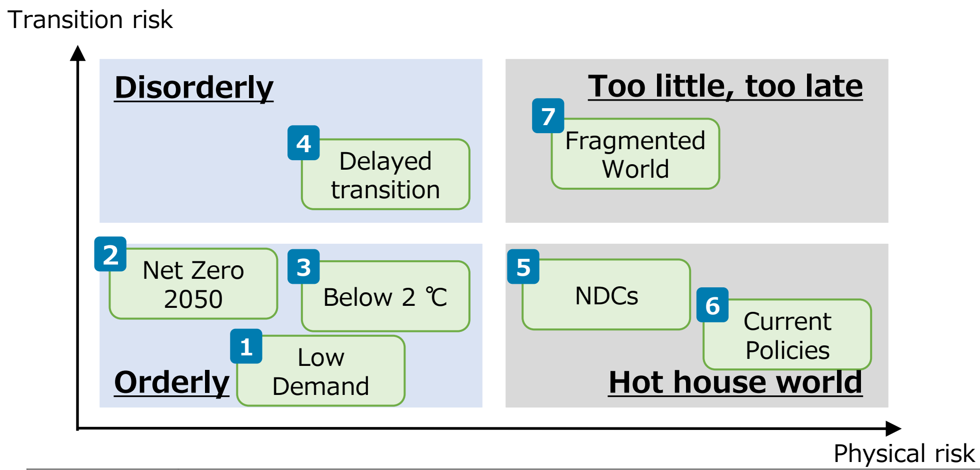
- Scenarios are designed to show the scope of transition and physical risk



Risk factor	Implications
Transition risk	Low if an orderly transition path is established, high if it is disorderly
Physical risk	Low if climate targets are achieved, high if they are not

Scenario elements	Overview
Orderly	Emission reduction policies are implemented immediately, and net zero emissions are achieved by 2070. Transition and physical risks are both low
Disorderly	Emission reduction policies fail to be implemented before 2030; transition risk increases due to the need for rapid policy responses
Hot House World	Emissions continue to increase until 2080 with no emission reduction policies implemented; physical risk increases due to the temperature rising 3°C or more
Too Little, Too late	scenarios assume that a late and uncoordinated transition fails to limit physical risks. This quadrant is explored for the first time in this vintage.

- 6 scenarios categorized through the climate scenario framework



	Scenario name	Overview
1	Low Demand	Difficult scenario to achieve +1.5℃ by the end of this century
2	Net Zero 2050	Net Zero 2050 is achieved through policies and innovation, with certain areas such as the US, EU, and Japan reaching targets of net zero emissions for all greenhouse gases
3	Below 2°C	Policies are gradually made stricter, and the 2°C and below target is reached at a rate of 67%
4	Delayed Transition	Annual emissions fail to be reduced by 2030, with limited reductions in CO2
5	NDCs	Physical risk is limited to a certain extent when each country achieves its established emission reduction targets
6	Current Policies	Only current policies are implemented; physical risk is expected to be high
7	Fragmented World	Scenarios in which climate change policies are implemented in a fragmented manner both intertemporally and geographically, resulting in more negative impacts.

Source : NGFS, *NGFS Scenarios for central banks and supervisors* (November 2023)

About the NGFS scenarios

The NGFS scenarios characterize physical risks and transition risks in terms of macro-financial risk overall based on policy ambition, policy response, and changes in and degree of use of technologies

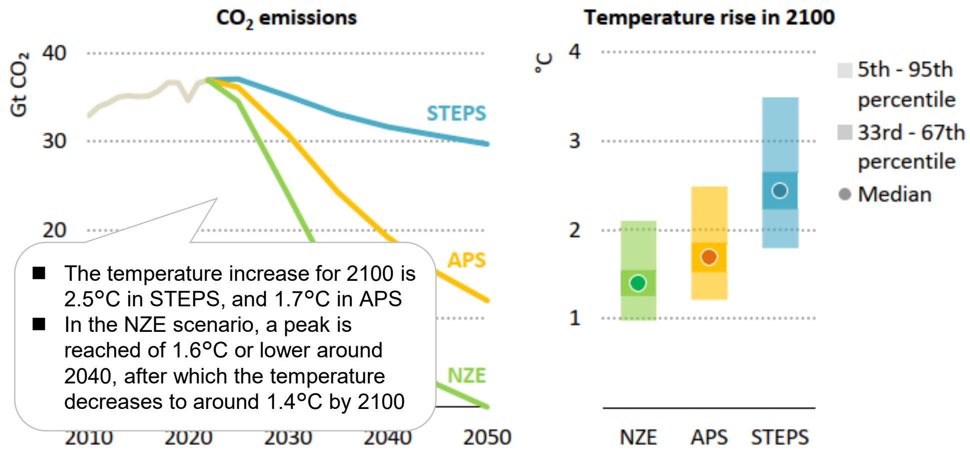
[Legend] : Low risk, : Medium risk, : High risk

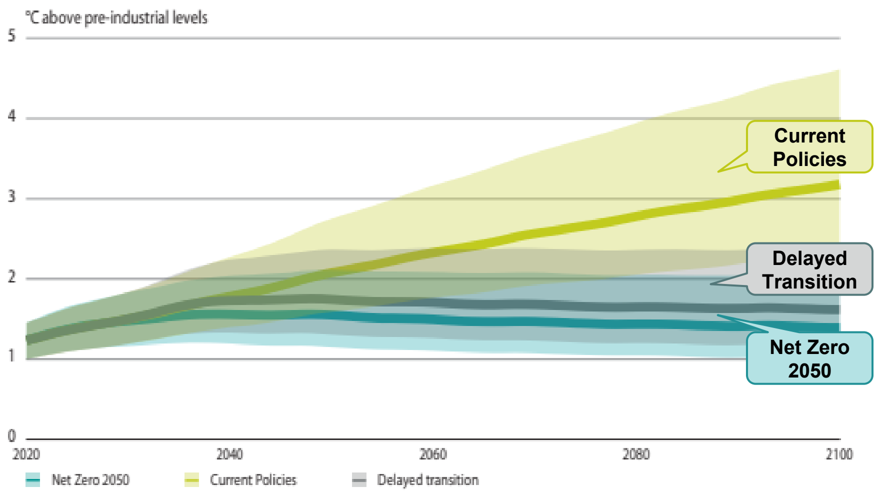
		Physical risk	Transition risk			
Category	**Scenario**	**Policy ambition**	**Policy response**	**Changes in technology**	**Use of CO2 removal**	**Variation in regional policies**
Orderly	**Low Demand**	1.4 °C (1.6 °C)	Immediate	Fast change	Medium use	Medium variation
	Net Zero 2050	1.4 °C (1.6 °C)	Immediate	Fast change	Medium-high use	Medium variation
	Below 2°C	1.7 °C (1.8 °C)	mmediate and smooth	Moderate change	Medium use	Low variation
Disorderly	**Delayed Transition**	1.7 °C (1.8 °C)	Delayed	Slow/Fast change	Medium use	High variation
Hot house world	**Nationally Determined Contributions (NDCs)**	2.4 °C (2.4 °C)	NDCs	Slow change	Low use	Medium variation
	Current Policies	2.9 °C (2.9 °C)	None − current policies	Slow change	Low use	Low variation
Too-little-too-late	**Fragmented World**	2.3 °C (2.3 °C)	Delayed and Fragmented	Slow/Fragmented change	Low-medium use	High variation

Source : NGFS, *NGFS Scenarios for central banks and supervisors* (November 2023)

Comparison with the IEA: Trends for rising global surface temperatures (median)

Both the IEA and NGFS use Integrated Assessment Models (IAM) to show transition paths for various scenarios; while the details of the paths differ, consistent results are shown





*For the temperature zones, the maximum temperature increase is listed with a confidence level of 50% and 33% to 67%

シナリオ名	概要
2.4°C Stated Policies Scenario (STEPS)	• Realistically examines the status of current policies and shows the direction of the energy system in the case where no new policies are introduced
1.7°C Announced Pledges Scenario (APS)	• Considers all climate change-related pledges announced by national governments, including NDC and long-term net zero goals, and assumes that these will all be achieved completely and on time
1.4°C Net Zero Emissions by 2050 Scenario (NZE)	• There is a rapid increase in green energy policies and investment, and developed countries reach net zero ahead of other countries • Achievement of universal access to energy and significant improvement in air quality by 2030

シナリオ名	概要
3°C+ Current Policies	Only current policies are implemented; physical risk is expected to be high **The temperature increase exceeds 3°C, bringing on serious and irreversible impact**
1.6°C Delayed Transition	Annual emissions fail to be reduced by 2030, with limited reductions in CO2
1.4°C Net Zero 2050	**Net Zero 2050 is achieved** through policies and innovation, with certain areas such as the US, EU, and Japan reaching targets of net zero emissions for all greenhouse gases

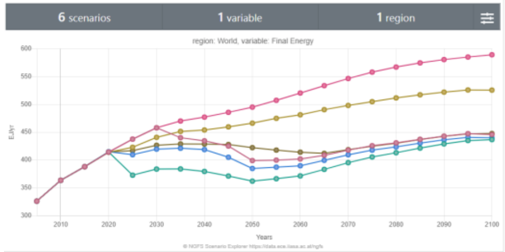
- The average temperature rises in all scenarios, exceeding 3°C in the Current Policies Scenario
- Changes in climatic conditions affect the productivity of manual labor, leading to serious and irreversible effects

Source : IEA, *World Energy Outlook 2023* (October 2023), NGFS, *NGFS Scenarios for central banks and supervisors* (November 2023)

The available parameters in the NGFS Phase 3 Scenario Explorer

NGFS Phase 4 Scenario Explorer

Issuing Agency	**NGFS**
Scenario	**Low Demand / Net Zero 2050 / Below 2°C / Delayed Transition / Nationally Determined Contributions (NDCs) / Current Policies / Fragmented World**
Time Horizon	**～2100, every 1 years** （historical data varies by scenario）



List of available parameters

Category	Details
Macro-economic	• GDP、Population • Macro-economic climate damage（GDP change）
Climate	• Temperature（global mean）、Surface temperature • Damage factor • Emissions（BC、C2F6、CF4、CH4、CO、CO2、Fガス、HFC、Kyoto gases、N2O、NH3、NOx、OC、PFC、SF6、Sulfur、VOC） • Concentration（CH4、CO2、N2O） • Radiative forcing
Price	• Carbon（Industry, residential and commercial, transportation, SCC, supply） • Primary energy（biomass, coal, gas, oil） • Secondary energy（electricity, gas, hydrogen, liquid fuels, solid fuels） • Final energy（industry, residential and commercial, transportation） • Industry（cement） • Agriculture（corn, Non-energy crops, soybean, wheat）
Capacity	• Electricity（biomass, coal, gas, geothermal, hydro, nuclear, oil, other, solar, biomass, wind） • Gas（biomass, coal, hydrogen, liquids） • Capacity additions（biomass, coal, gas, geothermal, hydro, nuclear, oil, solar, biomass, wind）

Category	Details
Energy	• Carbon sequestration（CCS, land use） • Trade（biomass, gas, coal, oil） • Production（primary energy, secondary energy, final energy） • Production（cement, chemicals, non-ferrous metals, steel） • Energy supply investment（CO2 transport and storage, electricity, extraction, heat, hydrogen, liquids, other）
Capital Cost	• Electricity（biomass, coal, gas, geothermal, hydro, nuclear, solar, wind） • Gas（biomass, coal） • Hydrogen（Biomass, coal, electricity, gas）‘ • Liquids（biomass, coal, gas, oil）
Agricultural crops and forestry	• Agricultural demand/production • Forestry demand/production • Yield（cereal, oil crops, sugar crops） • Fertilizer use（nitrogen, phosphorus） • Food demand（crops、livestock）
Other	• Government tax revenue • Water consumption • Land cover

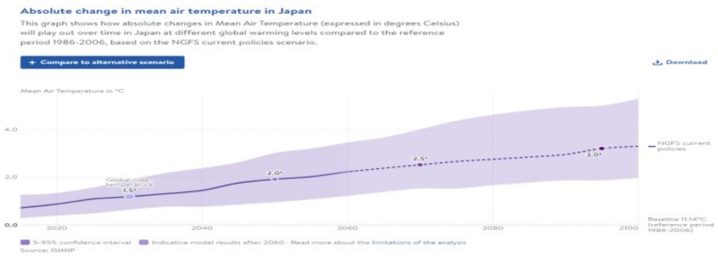
Source : NGFS, *NGFS Phase 3 Scenario Explorer*, https://data.ene.iiasa.ac.at/ngfs/#/workspaces (As of February 2024)

(Reference, Physical risk) NGFS CA Climate Impact Explorer Parameter

The available parameters in the NGFS CA Climate Impact Explorer

NGFS CA Climate Impact Explorer

Issuing Agency	**NGFS**
Scenario	**RCP2.6 / RCP4.5 / RCP6.0 / RCP8.5 / NGFS Low Demand / NGFS Net Zero 2050 / NGFS Below 2°C / NGFS Delayed Transition / NGFS Nationally Determined Contributions (NDCs) / NGFS Current Policies / NGFS Fragmented World / CAT Current Policies**
Time horizon	**～2100, every 1 years**



List of available parameters

Category	Details
Economic damages	• Annual expected damage from river floods • Annual expected damage from tropical cyclones • 1-in-100 year expected damage from tropical cyclones
Peril-specific hazards	• Land fraction annually exposed to river floods • Annual maximum river flood depth • Land fraction annually exposed to crop failures • Fraction of population annually exposed to crop failures • Land fraction annually exposed to wildfires • Fraction of population annually exposed to wildfires • Land fraction annually exposed to heatwaves • Fraction of population annually exposed to heatwaves
Agriculture	• Soil moisture • Annual mean maize yield • Annual mean rice yield • Annual mean soy yield • Annual mean wheat yield

Category	Details
Climate	• Relative humidity • Specific humidity • Precipitation • Snowfall • Atmospheric pressure (surface) • Atmospheric pressure (adjusted to sea level) • Downwelling longwave radiation • Wind speed
Mean air temperature	• Daily maximum air temperature • Daily minimum air temperature
Freshwater	• Surface runoff • River discharge • Maximum of daily river discharge • Minimum of daily river discharge
Labor productivity	• Reduced labor productivity due to heat stress

Source : NGFS, *NGFS CA Climate Impact Explorer,* Climate Analytics — Climate impact explorer (As of February 2024)

Outline of IPR scenario

IPR (the Inevitable Policy Response) is an initiative for supporting investor efforts to incorporate climate change risks into portfolio valuation; in December 2021, it released detailed information for the 1.5ºC scenario group

Summary	■ Initiative commissioned by PRI in 2018 to promote industry knowledge of climate change risk and support investor efforts to incorporate climate change risk into portfolio valuation ■ The Energy Transition Advisers and Vivid Economies led policy research and scenario modeling, working together with institutions such as 2Dii, Carbon Tracker Initiative, Climate Bonds Initiative, Quinbrook Infrastructure Partners, and Planet Tracker
Overview of IPR	**IPR Policy Forecast** Forceful policy responses to climate change and policy forecasts for energy, agriculture, and land use implications Three policy-based scenarios: **IPR 1.8° C Forecast Policy Scenario (FPS)**: Models the impact of policy projections on the economy through 2050, a scenario that reduces global emissions by 80% by 2050 and **addresses warming below 2° C (1.8° C)** **IPR FPS + Nature**: **First integrated nature-climate beta scenario for investors** that explores the possible impacts of nature-related policies incorporated into climate-related scenarios **IPR 1.5℃ RPS Scenario**: **Scenarios seeking policies aligned with the 1.5° C target based on the IEA NZE scenarios**, with deeper analysis of policy, land use, emerging economies, and value drivers **IPR supply chain analysis** Provides indicators for investors to more comprehensively and accurately assess transition risks for downstream companies (retail, distribution, etc.) dealing with tropical agricultural commodities. Supports reallocation of capital to companies with supply chains that do not involve deforestation **IPR value drivers** A set of publicly available outputs from the FPS and 1.5ºC RPS that offer significant granularity at the sector and country level allowing investors to assess their own climate risk
Release schedule	January - October 2021 ■ Announced the IPR explanatory materials, FPS report on land use / energy, and the 1.5ºC RPS policy summary December 2021 ■ Announced drivers for portfolio valuation and the detailed edition of the 1.5ºC RPS 2021 report January 2023 ■ Released IPR FPS + Nature as the first integrated nature-climate scenario for use by investors. Fills a critical gap in risk assessment and provides an exploratory future perspective on the potential impact of policy, technological, and social trends on key value drivers

Source : Investable Policy Response, *Preparing financial markets for climate-related policy and regulatory risks* (October 2021)

List of IPR 1.5℃ RPS 2021 Value Drivers Parameters

GHG emissions, CO2 removal, New Deployment, Capex, Capacity, Technology stock, Price

Parameter			Region		Unit	Time Horizon
Category	Variable	Industry	World	Japan		
GHG Emission	CO2 Emission	Power, Buildings, Transport, Other Energy, Industry, Total, Land use	●	●	Mt	2020-2050
CO2 removal	BECCS	Power, Industry, Total	●	●	Mt	2020-2050
	DACS	Total	●	-	Mt	2020-2050
New Deployment	Electricity Generation	Power, Hydrogen	●	●	GW	2020-2050
	Vehicles	Transport	●	●	Vehicles (thousands)	2020-2050
	Heating systems	Buildings	●	●	% mix	2020-2050
	Battery capacity	Total	●	●	GWh	2020-2050
Capex	Electricity generation	Power, Hydrogen	●	●	USD (million)	2020-2050
	Vehicles	Transport	●	●	USD (million)	2020-2050
	Heating systems	Buildings	●	●	USD (million)	2020-2050
Capacity	Electricity generation	Power	●	●	GW	2020-2050
Technology Stock	Electricity	Hydrogen	●	●	GW	2020-2050
	Vehicles	Transport	●	●	Vehicles (thousands)	2020-2050
	Heating systems	Buildings	●	●	% mix	2020-2050
Price	Battery	-	●	-	USD / kWh	2020-2050
	Nickel	-	●	-	USD / tonne	2020-2050
	Copper	-	●	-	USD / tonne	2020-2050
	Aluminum	-	●	-	USD / tonne	2020-2050
	Lithium	-	●	-	USD / tonne	2020-2050
	Cobalt	-	●	-	USD / tonne	2020-2050
	Coal	-	-	●	USD / tonne	2020-2050
	Oil	-	-	●	USD / tCO2	2020-2050

Source : PRI, *IPR FPS 2021 Value Drivers Database*、*IPR 1.5°C RPS 2021 Value Drivers Database*、*IPR FPS + Nature 2023 Value Drivers* (As of February 2023)

List of IPR 1.5℃ RPS 2021 Value Drivers Parameter

Electricity Generation, Production

Parameter			Region		Unit	Time Horizon
Category	Variable	Industry	World	Japan		
Electricity Generation	Coal	Power	●	●	TWh	2020-2050
	Coal CCS	Power	●	●	TWh	2020-2050
	Oil	Power	●	●	TWh	2020-2050
	Natural gas	Power	●	●	TWh	2020-2050
	Natural gas CCS	Power	●	●	TWh	2020-2050
	Nuclear	Power	●	●	TWh	2020-2050
	Hydro	Power	●	●	TWh	2020-2050
	Biomass	Power	●	●	TWh	2020-2050
	Biomass CCS	Power	●	●	TWh	2020-2050
	Solar	Power	●	●	TWh	2020-2050
	Onshore Wind	Power	●	●	TWh	2020-2050
	Offshore Wind	Power	●	●	TWh	2020-2050
	Hydrogen	Power	●	●	TWh	2020-2050
Production	Steel	Industry	●	●	Mt	2020-2050
	Cement	Industry	●	●	Mt	2020-2050
	Hydrogen	Industry	●	●	Mt	2020-2050
	Chemicals	Industry	●	●	Mt	2020-2050
	Aggregates	Industry	●	●	Mt	2020-2050
	Nickel	Industry	●	-	kt	2020-2050
	Steel	Industry	●	-	kt	2020-2050
	Aluminum	Industry	●	-	kt	2020-2050
	Lithium	Industry	●	-	kt	2020-2050
	Cobalt	Industry	●	-	kt	2020-2050

Source : PRI, *IPR FPS 2021 Value Drivers Database*、*IPR 1.5°C RPS 2021 Value Drivers Database*、*IPR FPS + Nature 2023 Value Drivers* (As of February 2023)

List of IPR 1.5℃ RPS 2021 Value Drivers Parameters

Sector energy demand, Primary energy demand, Demand, Population, Price (high), Price (low)

Parameter			Region		Unit	Time Horizon
Category	Variable	Industry	World	Japan		
Sector Energy Demand	Oil	Power, Buildings, Transport, Industry, No-energy use, Other energy	●	●	PJ	2020-2050
	Natural Gas	Power, Buildings, Transport, Industry, No-energy use, Other energy	●	●	PJ	2020-2050
	Coal	Power, Buildings, Transport, Industry, No-energy use, Other energy	●	●	PJ	2020-2050
	Biomass	Power, Buildings, Transport, Industry, Other energy	●	●	PJ	2020-2050
	Electricity	Power, Buildings, Transport, Industry, Other energy	●	●	PJ	2020-2050
	Hydrogen	Power, Buildings, Transport, Industry, Other energy	●	●	PJ	2020-2050
Primary Energy Demand	Oil	Total	●	●	PJ	2020-2050
	Natural gas	Total	●	●	PJ	2020-2050
	Coal	Total	●	●	PJ	2020-2050
	Biomass	Total	●	●	PJ	2020-2050
Demand	Aviation	Transport	●	●	RTK (billion)	2020-2050
Population	-	Total	●	●	Million Population	2020-2050
Price (High)	Oil	-	●	-	USD / Barrel	2020-2050
Price (Low)	Oil	-	●	-	USD / Barrel	2020-2050

Source : PRI, *IPR FPS 2021 Value Drivers Database*、*IPR 1.5°C RPS 2021 Value Drivers Database*、*IPR FPS + Nature 2023 Value Drivers* (As of February 2023)

List of IPR 1.5℃ RPS 2021 Value Drivers Parameters

Nature-based solutions, Bioenergy, Timber, Agriculture, Alternative meat

Parameter			Region		Unit	Time Horizon
Category	Variable	Industry	World	Japan		
Nature-based Solutions	Area	Land Use	●	●	Million ha	2020-2050
	Carbon Value	Land Use	●	●	USD 2020	2020-2050
	CAPEX	Land Use	●	●	USD 2020 , USD 2020/ha , Index (2020 = 1)	2020-2050
	OPEX	Land Use	●	●	USD 2020/ha/yr (average over project lifetime)	2020
Bioenergy	Production	Land Use	●	-	EJ/yr	2020-2050
	Price Index	Land Use	●	-	Index (2025 = 100)	2020-2050
Timber	Industrial roundwood	Land Use	●	-	Million M3, Index (2020 = 100)	2020-2050
Agriculture	Production	Land Use	●	-	Mt DM/yr	2020-2050
	Crop Yields	Land Use	●	-	t DM/ha	2020-2050
	Average annual food price change 2020-2050	Land Use	●	-	Percent	2020
Alternative Meat	Production	Land Use	●	-	Mt DM	2020-2050
	Production Cost	Land Use	●	-	Index（Animal meat average 2020年＝100）	2020-2050

Source : PRI, *IPR FPS 2021 Value Drivers Database*、*IPR 1.5°C RPS 2021 Value Drivers Database*、*IPR FPS + Nature 2023 Value Drivers* (As of February 2023)

List of FPS 2021 Energy Parameters

GHG emissions, CO2 removal, New deployment, Capex, Capacity, Technology stock, Price

Parameter			Region		Unit	Time Horizon
Category	Variable	Industry	World	Japan		
GHG emissions	CO2 emissions	Power, Buildings, Industry, Transport, Other energy, Total	●	●	Mt	2020-2050
CO2 Removal	BECCS	Power, Industry	●	●	Mt	2020-2050
	DACS	Total	●	-	Mt	2020-2050
New Deployment	Electricity Generation	Power, Hydrogen	●	●	GW	2020-2050
	Vehicles	Transport	●	●	Vehicles (thousands)	2020-2050
	Heating systems	Buildings	●	●	% mix	2020-2050
	Battery capacity	Total	●	●	GWh	2020-2050
Capex	Electricity Generation	Power, Hydrogen	●	●	USD (million)	2020-2050
	Vehicles	Transport	●	●	USD (million)	2020-2050
	Heating systems	Buildings	●	●	USD (million)	2020-2050
Capacity	Electricity Generation	Power	●	●	GW	2020-2050
Technology Stock	Electricity Generation	Hydrogen	●	●	GW	2020-2050
	Vehicles	Transport	●	●	Vehicles (thousands)	2020-2050
	Heating systems	Buildings	●	●	% mix	2020-2050
Price	Battery	-	●	-	USD / kWh	2020-2050
	Nickel	-	●	-	USD / tonne	2020-2050
	Copper	-	●	-	USD / tonne	2020-2050
	Aluminum	-	●	-	USD / tonne	2020-2050
	Lithium	-	●	-	USD / tonne	2020-2050
	Cobalt	-	●	-	USD / tonne	2020-2050
	Coal	-	-	●	USD / tonne	2020-2050
	Carbon	-	-	●	USD / tCO2	2020-2050

Source : PRI, *IPR FPS 2021 Value Drivers Database*、*IPR 1.5°C RPS 2021 Value Drivers Database*、*IPR FPS + Nature 2023 Value Drivers* (As of February 2023)

List of FPS 2021 Energy Parameters

Electricity Generation, Production

Parameter			Region		Unit	Time Horizon
Category	Variable	Industry	World	Japan		
Electricity Generation	Coal	Power	●	●	TWh	2020-2050
	Coal CCS	Power	●	●	TWh	2020-2050
	Oil	Power	●	●	TWh	2020-2050
	Natural gas	Power	●	●	TWh	2020-2050
	Natural gas CCS	Power	●	●	TWh	2020-2050
	Nuclear	Power	●	●	TWh	2020-2050
	Hydrogen	Power	●	●	TWh	2020-2050
	Biomass	Power	●	●	TWh	2020-2050
	Biomass CCS	Power	●	●	TWh	2020-2050
	Solar	Power	●	●	TWh	2020-2050
	Onshore wind	Power	●	●	TWh	2020-2050
	Offshore wind	Power	●	●	TWh	2020-2050
	Hydrogen	Power	●	●	TWh	2020-2050
Production	Steel	Industry	●	●	Mt	2020-2050
	Cement	Industry	●	●	Mt	2020-2050
	Hydrogen	Industry	●	●	Mt	2020-2050
	Chemicals	Industry	●	●	Mt	2020-2050
	Aggregates	Industry	●	●	Mt	2020-2050
	Nickel	Industry	●	-	kt	2020-2050
	Copper	Industry	●	-	kt	2020-2050
	Aluminum	Industry	●	-	kt	2020-2050
	Lithium	Industry	●	-	kt	2020-2050
	Cobalt	Industry	●	-	kt	2020-2050

Source : PRI, *IPR FPS 2021 Value Drivers Database*、*IPR 1.5°C RPS 2021 Value Drivers Database*、*IPR FPS + Nature 2023 Value Drivers* (As of February 2023)

FPS 2021 Energy Parameters

Sector energy demand, Primary energy demand, Demand, Population, Price (high), Price (low)

Parameter			Region		Unit	Time Horizon
Category	Variable	Industry	World	Japan		
Sector energy demand	Oil	Power, Buildings, Transport, Industry, Non-energy use, Other energy	●	●	PJ	2020-2050
	Natural gas	Power, Buildings, Transport, Industry, Non-energy use, Other energy	●	●	PJ	2020-2050
	Coal	Power, Buildings, Industry, Non-energy use, Other energy	●	●	PJ	2020-2050
	Biomass	Power, Buildings, Transport, Industry, Other energy	●	●	PJ	2020-2050
	Electricity	Power, Buildings, Transport, Industry, Other energy	●	●	PJ	2020-2050
	Hydrogen	Power, Buildings, Transport, Industry, Other energy	●	●	PJ	2020-2050
Primary energy demand	Oil	Total	●	●	PJ	2020-2050
	Natural gas	Total	●	●	PJ	2020-2050
	Coal	Total	●	●	PJ	2020-2050
	Biomass	Total	●	●	PJ	2020-2050
Demand	Aviation	Transport	●	●	RTK(billion)	2020-2050
Population	-	Total	●	●	Million	2020-2050
Price (high)	Oil	-	●	-	USD / Barrel	2020-2050
Price (low)	Oil	-	●	-	USD / Barrel	2020-2050

Source : PRI, *IPR FPS 2021 Value Drivers Database*、*IPR 1.5°C RPS 2021 Value Drivers Database*、*IPR FPS + Nature 2023 Value Drivers* (As of February 2023)

List of FPS 2022 Land Use Parameters

Opex, Capex, Annual revenue

Parameter			Region		Unit	Time Horizon
Category	Variable	Industry	World	Japan		
Opex	Cropland-improve	Land use	●	-	USD 2021/ha/yr (average over project lifetime)	2020
	Forest-avoid	Land use	●	-	USD 2021/ha/yr (average over project lifetime)	2020
	Forest-plant	Land use	●	-	USD 2021/ha/yr (average over project lifetime)	2020
	Forest-restore	Land use	●	-	USD 2021/ha/yr (average over project lifetime)	2020
	Mangrove-restore	Land use	●	-	USD 2021/ha/yr (average over project lifetime)	2020
	Pasture-improve	Land use	●	-	USD 2021/ha/yr (average over project lifetime)	2020
	Peat-restore	Land use	●	-	USD 2021/ha/yr (average over project lifetime)	2020
Capex	Cropland-improve	Land use	●	-	USD 2021/ha	2020-2050
	Forest-avoid	Land use	●	-	USD 2021/ha	2020-2050
	Forest-plant	Land use	●	-	USD 2021/ha	2020-2050
	Forest-restore	Land use	●	-	USD 2021/ha	2020-2050
	Mangrove-restore	Land use	●	-	USD 2021/ha	2020-2050
	Pasture-improve	Land use	●	-	USD 2021/ha	2020-2050
	Peat-restore	Land use	●	-	USD 2021/ha	2020-2050
Annual Revenue	Cropland-improve	Land use	●	-	USD 2021	2020-2050
	Forest-avoid	Land use	●	-	USD 2021	2020-2050
	Forest-restore-plant	Land use	●	-	USD 2021	2020-2050
	Mangrove-restore	Land use	●	-	USD 2021	2020-2050
	Pasture-improve	Land use	●	-	USD 2021	2020-2050
	Peat-restore	Land use	●	-	USD 2021	2020-2050
	All NBS	Land use	●	-	USD 2021	2020-2050

Source : PRI, *IPR FPS 2021 Value Drivers Database*、*IPR 1.5°C RPS 2021 Value Drivers Database*、*IPR FPS + Nature 2023 Value Drivers* (As of February 2023)

List of FPS 2022 Land Use Parameters

Cumulative investment, Cumulative area

Parameter			Region		Unit	Time Horizon
Category	Variable	Industry	World	Japan		
Cumulative Investment	Cropland-improve	Land Use	●	-	USD 2021	2020-2050
	Forest-avoid	Land Use	●	-	USD 2021	2020-2050
	Forest-restore-plant	Land Use	●	-	USD 2021	2020-2050
	Mangrove-restore	Land Use	●	-	USD 2021	2020-2050
	Pasture-improve	Land Use	●	-	USD 2021	2020-2050
	Peat-restore	Land Use	●	-	USD 2021	2020-2050
	All NBS	Land Use	●	-	USD 2021	2020-2050
Cumulative area	Cropland-improve	Land Use	●	-	Mha	2020-2050
	Forest-avoid	Land Use	●	-	Mha	2020-2050
	Forest-restore-plant	Land Use	●	-	Mha	2020-2050
	Mangrove-restore	Land Use	●	-	Mha	2020-2050
	Pasture-improve	Land Use	●	-	Mha	2020-2050
	Peat-restore	Land Use	●	-	Mha	2020-2050
	All NBS	Land Use	●	-	Mha	2020-2050

Source : PRI, *IPR FPS 2021 Value Drivers Database*、*IPR 1.5°C RPS 2021 Value Drivers Database*、*IPR FPS + Nature 2023 Value Drivers* (As of February 2023)

List of FPS + Nature 2022 Land Use Parameters

CO2, Land price index, Opex, Price

Parameters			Region		Unit	Time Horizon
Category	Variable	Industry	World	Japan		
CO2	-	Land Use	●	-	Mt CO2/yr	2020-2050
Land price index	-	Land Use	●	-	Index（2020 = 100)	2020-2050
Opex	Cropland-improve	Land Use	●	-	USD 2021/ha/yr (average over project lifetime)	2020
	Forest-avoid	Land Use	●	-	USD 2021/ha/yr (average over project lifetime)	2020
	Forest-plant	Land Use	●	-	USD 2021/ha/yr (average over project lifetime)	2020
	Forest-restore	Land Use	●	-	USD 2021/ha/yr (average over project lifetime)	2020
	Mangrove-restore	Land Use	●	-	USD 2021/ha/yr (average over project lifetime)	2020
	Pasture-improve	Land Use	●	-	USD 2021/ha/yr (average over project lifetime)	2020
	Peat-restore	Land Use	●	-	USD 2021/ha/yr (average over project lifetime)	2020
Price	Coffee	Land Use	●	-	Index(2020 = 100)	2020-2050
	Cocoa	Land Use	●	-	Index(2020 = 100)	2020-2050
	Rubber	Land Use	●	-	Index(2020 = 100)	2020-2050
	Sugar cane	Land Use	●	-	Index(2020 = 100)	2020-2050
	Maize	Land Use	●	-	Index(2020 = 100)	2020-2050
	Oil palm fruit	Land Use	●	-	Index(2020 = 100)	2020-2050
	Temperate cereals	Land Use	●	-	Index(2020 = 100)	2020-2050
	Poultry meat	Land Use	●	-	Index(Animal meat average 2020＝100)	2020-2050
	Industrial roundwood	Land Use	●	-	Index(2020 = 100)	2020-2050
	Soybean	Land Use	●	-	Index(2020 = 100)	2020-2050
	Monogastric meat	Land Use	●	-	Index(Animal meat average 2020＝100)	2020-2050
	Ruminant meat	Land Use	●	-	Index(Animal meat average 2020＝100)	2020-2050
	Animal meat average	Land Use	●	-	Index(Animal meat average 2020＝100)	2020-2050
	Dairy	Land Use	●	-	Index (Dairy average 2020＝100) , Index (2020 = 100)	2020-2050
	Rice	Land Use	●	-	Index(2020 = 100)	2020-2050

Source : PRI, *IPR FPS 2021 Value Drivers Database*、*IPR 1.5°C RPS 2021 Value Drivers Database*、*IPR FPS + Nature 2023 Value Drivers* (As of February 2023)

List of FPS + Nature 2022 Land Use Parameters

Price index, Food price index, Production, Capex

Parameter			Region		Unit	Time Horizon
Category	Variable	Industry	World	Japan		
Price index	Second-generation	Land Use	●	-	Index(2020 = 100)	2020-2050
Food price index	-	Land Use	●	-	Index(2020 = 100)	2020-2050
Production	Coffee	Land Use	●	-	Mt DM/yr	2020-2050
	Cocoa	Land Use	●	-	Mt DM/yr	2020-2050
	Rubber	Land Use	●	-	Mt DM/yr	2020-2050
	Sugar cane	Land Use	●	-	Mt DM/yr	2020-2050
	Maize	Land Use	●	-	Mt DM/yr	2020-2050
	Oil palm fruit	Land Use	●	-	Mt DM/yr	2020-2050
	Temperate cereals	Land Use	●	-	Mt DM/yr	2020-2050
	Poultry meat	Land Use	●	-	Mt DM/yr	2020-2050
	Industrial roundwood	Land Use	●	-	Mm3/yr	2020-2050
	Soybean	Land Use	●	-	Mt DM/yr	2020-2050
	Second-generation	Land Use	●	-	EJ/yr	2020-2050
	Monogastric meat	Land Use	●	-	Mt DM/yr	2020-2050
	Ruminant meat	Land Use	●	-	Mt DM/yr	2020-2050
	Dairy	Land Use	●	-	Mt DM/yr	2020-2050
	Rice	Land Use	●	-	Mt DM/yr	2020-2050
Capex	Cropland-improve	Land Use	●	-	USD 2021/ha	2020-2050
	Forest-avoid	Land Use	●	-	USD 2021/ha	2020-2050
	Forest-plant	Land Use	●	-	USD 2021/ha	2020-2050
	Forest-restore	Land Use	●	-	USD 2021/ha	2020-2050
	Mangrove-restore	Land Use	●	-	USD 2021/ha	2020-2050
	Pasture-improve	Land Use	●	-	USD 2021/ha	2020-2050
	Peat-restore	Land Use	●	-	USD 2021/ha	2020-2050

Source : PRI, *IPR FPS 2021 Value Drivers Database*、*IPR 1.5°C RPS 2021 Value Drivers Database*、*IPR FPS + Nature 2023 Value Drivers* (As of February 2023)

List of FPS + Nature 2022 Land Use Parameter

Annual revenue, Average crop yields, Cumulative investment, Cumulative area

Parameter			Region		Unit	Time Horizon
Category	Variable	Industry	World	Japan		
Annual revenue	Cropland-improve	Land Use	●	-	USD21	2020-2050
	Forest-avoid	Land Use	●	-	USD21	2020-2050
	Forest-restore-plant	Land Use	●	-	USD21	2020-2050
	Mangrove-restore	Land Use	●	-	USD21	2020-2050
	Pasture-improve	Land Use	●	-	USD21	2020-2050
	Peat-restore	Land Use	●	-	USD21	2020-2050
	All NBS	Land Use	●	-	USD21	2020-2050
Average crop yields	-	Land Use	●	-	t DM/ha	2020-2050
Cumulative Investment	Cropland-improve	Land Use	●	-	USD21	2020-2050
	Forest-avoid	Land Use	●	-	USD21	2020-2050
	Forest-restore-plant	Land Use	●	-	USD21	2020-2050
	Mangrove-restore	Land Use	●	-	USD21	2020-2050
	Pasture-improve	Land Use	●	-	USD21	2020-2050
	Peat-restore	Land Use	●	-	USD21	2020-2050
	All NBS	Land Use	●	-	USD21	2020-2050
Cumulative Area	Cropland-improve	Land Use	●	-	Mha	2020-2050
	Forest-avoid	Land Use	●	-	Mha	2020-2050
	Forest-restore-plant	Land Use	●	-	Mha	2020-2050
	Mangrove-restore	Land Use	●	-	Mha	2020-2050
	Pasture-improve	Land Use	●	-	Mha	2020-2050
	Peat-restore	Land Use	●	-	Mha	2020-2050
	All NBS	Land Use	●	-	Mha	2020-2050

Source : PRI, *IPR FPS 2021 Value Drivers Database*、*IPR 1.5°C RPS 2021 Value Drivers Database*、*IPR FPS + Nature 2023 Value Drivers* (As of February 2023)

IPR Parameter

Tools related to “IPR Supply Chain Analysis 2022“

IPR Supply Chain Analysis 2022

Issuing Agency	Inevitable Policy Response	
Scenario	IPR FPS/IPR RPS/BAU ※R6/R7: IPR FPS only	
Time Horizon	2020−2050, every 5 years	
Item/ Use case	• R1：Commodity production • R2：Commodity global prices • R6：Upgrading Operation costs • R7：Commodity price premia	
	R1	1. Modeled after several policy scenarios and explores **the long-term trends** in global and regional productions 2. To assess the likelihood of downstream companies facing **chronic demand shift**
	R2	1. A **chronological study of price trends** in various policy scenarios 2. To analyze the impact of global price change on **downstream company`s business models**
	R6	1. To assess the **total cost of operational improvements** that downstream firms must bear to reduce deforestation
	R7	1. To evaluate the **sum of the prices** that downstream firms must pay to **procure goods that internalize the cost of deforestation** using the Price Premier Value Driver

R1/R6：List of available parameters

Category	Region
Soybean Beef Palm oil Timber Cocoa Coffee Rubber	• SEA：Southeast Asia • ANZ：Australia and NZ • CHA：China, Korean Democratic People`s Republic, Taiwan, HK, and Macau • EUR：West Europe • NEU：North Europe • IND：India • DEA：Japan and Korea • MEA：Middle East Asia • CAN：Canada, Saint Pierre and Miquelon • TLA：Tropical Latin America • USA：USA • REF：East Europe • RUS：Russia • SAS：South Asia • SCO：Latin America`s Southern Cone • BRA：Brazil • TAF：Tropical Africa • SAF：Southern Africa

R2/R7：List of available parameters

Category	Region
Same as above	• Global

Source : IPR, *IPR Supply Chain Analysis 2022 Value drivers*, https://www.unpri.org/download?ac=17317 (October 2022)

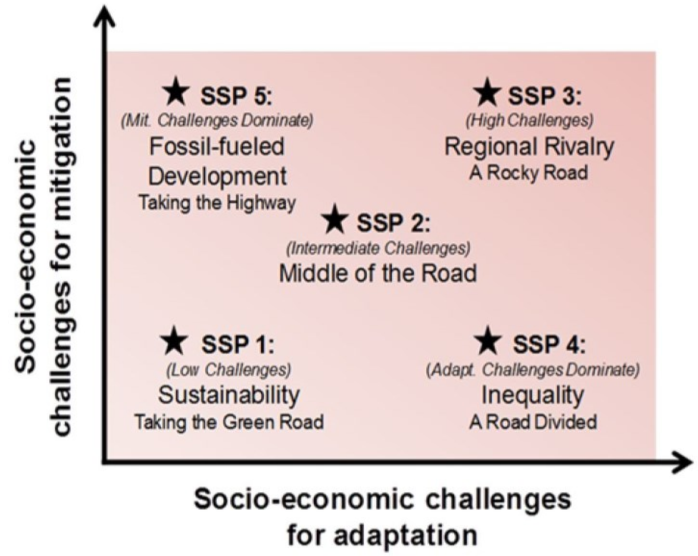
Overview of SSP（Shared Socioeconomic Pathways）

SSP was developed as a socio-economic scenario based on recent policies and socio-economic environment

- Based on the issues of the socio-economic scenario “SRES” related to the evaluation of existing climate change, National Institute for Environmental Studies（Japan）, PNNL（US）, PBL（Netherland）, IIASA（Austria）and Germany（PIK）has developed **SSP**[*1]
  - SPES has problems such as the old base year (1990) and the inability to reflect recent policies
  - SSP considers recent changes in the external environment such as **recent policies, vital statistics, GDP, and urbanization**[*2], and has relevance to existing socio-economic scenarios such as "SERS" and "RCPs". Developed as a scenario. It consists of 5 scenarios

5 Scenario Composition of SSP

SSP	Scenario	Scenario Outline[*3]
SSP1	Sustainability	A scenario that assumes the realization of both international mitigation measures and adaptation measures related to climate change
SSP2	Middle of the Road	A scenario that assumes that the current socio-economic growth will continue
SSP3	Regional Rivalry	A scenario that assumes a situation where the country is divided, and it is difficult to realize international mitigation measures and adaptation measures
SSP4	Inequality	A scenario that assumes an international economic society with widening disparities
SSP5	Fossil-fueled Development	A scenario that assumes that the international community will develop depending on fossil fuels



*1： https://www.nies.go.jp/whatsnew/20170221/20170221.html 、*2： https://unfccc.int/sites/default/files/part1_iiasa_rogelj_ssp_poster.pdf
*3： https://www.carbonbrief.org/explainer-how-shared-socioeconomic-pathways-explore-future-climate-change

Source : SSP, *SSP Public Database Version2.0* (As of February 2024)

List of SSP Public Database Version2.0 Parameters（1/10）

IAM Scenarios Model：GDP, Population, Primary Energy, Secondary Energy (Electricity)

Category			Unit	SSP					Remark
Large	Medium	Small		SSP1	SSP2	SSP3	SSP4	SSP5	
GDP	PPP	—	billionUS$2005/yr	○	○	○	○	○	
Population	Population	—	million	○	○	○	○	○	
Energy	Primary Energy	Total	EJ/yr	○	○	○	○	○	
Energy	Primary Energy	Biomass(Total / Traditional / with CCS/ without CCS)	EJ/yr	○	○	△	○	○	Some data（Traditional, CCS）is not available in SSP3
Energy	Primary Energy	Coal (Total / with CCS /without CCS)	EJ/yr	○	○	△	○	○	Some data（CCS）is not available in SSP3
Energy	Primary Energy	Oil (Total / with CCS / wihout CCS)	EJ/yr	○	△	△	○	△	Some data（CCS）is not available in SSP2,3,5
Energy	Primary Energy	Gas (Total / with CCS/ without CCS)	EJ/yr	○	○	△	○	○	Some data（CCS）is not available in SSP3
Energy	Primary Energy	Fossil (Total , with CCS, wihout CCS)	EJ/yr	○	○	△	○	○	Some data（CCS）is not available in SSP3
Energy	Primary Energy	Nuclear	EJ/yr	○	○	○	○	○	
Energy	Primary Energy	Non-Biomass Renewables	EJ/yr	○	○	○	○	○	
Energy	Primary Energy	Hydro	EJ/yr	○	○	○	○	○	
Energy	Primary Energy	Geothermal	EJ/yr	-	○	○	○	○	Data is not available in SSP1
Energy	Primary Energy	Other	EJ/yr	○	○	○	-	-	Data is not available in SSP4,5
Energy	Primary Energy	Solar	EJ/yr	○	○	○	○	○	
Energy	Primary Energy	Wind	EJ/yr	○	○	○	○	○	
Energy	Primary Energy	Secondary Energy Trade	EJ/yr	-	-	○	-	-	Data is not available in SSP1,2,4,5
Energy	Secondary Energy (Electricity)	Total	EJ/yr	○	○	○	○	○	
Energy	Secondary Energy (Electricity)	Biomass(Total / with CCS/ without CCS)	EJ/yr	○	○	△	○	○	Some data（CCS）is not available in SSP3
Energy	Secondary Energy (Electricity)	Coal (Total / with CCS /without CCS)	EJ/yr	○	○	△	○	○	Some data（CCS）is not available in SSP3
Energy	Secondary Energy (Electricity)	Oil	EJ/yr	○	○	○	○	○	
Energy	Secondary Energy (Electricity)	Gas (Total / with CCS/ without CCS)	EJ/yr	○	○	△	○	○	Some data（CCS）is not available in SSP3
Energy	Secondary Energy (Electricity)	Geothermal	EJ/yr	△	○	○	○	○	Data is not available in SSP1
Energy	Secondary Energy (Electricity)	Hydro	EJ/yr	○	○	○	○	○	
Energy	Secondary Energy (Electricity)	Non-Biomass Renewables	EJ/yr	○	○	○	○	○	
Energy	Secondary Energy (Electricity)	Nuclear	EJ/yr	○	○	○	○	○	
Energy	Secondary Energy (Electricity)	Solar	EJ/yr	○	○	○	○	○	
Energy	Secondary Energy (Electricity)	Wind	EJ/yr	○	○	○	○	○	

※Extract parameters for which Global values can be obtained
※2005, 2010~2100, data is available for each 10 years

Source : SSP, *SSP Public Database Version2.0* (As of February 2024)

List of SSP Public Database Version2.0 Parameters（2/10）

IAM Scenarios Model：Secondary Energy, Final Energy

Category			Unit	SSP					Remark
Large	Medium	Small		SSP1	SSP2	SSP3	SSP4	SSP5	
Energy	Secondary Energy (Gases)	Total	EJ/yr	○	○	○	○	○	
Energy	Secondary Energy (Gases)	Biomass	EJ/yr	-	○	-	○	○	Data is not available in SSP1,3
Energy	Secondary Energy (Gases)	Coal	EJ/yr	-	○	-	○	○	Data is not available in SSP1,3
Energy	Secondary Energy (Gases)	Natural Gas	EJ/yr	○	○	○	○	○	
Energy	Secondary Energy (Heat)	Total	EJ/yr	-	○	○	-	○	Data is not available in SSP1,4
Energy	Secondary Energy (Heat)	Geothermal	EJ/yr	-	○	○	-	○	Data is not available in SSP1,4
Energy	Secondary Energy (Hydrogen)	Total	EJ/yr	○	○	-	○	○	Data is not available in SSP3
Energy	Secondary Energy (Hydrogen)	Biomass(Total / with CCS/ without CCS)	EJ/yr	○	○	-	○	○	Data is not available in SSP3
Energy	Secondary Energy (Hydrogen)	Electricity	EJ/yr	○	○	-	○	○	Data is not available in SSP3
Energy	Secondary Energy (Liquids)	Total	EJ/yr	○	○	○	○	○	
Energy	Secondary Energy (Liquids)	Biomass(Total / with CCS/ without CCS)	EJ/yr	△	○	△	○	○	Some data（CCS）is not available in SSP1,（CCU・without CCU）is not available in SSP1
Energy	Secondary Energy (Liquids)	Coal (Total / with CCS /without CCS)	EJ/yr	-	○	-	-	○	Data is not available in SSP1,3,4
Energy	Secondary Energy (Liquids)	Gas (Total / with CCS/ without CCS)	EJ/yr	-	○	-	-	-	Data is not available in SSP1,3,4,5
Energy	Secondary Energy (Liquids)	Oil	EJ/yr	○	○	○	○	○	
Energy	Secondary Energy (Solids)	—	EJ/yr	○	○	-	-	○	Data is not available in SSP3,4
Energy	Final Energy	Total	EJ/yr	○	○	○	○	○	
Energy	Final Energy	Electricity	EJ/yr	○	○	○	○	○	
Energy	Final Energy	Gases	EJ/yr	○	○	○	○	○	
Energy	Final Energy	Heat	EJ/yr	○	○	○	○	○	
Energy	Final Energy	Hydrogen	EJ/yr	○	○	-	○	○	Data is not available in SSP3
Energy	Final Energy	Liquids	EJ/yr	○	○	○	○	○	
Energy	Final Energy	Solar	EJ/yr	○	○	-	-	-	Data is not available in SSP3,4,5
Energy	Final Energy (Solids)	Total	EJ/yr	○	○	○	○	○	
Energy	Final Energy (Solids)	Biomass (Total, Traditional)	EJ/yr	○	○	△	○	○	Some data（Traditional）is not available in SSP3
Energy	Final Energy (Solids)	Coal	EJ/yr	○	○	○	○	○	
Energy	Final Energy	Industry	EJ/yr	○	○	○	○	-	Data is not available in SSP5
Energy	Final Energy	Residential and Commercial	EJ/yr	○	○	○	○	-	Data is not available in SSP5
Energy	Final Energy	Transportation	EJ/yr	○	○	○	○	○	

※Extract parameters for which Global values can be obtained
※2005, 2010~2100, data is available for each 10 years

Source : SSP, *SSP Public Database Version2.0* (As of February 2024)

List of SSP Public Database Version2.0 Parameters（3/10）

IAM Scenarios Model : Energy Service (Transportation), Land Cover, Emissions（unharmonized）

Category			Unit	SSP					Remark
Large	Medium	Small		SSP1	SSP2	SSP3	SSP4	SSP5	
Energy	Energy Service (Transportation)	Freight	bn tkm/yr	○	-	-	○	○	Data is not available in SSP2,3
Energy	Energy Service (Transportation)	Passenger	bn pkm/yr	○	-	-	○	○	Data is not available in SSP2,3
Land Cover	Built-up Area	—	million ha	○	-	○	○	○	Data is not available in SSP2
Land Cover	Cropland	—	million ha	○	○	○	○	○	
Land Cover	Forest	—	million ha	○	○	○	○	○	
Land Cover	Pasture	—	million ha	○	○	○	○	○	
Emissions (unharmonized)	BC	—	Mt BC/yr	○	○	○	○	○	
Emissions (unharmonized)	CH4	Total	Mt CH4/yr	○	○	○	○	○	
Emissions (unharmonized)	CH4	Fossil Fuels and Industry	Mt CH4/yr	-	-	-	○	○	Data is not available in SSP1,2,3
Emissions (unharmonized)	CH4	Land Use	Mt CH4/yr	○	○	○	○	○	
Emissions (unharmonized)	CO	—	Mt CO/yr	○	○	○	○	○	
Emissions (unharmonized)	CO2	Total	Mt CO2/yr	○	○	○	○	○	
Emissions (unharmonized)	CO2 (Carbon Capture and Storage)	Total	Mt CO2/yr	○	○	-	○	○	Data is not available in SSP3
Emissions (unharmonized)	CO2 (Carbon Capture and Storage)	Biomass	Mt CO2/yr	○	○	-	○	○	Data is not available in SSP3
Emissions (unharmonized)	CO2	Fossil Fuels and Industry	Mt CO2/yr	○	○	○	○	○	
Emissions (unharmonized)	CO2	Land Use	Mt CO2/yr	○	○	○	○	○	
Emissions (unharmonized)	F-Gases	—	Mt CO2-equiv/yr	○	○	○	○	○	
Emissions (unharmonized)	Kyoto Gases	—	Mt CO2-equiv/yr	○	○	○	○	○	
Emissions (unharmonized)	N2O	Total	kt N2O / yr	○	○	○	○	○	
Emissions (unharmonized)	N2O	Land Use	kt N2O / yr	○	○	○	○	○	
Emissions (unharmonized)	NH3	—	Mt NH3/yr	○	○	○	○	○	
Emissions (unharmonized)	NOx	—	Mt NO2/yr	○	○	○	○	○	
Emissions (unharmonized)	OC	—	Mt OC/yr	○	○	○	○	○	
Emissions (unharmonized)	Sulfur	—	Mt SO2/yr	○	○	○	○	○	
Emissions (unharmonized)	VOC	—	Mt VOC/yr	○	○	○	○	○	

※Extract parameters for which Global values can be obtained
※2005, 2010~2100, data is available for each 10 years

Source : SSP, *SSP Public Database Version2.0* (As of February 2024)

List of SSP Public Database Version2.0 Parameters（4/10）

IAM Scenarios Model : Emissions (harmonized), Climate

Category			Unit	SSP					Remark
Large	Medium	Small		SSP1	SSP2	SSP3	SSP4	SSP5	
Emissions (harmonized)	BC	—	Mt BC/yr	-	-	○	-	○	Data is not available in SSP1,2,4
Emissions (harmonized)	CH4	Total	Mt CH4/yr	-	-	○	-	○	Data is not available in SSP1,2,4
Emissions (harmonized)	CH4	Fossil Fuels and Industry	Mt CH4/yr	-	-	○	-	○	Data is not available in SSP1,2,4
Emissions (harmonized)	CH4	Land Use	Mt CH4/yr	-	-	○	-	○	Data is not available in SSP1,2,4
Emissions (harmonized)	CO	—	Mt CO/yr	-	-	○	-	○	Data is not available in SSP1,2,4
Emissions (harmonized)	CO2	Total	Mt CO2/yr	-	-	○	-	○	Data is not available in SSP1,2,4
Emissions (harmonized)	CO2	Fossil Fuels and Industry	Mt CO2/yr	-	-	○	-	○	Data is not available in SSP1,2,4
Emissions (harmonized)	CO2	Land Use	Mt CO2/yr	-	-	○	-	○	Data is not available in SSP1,2,4
Emissions (harmonized)	F-Gases	—	Mt CO2-equiv/yr	-	-	○	-	○	Data is not available in SSP1,2,4
Emissions (harmonized)	Kyoto Gases	—	Mt CO2-equiv/yr	-	-	○	-	○	Data is not available in SSP1,2,4
Emissions (harmonized)	N2O	—	kt N2O/yr	-	-	○	-	○	Data is not available in SSP1,2,4
Emissions (harmonized)	NH3	—	Mt NH3/yr	-	-	○	-	○	Data is not available in SSP1,2,4
Emissions (harmonized)	NOx	—	Mt NO2/yr	-	-	○	-	○	Data is not available in SSP1,2,4
Emissions (harmonized)	OC	—	Mt OC/yr	-	-	○	-	○	Data is not available in SSP1,2,4
Emissions (harmonized)	Sulfur	—	Mt SO2/yr	-	-	○	-	○	Data is not available in SSP1,2,4
Emissions (harmonized)	VOC	—	Mt VOC/yr	-	-	○	-	○	Data is not available in SSP1,2,4
Climate	Concentration	CO2	ppm	○	○	○	○	○	
Climate	Concentration	CH4	ppb	○	○	○	○	○	
Climate	Concentration	N2O	ppb	○	○	○	○	○	
Climate	Forcing	Total	W/m2	○	○	○	○	○	
Climate	Forcing	CO2	W/m2	○	○	○	○	○	
Climate	Forcing	CH4	W/m2	○	○	○	○	○	
Climate	Forcing	N2O	W/m2	○	○	○	○	○	
Climate	Forcing	Kyoto Gases	W/m2	○	○	○	○	○	
Climate	Forcing	F-Gases	W/m2	○	○	○	○	○	
Climate	Forcing	Aerosol	W/m2	○	○	○	○	○	
Climate	Temperature	Global Mean	℃	○	○	○	○	○	

※Extract parameters for which Global values can be obtained
※2005, 2010~2100, data is available for each 10 years

Source : SSP, *SSP Public Database Version2.0* (As of February 2024)

List of SSP Public Database Version2.0 Parameters（5/10）

IAM Scenarios Model：Agricultural Indicators, Economic Indicators, Technological Indicators

Category			Unit	SSP					Remark
Large	Medium	Small		SSP1	SSP2	SSP3	SSP4	SSP5	
Agricultural Indicators	Demand	Crops	million t DM/yr	○	○	○	-	-	Data is not available in SSP4,5
Agricultural Indicators	Demand	Crops (Energy)	million t DM/yr	-	-	○	-	○	Data is not available in SSP1,2,4
Agricultural Indicators	Demand	Livestock	million t DM/yr	○	○	○	-	○	Data is not available in SSP4
Agricultural Indicators	Production	Crops (Energy)	million t DM/yr	○	○	○	○	○	
Agricultural Indicators	Production	Crops (Non-Energy)	million t DM/yr	○	○	○	○	○	
Agricultural Indicators	Production	Livestock	million t DM/yr	○	○	○	○	○	
Economic Indicators	Consumption	—	billion US$2005/yr	○	○	○	-	○	Data is not available in SSP4
Economic Indicators	Price (Carbon)	—	US$2005/t CO2	○	○	-	○	○	Data is not available in SSP3
Technological Indicators	Capacity (Electricity)	Total	GW	○	○	○	○	○	
Technological Indicators	Capacity (Electricity)	Biomass	GW	○	○	○	○	○	
Technological Indicators	Capacity (Electricity)	Coal	GW	○	○	○	○	○	
Technological Indicators	Capacity (Electricity)	Gas	GW	○	○	○	○	○	
Technological Indicators	Capacity (Electricity)	Geothermal	GW	-	○	○	○	○	Data is not available in SSP1
Technological Indicators	Capacity (Electricity)	Hydro	GW	○	○	○	-	○	Data is not available in SSP4
Technological Indicators	Capacity (Electricity)	Nuclear	GW	○	○	○	○	○	
Technological Indicators	Capacity (Electricity)	Oil	GW	○	○	○	○	-	Data is not available in SSP5
Technological Indicators	Capacity (Electricity)	Other	GW	○	-	-	-	-	Data is not available in SSP2,3,4,5
Technological Indicators	Capacity (Electricity)	Solar (Total, CSP, PV)	GW	○	○	△	△	○	Data is not available in SSP3（CSP）, and SSP4（CSP, PV）
Technological Indicators	Capacity (Electricity)	Wind (Total, Offshore, Onshore)	GW	○	○	△	△	△	Data is not available in SSP3（Onshore）, and SSP4,5（Onshore, Offshore）

※Extract parameters for which Global values can be obtained
※2005, 2010~2100, data is available for each 10 years

Source : SSP, *SSP Public Database Version2.0* (As of February 2024)

List of SSP Public Database Version2.0 Parameters（6/10）

CMIP6 Emissions Model：BC, C2F6, CF4, CH4

Category		Unit	SSP					Remark
Large	Medium		SSP1	SSP2	SSP3	SSP4	SSP5	
BC	Agricultural Waste Burning	Mt BC/yr	○	○	○	○	○	
BC	Aircraft	Mt BC/yr	○	○	○	○	○	
BC	Energy Sector	Mt BC/yr	○	○	○	○	○	
BC	Forest Burning	Mt BC/yr	○	○	○	○	○	
BC	Grassland Burning	Mt BC/yr	○	○	○	○	○	
BC	Industrial Sector	Mt BC/yr	○	○	○	○	○	
BC	International Shipping	Mt BC/yr	○	○	○	○	○	
BC	Peat Burning	Mt BC/yr	○	○	○	○	○	
BC	Residential Commercial Other	Mt BC/yr	○	○	○	○	○	
BC	Transportation Sector	Mt BC/yr	○	○	○	○	○	
BC	Total	Mt BC/yr	○	○	○	○	○	
BC	Waste	Mt BC/yr	○	○	○	○	○	
C2F6	—	kt C2F6/yr	○	○	○	○	○	
CF4	—	kt CF4/yr	○	○	○	○	○	
CH4	Agricultural Waste Burning	Mt CH4/yr	○	○	○	○	○	
CH4	Agriculture	Mt CH4/yr	○	○	○	○	○	
CH4	Energy Sector	Mt CH4/yr	○	○	○	○	○	
CH4	Forest Burning	Mt CH4/yr	○	○	○	○	○	
CH4	Grassland Burning	Mt CH4/yr	○	○	○	○	○	
CH4	Industrial Sector	Mt CH4/yr	○	○	○	○	○	
CH4	International Shipping	Mt CH4/yr	○	○	○	○	○	
CH4	Peat Burning	Mt CH4/yr	○	○	○	○	○	
CH4	Residential Commercial Other	Mt CH4/yr	○	○	○	○	○	
CH4	Transportation Sector	Mt CH4/yr	○	○	○	○	○	
CH4	Total	Mt CH4/yr	○	○	○	○	○	
CH4	Waste	Mt CH4/yr	○	○	○	○	○	

Source : SSP, *SSP Public Database Version2.0* (As of February 2024)

※Extract parameters for which Global values can be obtained
※2005, 2010~2100, data is available for each 10 years

List of SSP Public Database Version2.0 Parameters（7/10）

CMIP6 Emissions Model：CO2, CO, HFC, N2O

Categoryhgac		Unit	SSP					Remark
Large	Medium		SSP1	SSP2	SSP3	SSP4	SSP5	
CO2	AFOLU	Mt CO2/yr	○	○	○	○	○	
CO2	Aircraft	Mt CO2/yr	○	○	○	○	○	
CO2	Energy Sector	Mt CO2/yr	○	○	○	○	○	
CO2	Industrial Sector	Mt CO2/yr	○	○	○	○	○	
CO2	International Shipping	Mt CO2/yr	○	○	○	○	○	
CO2	Residential Commercial Other	Mt CO2/yr	○	○	○	○	○	
CO2	Solvents Production and Application	Mt CO2/yr	○	○	○	○	○	
CO2	Transportation Sector	Mt CO2/yr	○	○	○	○	○	
CO2	Total	Mt CO2/yr	○	○	○	○	○	
CO2	Waste	Mt CO2/yr	○	○	○	○	○	
CO	Agricultural Waste Burning	Mt CO/yr	○	○	○	○	○	
CO	Aircraft	Mt CO/yr	○	○	○	○	○	
CO	Energy Sector	Mt CO/yr	○	○	○	○	○	
CO	Forest Burning	Mt CO/yr	○	○	○	○	○	
CO	Grassland Burning	Mt CO/yr	○	○	○	○	○	
CO	Industrial Sector	Mt CO/yr	○	○	○	○	○	
CO	International Shipping	Mt CO/yr	○	○	○	○	○	
CO	Peat Burning	Mt CO/yr	○	○	○	○	○	
CO	Residential Commercial Other	Mt CO/yr	○	○	○	○	○	
CO	Transportation Sector	Mt CO/yr	○	○	○	○	○	
CO	Total	Mt CO/yr	○	○	○	○	○	
CO	Waste	Mt CO/yr	○	○	○	○	○	
HFC	—	Mt CO2-equiv/yr	○	○	○	○	○	
N2O	—	kt N2O/yr	○	○	○	○	○	

※Extract parameters for which Global values can be obtained
※2005, 2010~2100, data is available for each 10 years

Source : SSP, *SSP Public Database Version2.0* (As of February 2024)

List of SSP Public Database Version2.0 Parameters（8/10）

CMIP6 Emissions Model：NH3, Nox

Category		Unit	SSP					Remark
Large	Medium		SSP1	SSP2	SSP3	SSP4	SSP5	
NH3	Agricultural Waste Burning	Mt NH3/yr	○	○	○	○	○	
NH3	Agriculture	Mt NH3/yr	○	○	○	○	○	
NH3	Aircraft	Mt NH3/yr	○	○	○	○	○	
NH3	Energy Sector	Mt NH3/yr	○	○	○	○	○	
NH3	Forest Burning	Mt NH3/yr	○	○	○	○	○	
NH3	Grassland Burning	Mt NH3/yr	○	○	○	○	○	
NH3	Industrial Sector	Mt NH3/yr	○	○	○	○	○	
NH3	International Shipping	Mt NH3/yr	○	○	○	○	○	
NH3	Peat Burning	Mt NH3/yr	○	○	○	○	○	
NH3	Residential Commercial Other	Mt NH3/yr	○	○	○	○	○	
NH3	Transportation Sector	Mt NH3/yr	○	○	○	○	○	
NH3	Total	Mt NH3/yr	○	○	○	○	○	
NH3	Waste	Mt NH3/yr	○	○	○	○	○	
Nox	Agricultural Waste Burning	Mt NOx/yr	○	○	○	○	○	
Nox	Agriculture	Mt NOx/yr	○	○	○	○	○	
Nox	Aircraft	Mt NOx/yr	○	○	○	○	○	
Nox	Energy Sector	Mt NOx/yr	○	○	○	○	○	
Nox	Forest Burning	Mt NOx/yr	○	○	○	○	○	
Nox	Grassland Burning	Mt NOx/yr	○	○	○	○	○	
Nox	Industrial Sector	Mt NOx/yr	○	○	○	○	○	
Nox	International Shipping	Mt NOx/yr	○	○	○	○	○	
Nox	Peat Burning	Mt NOx/yr	○	○	○	○	○	
Nox	Residential Commercial Other	Mt NOx/yr	○	○	○	○	○	
Nox	Solvents Production and Application	Mt NOx/yr	○	○	○	○	○	
Nox	Transportation Sector	Mt NOx/yr	○	○	○	○	○	
Nox	Total	Mt NOx/yr	○	○	○	○	○	
Nox	Waste	Mt NOx/yr	○	○	○	○	○	

※Extract parameters for which Global values can be obtained
※2005, 2010~2100, data is available for each 10 years

Source : SSP, *SSP Public Database Version2.0* (As of February 2024)

List of SSP Public Database Version2.0 Parameters（9/10）

CMIP6 Emissions Model：OC, SF6, Sulfur

Category		Unit	SSP					Remark
Large	Medium		SSP1	SSP2	SSP3	SSP4	SSP5	
OC	Agricultural Waste Burning	Mt OC/yr	○	○	○	○	○	
OC	Aircraft	Mt OC/yr	○	○	○	○	○	
OC	Energy Sector	Mt OC/yr	○	○	○	○	○	
OC	Forest Burning	Mt OC/yr	○	○	○	○	○	
OC	Grassland Burning	Mt OC/yr	○	○	○	○	○	
OC	Industrial Sector	Mt OC/yr	○	○	○	○	○	
OC	International Shipping	Mt OC/yr	○	○	○	○	○	
OC	Peat Burning	Mt OC/yr	○	○	○	○	○	
OC	Residential Commercial Other	Mt OC/yr	○	○	○	○	○	
OC	Transportation Sector	Mt OC/yr	○	○	○	○	○	
OC	Total	Mt OC/yr	○	○	○	○	○	
OC	Waste	Mt OC/yr	○	○	○	○	○	
SF6	—	kt SF6/yr	○	○	○	○	○	
Sulfur	Agricultural Waste Burning	Mt SO2/yr	○	○	○	○	○	
Sulfur	Aircraft	Mt SO2/yr	○	○	○	○	○	
Sulfur	Energy Sector	Mt SO2/yr	○	○	○	○	○	
Sulfur	Forest Burning	Mt SO2/yr	○	○	○	○	○	
Sulfur	Grassland Burning	Mt SO2/yr	○	○	○	○	○	
Sulfur	Industrial Sector	Mt SO2/yr	○	○	○	○	○	
Sulfur	International Shipping	Mt SO2/yr	○	○	○	○	○	
Sulfur	Peat Burning	Mt SO2/yr	○	○	○	○	○	
Sulfur	Residential Commercial Other	Mt SO2/yr	○	○	○	○	○	
Sulfur	Transportation Sector	Mt SO2/yr	○	○	○	○	○	
Sulfur	Total	Mt SO2/yr	○	○	○	○	○	
Sulfur	Waste	Mt SO2/yr	○	○	○	○	○	

※Extract parameters for which Global values can be obtained
※2005, 2010~2100, data is available for each 10 years

Source : SSP, *SSP Public Database Version2.0* (As of February 2024)

List of SSP Public Database Version2.0 Parameters（10/10）

CMIP6 Emissions Model：VOC

Category		Unit	SSP					Remark
Large	Medium		SSP1	SSP2	SSP3	SSP4	SSP5	
VOC	Agricultural Waste Burning	Mt VOC/yr	○	○	○	○	○	
VOC	Aircraft	Mt VOC/yr	○	○	○	○	○	
VOC	Energy Sector	Mt VOC/yr	○	○	○	○	○	
VOC	Forest Burning	Mt VOC/yr	○	○	○	○	○	
VOC	Grassland Burning	Mt VOC/yr	○	○	○	○	○	
VOC	Industrial Sector	Mt VOC/yr	○	○	○	○	○	
VOC	International Shipping	Mt VOC/yr	○	○	○	○	○	
VOC	Peat Burning	Mt VOC/yr	○	○	○	○	○	
VOC	Residential Commercial Other	Mt VOC/yr	○	○	○	○	○	
VOC	Solvents Production and Application	Mt VOC/yr	○	○	○	○	○	
VOC	Transportation Sector	Mt VOC/yr	○	○	○	○	○	
VOC	Total	Mt VOC/yr	○	○	○	○	○	
VOC	Waste	Mt VOC/yr	○	○	○	○	○	

Source : SSP, *SSP Public Database Version2.0* (As of February 2024)

※Extract parameters for which Global values can be obtained
※2005, 2010~2100, data is available for each 10 years

Table of contents

Main Part

Appendix

Physical risk tools used in past projects (excerpt)

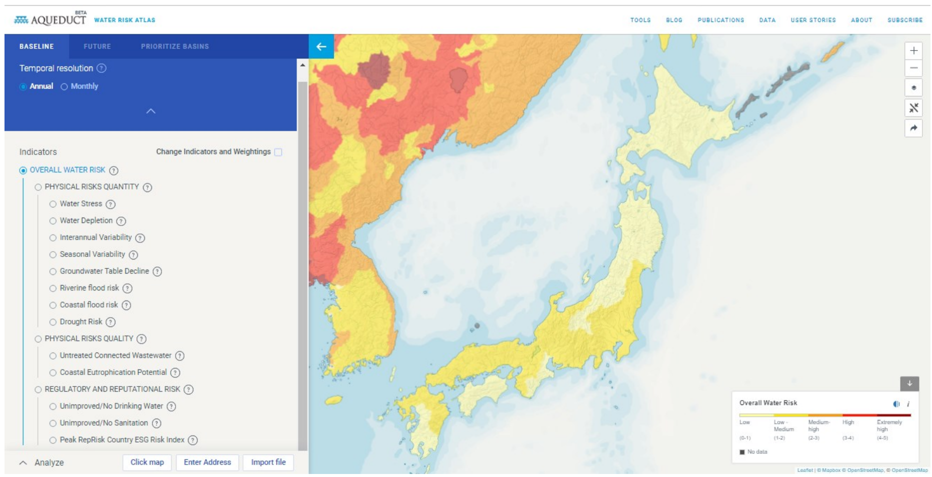
#	Issuing Agency	Tool Name	URL	Subject region	Explanation related page
1	World Resources Institute (WRI)	Aqueduct Water Risk Atlas	https://www.wri.org/aqueduct	Global	5-108
2	World Bank	Climate Change Knowledge Portal	https://climateknowledgeportal.worldbank.org/	Global	5-110
3	AP-PLAT	Climate Impact Viewer	https://a-plat.nies.go.jp/ap-plat/asia_pacific/index.html	Asia	5-111
4	A-PLAT	Web GIS	https://adaptation-platform.nies.go.jp/webgis/index.html	Japan	5-112～5-122
5	European Commission	European Climate Adaptation Platform （Climate-ADAPT）	https://climate-adapt.eea.europa.eu/	EU	- ※European Adaptation Platform
6	IPCC TGICA	IPCC Data Distribution Centre	https://www.ipcc-data.org/	Global	- ※Database of the Intergovernmental Panel on Climate Change (IPCC)
7	FAO	The future of food and agriculture Alternative pathways to 2050	https://www.fao.org/global-perspectives-studies/food-agriculture-projections-to-2050/en/	Global	-

Physical risk tools used in past projects (excerpt)：Parameter

AQUEDUCT Water Risk Atlas (WRI)

AQUEDUCT Water Risk Atlas

Issuing Agency	**World Resource Institution**
Scenario	**Pessimistic / Business as usual / Optimistic**
Time Horizon	**Baseline / 2030ー2040**



List of available parameters

Indicators （Current）	
Physical Risks （Quantity）	• Water Stress • Water Depletion • Interannual Variability • Seasonal Variability • Groundwater Table Decline • Riverine flood risk／Coastal flood risk • Drought Risk
Physical Risks （Quality）	• Untreated Connected Wastewater • Coastal Eutrophication Potential
Regulatory and Reputational Risk	• Unimproved/No Drinking Water • Unimproved/No Sanitation • Peak RepRisk Country ESG Risk Index

Indicators （2030-2040）
• Water Stress • Seasonal Variability • Water Supply • Water Demand

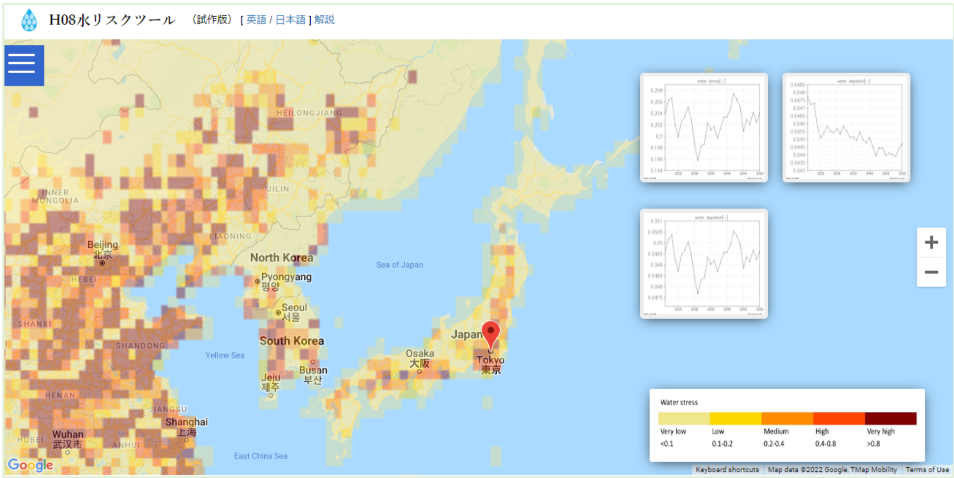
Source : WRI, *AQUEDUCT Water Risk Atlas,* https://www.wri.org/applications/aqueduct/water-risk-atlas/#/?advanced=false&basemap=hydro&indicator=w_awr_def_tot_cat&lat=30&lng=-80&mapMode=view&month=1&opacity=0.5&ponderation=DEF&predefined=false&projection=absolute&scenario=optimistic&scope=baseline&timeScale=annual&year=baseline&zoom=3 (As of February 2024)

(Reference) Physical risk tools (excerpt): Parameter

H08 Water Risk Tool（National Institute for Environmental Studies）

H08 Water Risk Tool

Issuing agency	**National Institute for Environmental Studies**
Scenario	**RCP2.6（2℃ increase）/ RCP7.0（3℃increase）/ RCP8.5（4℃ increase）**
Time Horizon	**1901ー2090 (Selected per year)**



Results from the H08 water risk tool can also be compared with results from other tools, such as Aqueduct, to enhance analysis and improve the reliability of information on the tightness of water resources.

List of available parameters

Indicators（map）	
Climate Model	• GFDL-ESM4 • MPI-ESM1-2-HR • IPSL-CM6A-LR • MRI-ESM2-0 • UKESM1-0-LL • Ensemble（Average of the above five models）
Water stress index	• Water stress • Water depletion • Interannual variability • Seasonal variability • Groundwater level decline • Possible sustainable water intake
Basic variables	• Total water withdrawal • Annual river discharge（water resources） • Water intake from sustainable water sources

Indicators（Time series）
• Specify the location on map • Specify the location from the name of place • Specify the location from the latitude and longitude

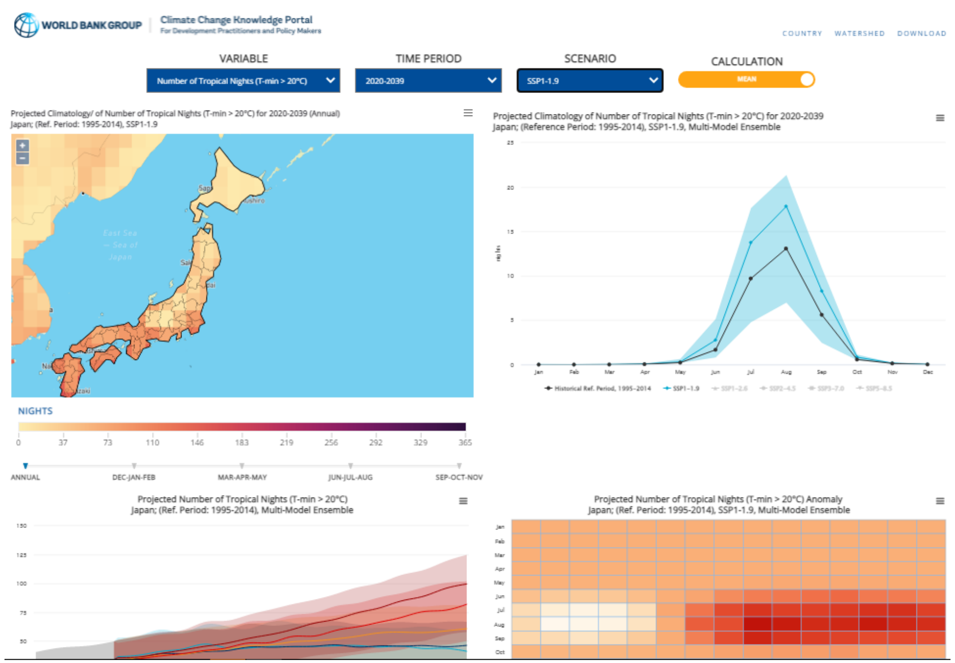
Source : *H08 Water Risk Tool* , https://h08.nies.go.jp/~ddc/cgi-bin/viewer2021/index_ja.php（As of February 2024）

Physical risk tools used in past projects (excerpt) : Parameter

Climate Change Knowledge Portal (World Bank)

Climate Change Knowledge Portal

Issuing agency	**World Bank**
Scenario	**SSP1-1.9 / SSP1-2.6 / SSP2-4.5 / SSP3-7.0 / SSP5-8.5**
Time Horizon	**2020—2039 / 2040—2059 / 2060—2079 / 2080—2099**



List of available parameters

Item	Variable
Essential Climate Variable	• Mean-Temperature（month・year） • Max-Temperature（month・year） • Min-Temperature（month・year） • Precipitation（month・year）
Temperature	• Days with heat index（>35℃） • Maximum of Daily Max-Temperature • Number of Frost Days (T-min<0℃) • Number of Summer Days (T-max>25℃) • Number of Tropical Nights (T-min>20℃、26℃) • Number of Hot Days (T-max＞35℃、40℃、42℃、45℃) • Minimum of Daily Min-Temperature • Warm Spell Duration Index
Precipitation	• Average Largest 1-Day Precipitation • Average Largest 5-Day Cumulative Precipitation • Days with Precipitation>20mm • Max Number of Consecutive Dry Days • Max Number of Consecutive Wet Days • Precipitation Percent Change • Average Largest Monthly Cumulative Precipitation • Days with Precipitation>50mm • Precipitation amount during wettest days
Additional Variables	• Relative humidity • Growing Season Length

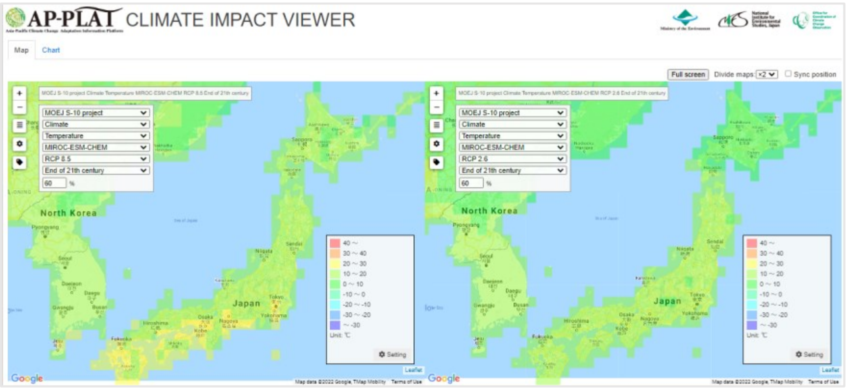
Source : World Bank, *Climate Change Knowledge Portal,* https://climateknowledgeportal.worldbank.org/country/japan/climate-data-projections (As of February 2024)

Physical risk tools used in past projects (excerpt)：Parameter

Climate Impact Viewer (AP-PLAT)

Climate Impact Viewer（MOEJ S-14 project）

Issuing agency	**AP-PLAT**
Scenario	**RCP2.6 / 4.5 / 6.0 / 8.5**
Time Horizon	**2011-2020 / 2021-2030 / 2031-2040 / 2041-2050 / 2051-2060 / 2061-2070 / 2071-2080 / 2081-2090 / 2091-2100**



The AP-PLAT Platform page introduces climate information for each region and country, which can be referred to.
https://ap-plat.nies.go.jp/platforms/index.html

List of available parameters

Item	Index
Climate	• Daily mean temperature • Daily maximum temperature • Daily minimum temperature • Daily total precipitation • Daily mean downward shortwave radiation flux • Daily mean downward longwave radiation flux • Daily mean relative humidity • Daily mean specific humidity • Daily mean wind speed • Daily mean surface pressure • Daily mean absolute humidity • Number of days that reached 35℃ or greater • Number of days that reached 30℃ or greater • Number of dry days • Number of days that reached 50mm/day precipitation or greater • Number of days that reached 100mm/day precipitation or greater • Number of days that reached 150mm/day precipitation or greater • Number of days that reached 200mm/day precipitation or greater • Annual maximum daily precipitation

Item	Index	
Impact	• Crop Yield	• Maize • Rice • Soybean • Wheat
	• Hydropower	—
	• Sea level rise	• Inundated area • Affected population • Economic damage
	• Heat Mortality	—
	• Labor capacity	—
	• Degree Days	—

Source : AP-PLAT, *Climate Impact Viewer,* https://a-plat.nies.go.jp/ap-plat/asia_pacific/index.html (As of February 2024)

Physical risk tools used in past projects (excerpt)：Parameter

Working on a warmer planet

Working on a warmer planet

Issuing agency	International Labour Organization（ILO）
Overview	Analyze and forecast the impact on labor productivity according to workload
Time frame	1995 / 2030

Key Points

- Estimates the percentage of work hours lost due to heat stress (and related health, welfare, and productivity impacts) across sectors and economies worldwide
- Productivity loss is measured as the loss of work capacity resulting from work delays or complete work disruptions caused by heat stress.
- RCP2.6 pathway is used as a representative value for the analysis because there is no significant difference in temperature increase between the other scenarios (RCP6.0), which represents the temperature range until 2030.

Outline

1. **Heat stress and decent work**
2. **Global overview**
   1. Climate change and the rising incidence of heat stress
   2. Labour market trends and exposure to heat stress
   3. Methodology
   4. Heat stress and its effect on labour productivity
   5. Urban heat islands
   6. Vulnerability of disadvantaged workers and subregions

3～7. Regional Analysis（Africa、America、Arab State、Asia and the Pacific、Europe and Central Asia）
   1. Current and projected heat levels
   2. Labour market trends
   3. Subregional and national estimates
   4. Conclusion and key findings

8. Employment and labour market policies
   Part I. Adapting to heat-related hazards through international labour standards and tripartism
   Part II. Complementary mitigation efforts to reduce heat-related hazards

List of available parameters

項目	詳細
Percentage of work hours lost due to heat stress	Time Horizon：2030 Scenario：2℃ scenario (RCP2.6) Region：Worldwide Industry and Conditions：Agriculture (shade)/Manufacturing/Construction (shade)/Services*.

Table 6.1 Working hours lost to heat stress, by sector and country/territory, Eastern Asia, 1995 and 2030 (projections)

Country	1995						2030					
	Agriculture (in shade) (%)	Industry (%)	Construction (in shade) (%)	Services (%)	Total (%)	Total (thousand full-time jobs)	Agriculture (in shade) (%)	Manufacturing (%)	Construction (in shade) (%)	Services (%)	Total (%)	Total (thousand full-time jobs)
China	0.90	0.36	0.90	0.05	**0.55**	**3780**	1.88	0.91	1.88	0.16	**0.78**	**5479**
Hong Kong, China	2.80	0.80	2.80	0.01	**0.45**	**16**	5.62	2.57	5.62	0.23	**0.81**	**43**
Japan	0.40	0.12	0.40	0.01	**0.10**	**64**	0.99	0.39	0.99	0.04	**0.21**	**126**
Korea, Dem. People's Republic of	0.05	0.01	0.05	0	**0.03**	**4**	0.22	0.07	0.22	0.01	**0.15**	**22**
Korea, Republic of	0.10	0.02	0.10	0	**0.03**	**6**	0.48	0.15	0.48	0.01	**0.08**	**21**
Macau, China	0	0.96	0	0.02	**0.55**	**1**	6.08	2.89	6.08	0.29	**1.13**	**3**
Mongolia	0	0	0	0	**0**	**0**	0	0	0	0	**0**	**0**
Taiwan, China	0.79	0.18	0.79	0	**0.19**	**17**	1.85	0.60	1.85	0.04	**0.39**	**49**
Eastern Asia	**0.87**	**0.31**	**0.87**	**0.04**	**0.49**	**3887**	**1.76**	**0.84**	**1.76**	**0.15**	**0.70**	**5743**

- Table (for Japan) -

- Japanese labour productivity in 2030 under the 2°C scenario (RCP2.6) is reduced by 0.99% in agriculture (shade), 0.39% in manufacturing, and 0.99% in construction (shade)

Source : International Labour Organization（ILO）, *Working on a warmer planet*, (01 July 2019)
* : Assumes industries that involve clerical or light physical labor as service industries

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Main Part

Appendix

List of reports released by TCFD

The TCFD has issued recommendations, manuals and guidance on the recommended disclosure items, including scenario analysis

	Category	Document title and URL (Original/Japanese)	Overview
For those looking to understand the general concept of the TCFD recommendations	TCFD recommendation as a whole	 ■ **Final Report: "Recommendations of the Task Force on Climate-related Financial Disclosures"** (June 2017) ➢ (Original) https://assets.bbhub.io/company/sites/60/2021/10/FINAL-2017-TCFD-Report.pdf ➢ (Japanese) https://www.sustainability-fj.org/susfjwp/wp-content/uploads/2019/01/ccc822ae11df3bb3f0543d9bd3c7232d.pdf	Final report providing background and frameworks for climate-related financial disclosures
		 ■ **Annex: "Implementing the Recommendations of the Task Force on Climate-related Financial Disclosures"** (revised in October 2021)* ➢ (Original) https://assets.bbhub.io/company/sites/60/2021/07/2021-TCFD-Implementing_Guidance.pdf ➢ (Japanese) https://tcfd-consortium.jp/pdf/about/2021_TCFD_Implementing_Guidance_2110_jp.pdf	Report providing detailed information that is useful when **implementing the recommended disclosure items**
For those looking to learn the details of the individual TCFD recommendation items	Strategy	 ■ **Technical Supplement: "The Use of Scenario Analysis in Disclosure of Climate-Related Risks and Opportunities"** (June 2017) ➢ (Original) https://assets.bbhub.io/company/sites/60/2021/03/FINAL-TCFD-Technical-Supplement-062917.pdf ➢ (Japanese) https://www.sustainability-fj.org/susfjwp/wp-content/uploads/2019/01/ccc822ae11df3bb3f0543d9bd3c7232d.pdf	Report providing detailed information for referencing when **considering scenario analysis**
		(Non-financial)  ■ **"Guidance on Scenario Analysis for Non-Financial Companies"** (October 2020) ➢ (Original) https://assets.bbhub.io/company/sites/60/2020/09/2020-TCFD_Guidance-Scenario-Analysis-Guidance.pdf	Guidance on practical processes for scenario analysis and ideas for resilience disclosures for different climate-related scenarios
	Risk manage ment	 ■ **"Guidance on Risk Management Integration and Disclosure"** (October 2020) ➢ (Original) https://assets.bbhub.io/company/sites/60/2020/09/2020-TCFD_Guidance-Risk-Management-Integration-and-Disclosure.pdf	Guidance targeted at companies that integrate climate-related risks into their existing risk management processes and disclose this information
	Metrics & targets	 ■ **"Guidance on Metrics, Targets, and Transition Plans"** (October 2021) ➢ (Original) https://assets.bbhub.io/company/sites/60/2021/07/2021-Metrics_Targets_Guidance-1.pdf	Guidance explaining the latest trends in climate-related metrics, transition plans, and cross-industry climate-related metrics
Progress status	Other	 ■ **"2023 Status Report"** (October 2023) ➢ (Original) 2023-Status-Report.pdf (bbhub.io))	Annual report explaining progress, insights, and challenges in climate-related disclosure (Issued annually from 2018)

Can be referred together with this guide

*: The Annex includes financial and non-financial sectors (key sectors are energy, transport, materials/architecture, and agriculture/food/forestry products)

※Information as of February 2024

List of Japanese reports related to the TCFD and scenario analysis

Some excerpts from the guidelines on TCFD and scenario analysis practices in Japan

	Category	Document title and URL	Overview
For those looking to understand the general concept of the TCFD recommendations	For all industries	 ■ "Guidance on Climate-related Financial Disclosures 3.0 (TCFD Guidance 3.0)" (TCFD Consortium, October 2022) https://tcfdconsortium.jp/pdf/news/22100501/TCFD_Guidance_3.0_J.pdf	Explains the TCFD Final Report from a corporate perspective
		 ■ "Practical guide for Scenario analysis in line with the TCFD recommendations 2022" (Ministry of the Environment, March 2023) ※This guide	Aimed at the smooth implementation of corporate scenario analysis in line with the TCFD recommendations; contains explanations covering procedures for those in charge of implementation to those for management, as well as summarized explanations of disclosure case studies, etc.
For those looking to learn the details of the individual TCFD recommendation items		 ■ "A Guide to Physical Risk Assessment in TCFD Recommendations: Flood Inundation Risk Assessment Based on Climate Change" (Ministry of Land, Infrastructure, Transport and Tourism, to be released at the end of March 2023)	A manual for assessing the physical risks in corporate climate-related disclosures, especially those related to flooding
		 ■ "A Guide to Transition Plan" (TCFD Consortium, August 2024) https://tcfd-consortium.jp/news_detail/24083001	A compilation of transition planning practices and examples based on each country's approach to transition planning
	By sector	**(Banking)**  ■ "A Practical Guide to Implementing Scenario Analysis for Climate Change Risks and Opportunities in Line with the TCFD Recommendations (Banking Sector) ver. 2.0" (Ministry of the Environment, April 2022) https://www.env.go.jp/content/900518880.pdf	Released as guidance focusing on scenario analysis methods for quantifying and evaluating transition risks/physical risks that are reliable enough to withstand disclosure
		(Real estate)  ■ "Guidance for the Real Estate Sector on Addressing 'TCFD Recommendations for Climate-Related Financial Disclosures' (TCFD Response Guidance for the Real Estate Field)" (Ministry of Land, Infrastructure, Transport and Tourism, March 2021) https://www.mlit.go.jp/totikensangyo/totikensangyo_tk5_000215.html	Comprehensive explanation based on progress of ESG investment covering information specific to the real estate sector for information disclosures in line with the TCFD recommendations; also covers illustrative examples of scenario analysis
		(Food products)  ■ "Introduction to Disclosure of Climate-Related Risks and Opportunities in the Food, Agriculture, Forestry, and Fishery Industries" (Ministry of Agriculture, Forestry, and Fisheries, June 2021) https://tcfd-consortium.jp/pdf/news/21062401/visual-60.pdf  ■ "Disclosure of Information on Climate-related Risks and Opportunities in Food, Agriculture, Forestry and Fisheries (Practical Edition)" (Ministry of Agriculture, Forestry, and Fisheries, June 2022) https://www.maff.go.jp/j/press/kanbo/b_kankyo/attach/pdf/220603-5.pdf	Explains information on climate-related risks and opportunities for information disclosures in line with the TCFD recommendations for the food, agriculture, forestry, and fishery industries by sectors such as livestock and agricultural products
Investment related	For investors	 ■ "Guidance for Utilizing Climate-related Information to Promote Green Investment 2.0 (Green Investment Guidance 2.0)" (Ministry of Economy, Trade and Industry, October 2021) https://tcfd-consortium.jp/pdf/news/21100501/green_investment_guidance20-j.pdf	Explains perspectives from which investors and others can interpret corporate information disclosures based on the TCFD recommendations

※Information as of February 2024

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Main Part

Appendix

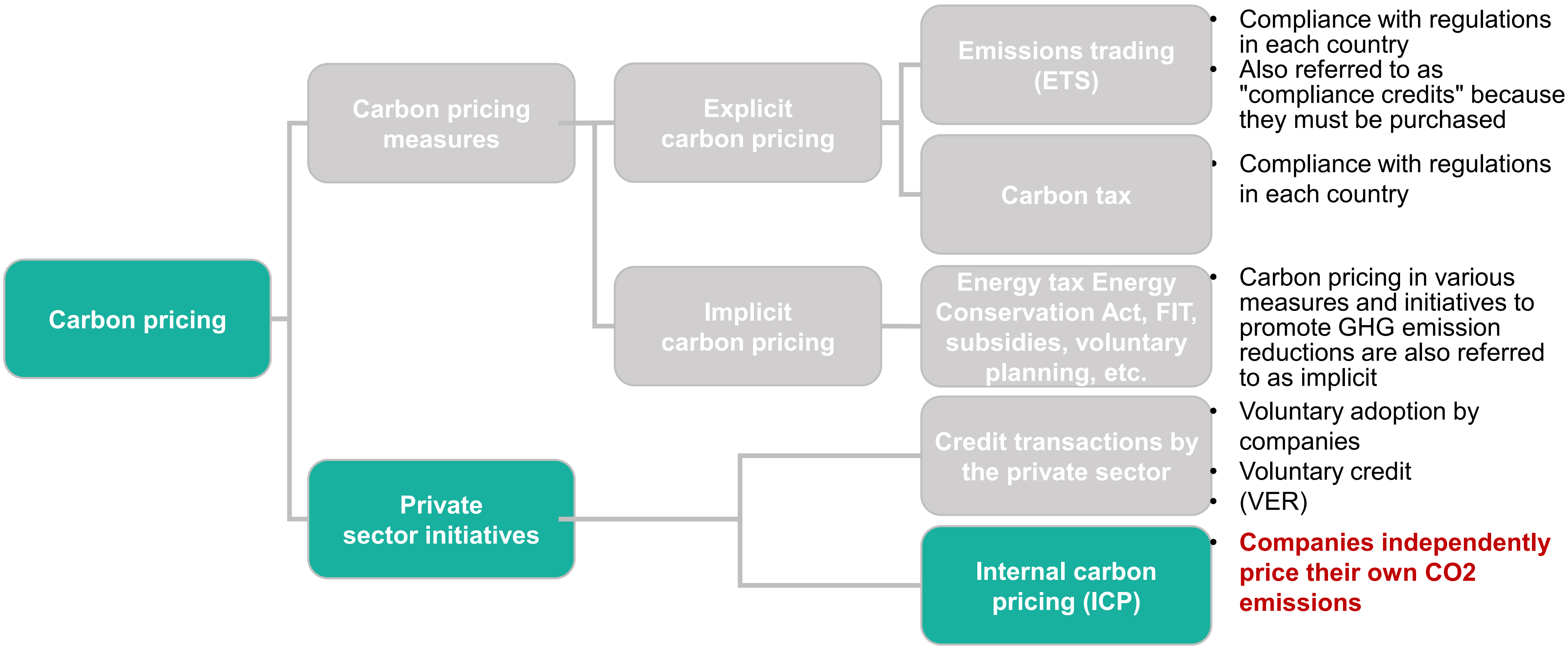
Tailored to the needs of the reader in a 3-tiered structure encompassing "definition," "theory," and "application"

	Reader needs		Guidelines outline/summary
Definition	Management	What exactly is ICP? I need a **summary** of why its implementation is important!	**Section 2-1 Definition of internal carbon pricing** Overview of what ICP is, the significance of its implementation, and its current adoption rate
Theory	Manager	I want to know **how to implement** ICP and **major consideration points**!	**Section 2-2 Theory of internal carbon pricing** Overview of three items to be considered as prerequisites for implementing ICP
Application	Manager	I want to know **more detailed processes for considering the implementation** of ICP!	**Section 2-3 Application of internal carbon pricing** Detailed overview of practical points to consider when implementing ICP
Application	Manager	I want **examples/case studies or other information on domestic/international ICP implementations.**	**Section 2-4 Application of internal carbon pricing - reference information** Information to reference when implementing ICP (E.g., FAQs, term lists, domestic/international ICP case studies)

Overview of carbon pricing

Carbon pricing refers to the pricing of carbon emissions. These guidelines give an overview of internal carbon pricing (ICP) - a tool to promote decarbonization investment by companies.

- Putting a price on carbon emissions is called **carbon pricing**
- Carbon pricing can be broadly classified into those regulated by the government (carbon pricing measures) and those provided by the private sector (voluntary credit (VER) issued by international organizations, **internal carbon pricing (ICP), etc**.)
- **These guidelines explore "internal carbon pricing**," a private sector initiative in which companies set their own prices for carbon emissions voluntarily

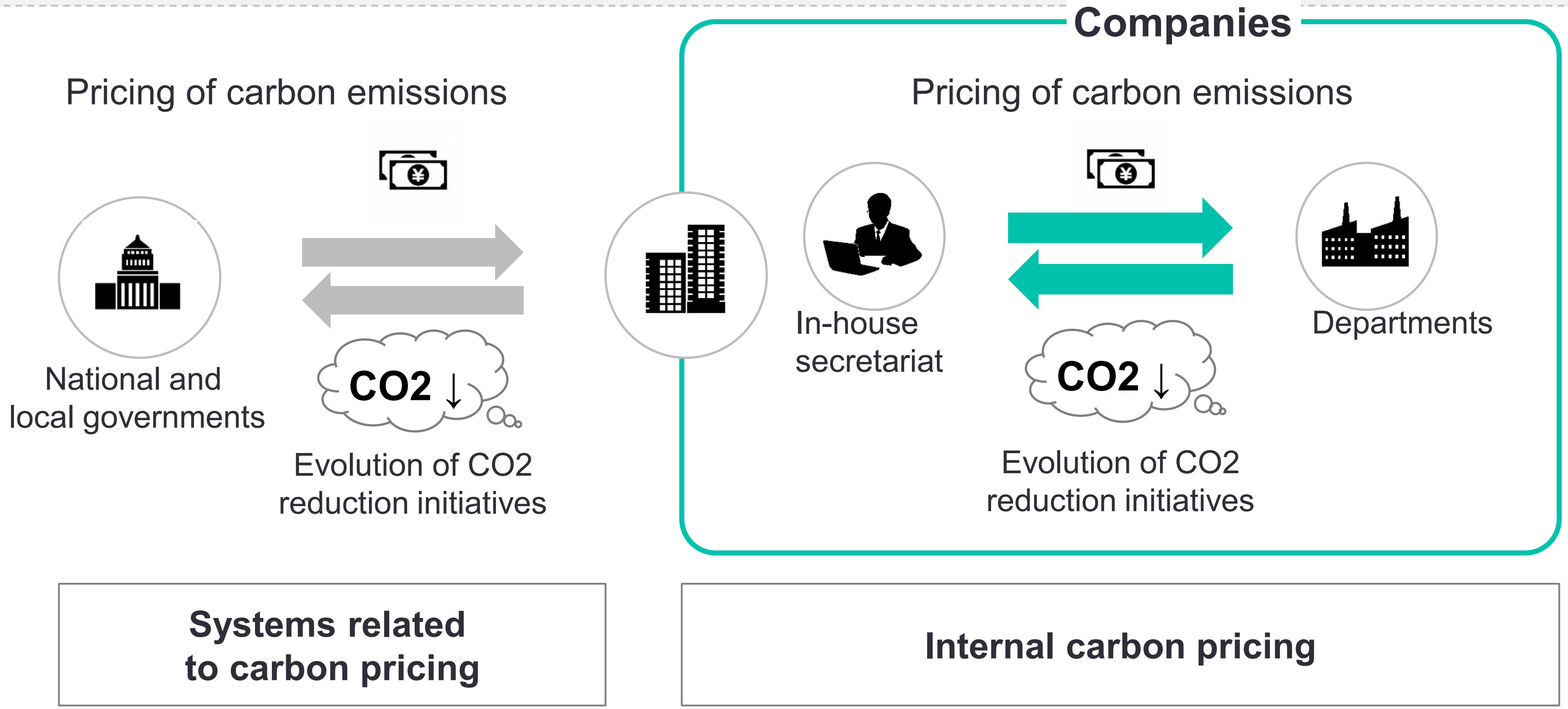


Source: Compiled based on the State of Economic Instruments for Achieving Carbon Neutrality on a Global Scale (METI)

What is internal carbon pricing (ICP)?

Internal carbon pricing (ICP) refers to carbon prices that are set and used internally to promote decarbonized business.

- **Carbon pricing estimated internally by the company**, used to promote investments in decarbonization efforts by companies
- A methodology used for corporate planning linked to climate change-related targets (carbon neutral/SBT/RE100)*, which can be used as an incentive to promote decarbonization, identify revenue opportunities and risks, or guide investment decisions



*For climate change-related targets (SBT/RE100), see pages 152-153

Source: TCFD, *Recommendations of the Task Force on Climate-related Financial Disclosures* (June 2017)

What is ICP: Organizational benefits of implementation

A major feature of the ICP is the ability to flexibly manipulate carbon prices in line with world trends and with the pace of internal decarbonization initiatives.

- Companies can flexibly change their investment and business activities for decarbonization in light of social trends.
- The flexibility to raise and lower prices also avoids corporate decision-making risks (i.e., once a decision to decarbonize is made, it must be followed through and can't be halted).

Pricing example

Company's existing unit cost of reduction	Feasible unit cost based on internal analysis	Unit price calculated from risk of future climate change	General unit price from 1.5°C scenario
2,000 JPY/tCO2	6,000 JPY/tCO2	18,000 JPY/tCO2	32,000 JPY/tCO2

Price **change** example

If decarbonization is slowing ↓ :

Reduce the price ↓ and observe the status of decarbonization activities

Decide upon ICP

If decarbonization is accelerating ↑ :

Increase the price ↑ and promote climate change management

For details on ICP, see attached Chapter 2.

Source: Prepared based on the results of interviews

Objective of implementing ICP

The objectives of implementing ICP can be classified into two axes: "Initiative drivers" and "Urgency of investment actions."

- It is important to align **"the objective of ICP" as "the objective of decarbonization investment"**
- This is an issue that should be considered at the outset, as the pricing and adoption methods vary depending on the objectives for implementing ICP.
- Broadly classified into **"initiative drivers(internal and external factors)" and "urgency of investment activities"**

Overview of objectives

Urgency of investment activities (High ↑ / Low ↓)

Initiative drivers (Internal ← → External)

Achieving decarbonization target
(SBT/RE100/internal environmental goals/visions)

- Promote decarbonization investment in concrete terms
- Promote in-house understanding of ICP (as a preliminary step to concrete rollout) and foster awareness of decarbonization

Compliance with decarbonization regulations

- Need to comply with regulations such as the Emission Trading and Energy Conservation Acts

Promotion of information disclosure
(Response to CDP, etc.)

- Need to appeal to investors and rating agencies

Preparing for and seizing opportunities related to **decarbonizing regulations that may be strengthened/introduced in future**

- Need to identify climate-related risks and opportunities first
- Understanding and visualizing the economic impact of carbon taxes
- Need to introduce decarbonization equipment in advance to prepare for rise of carbon costs
- Need to promote R&D on decarbonization

Benefits of implementing ICP (1/2)

The implementation of ICP will make it possible to "detect signals through the visualization of CO2 prices," "establish company-wide governance to achieve decarbonization targets," and "facilitate decision-making on decarbonization investments."

1 Signal detection through visualization of CO2 prices

Before implementing ICP

Unsure of how to price something "invisible" such as CO2

How much **investment** do we need to achieve our **decarbonization goals?**

In light of CO2 prices, to what extent are costs expected to **be borne by current operations and new investments?**

After implementing ICP

As CO2 is priced, the amount of investment and cost for CO2 is visualized.

Annual CO2 reduction ✖ ICP

Value that reflects CO2 becomes visible

2 Develop corporate governance to achieve decarbonization targets

Before implementing ICP

Promoting decarbonization at various levels and in line with the investment criteria of each department

Business A	Investment criteria A
Business B	Investment criteria B
Business C	Investment criteria C

After implementing ICP

Establishment of ICP as a company-wide standard, thereby contributing to the development of corporate governance on decarbonization.

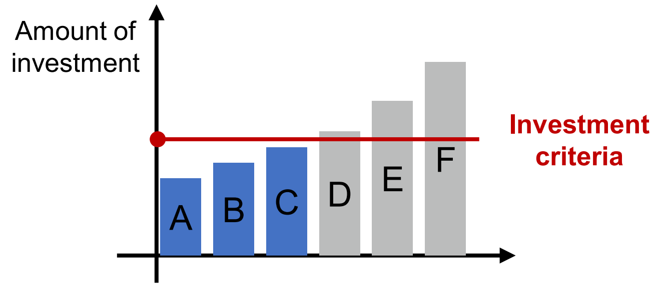
Business A, **Business B**, **Business C** → Based on decarbonization criteria that considers ICP

Promote cross-company awareness and initiatives on decarbonization is now possible

3 Facilitate corporate decision-making on decarbonization

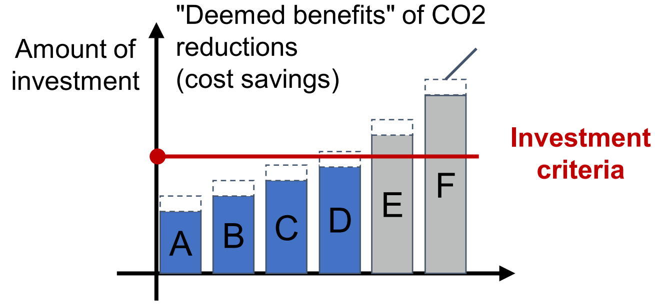
Before implementing ICP

Current investment criteria restrict options and investment in decarbonization is not feasible



After implementing ICP

By adding the amount of CO2 reduction as a "deemed benefit," the number of investment targets increases (D is included in the investment targets), and more decarbonization activities are feasible



Benefits of implementing ICP (2/2)

Including in meeting and decision-making documents allows for items to reach the eyes of decision makers, which can lead to progress in discussions and initiatives for decarbonization, and to the creation of a sense of ownership in each sector

Benefits of implementing ICP

Under a new perspective of converting CO_2 emissions into monetary value, costs relative to CO_2 are visualized, and decision-making linked to awareness-building and decarbonization investment is promoted

1 Single detection

As CO_2 is priced, the amount of investment and cost for CO_2 is visualized.

2 Improvement of corporate governance

The ICP will be set as a cross-company standard, and it will be possible to foster decarbonization awareness.

3 Facilitation of decarbonization decision-making

The amount of CO_2 reduction is considered as a "deemed benefit" and more decarbonization activities are available for investment.

Comments on the impact of implementing ICP obtained from interviews with companies that have introduced ICP

Costs related to CO_2 can be routinely visualized in the decision-making process

- Once included in meeting and decision-making documents, **the environmental efforts of each division, which had not received much attention before, were made visible to decision-makers in management.**
- The management committee now has questions on environmental initiatives

A sense of ownership toward achieving decarbonization targets was fostered

- **Increased awareness of CO_2 in each sector**
- **Investments in equipment that helps reduce CO_2 emissions have been initiated**
- Group companies, subsidiaries, and divisions are seriously considering the implementation of ICP, and **awareness is being fostered**

Discussions linked to medium- and long-term decision-making were promoted, and progress was made in decarbonization investments

- **Discussions have begun to link CO_2 pricing to decision-making** on business opportunities to focus on/pull back from
- **Decarbonization efforts are being promoted** and the decarbonization of businesses is being accelerated

Internal and external impact of implementing ICP

Flexible decision-making and multiple internal/external impacts

Internal impacts

Long-term and future-focused decision-making on decarbonization investments

Convert the impact of decarbonization initiatives on future businesses into economic value
⇒ Make decisions that are not bound by short-term profitability

Flexible decision-making in response to social trends

By only moving the carbon price "lever", the decision-making level of decarbonization investments can be modified ⇒ it becomes easier to update decarbonization policies according to the changes in internal and external environments

Equalization of the level of company-wide decarbonization efforts

By visualizing the contribution to CO_2 reduction in each division, it becomes easier to recognize rewards/penalties ⇒ any sense of unfairness due to non-uniform activities within the company is addressed

+

External impacts

Quantitatively demonstrate the company's commitment to decarbonization

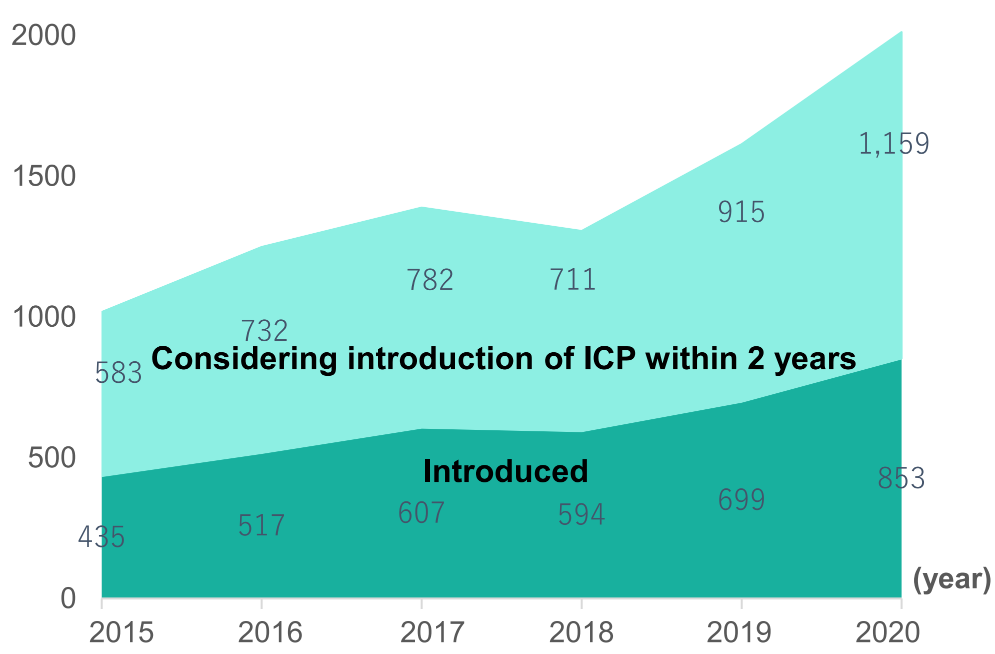
Express the carbon price recognized by the company ⇒ makes it possible to appeal to the outside world that the company is conducting business operations while balancing economic performance and climate change measures
Responses from CDP also asked for ICPs, and the TCFD recommended the implementation of ICPs

Current status of ICP introduction > Global

Number of companies that have introduced ICP is increasing around the world

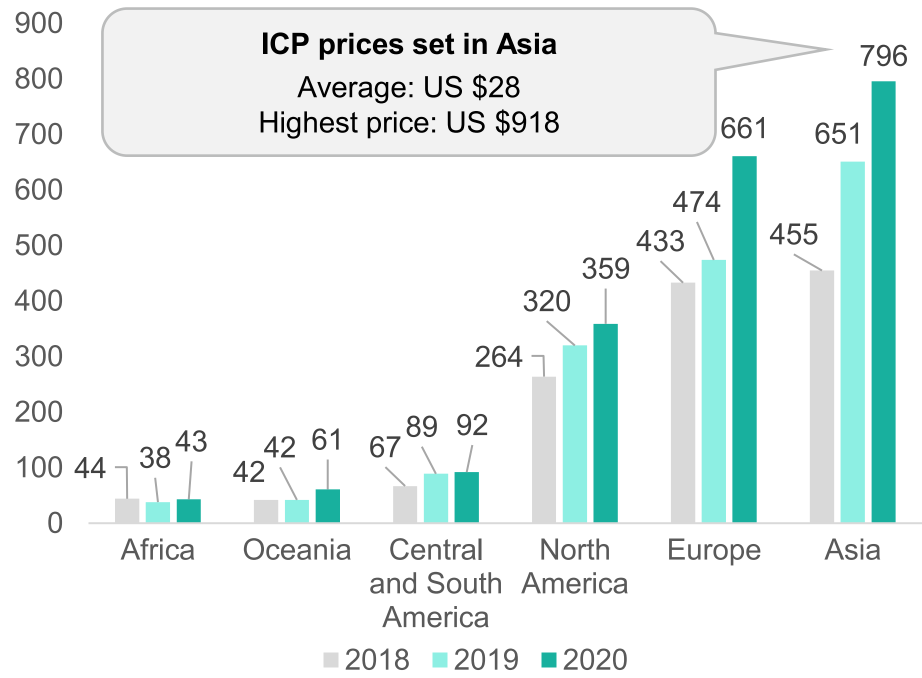
Trends in introduction and consideration status of ICP

- From 2015 to 2020, the number of companies introducing or considering introducing ICP have increased by more than 80%.
- **More than 2,000 companies** have indicated in their CDP responses that they have introduced or are considering introducing ICP.
- The combined aggregate market value of these companies now exceeds US $27 trillion, up from US $7 trillion in 2017.



Current status of ICP introduction and prices by region

- **Since 2018, the total number of companies in Asia that have introduced or are considering introducing ICP has increased the most**. Particularly in China, the number of companies introducing or considering introducing ICP has increased by more than 27%
- **The median ICP price disclosed by companies in 2020 was US $25/tCO2**. Carbon prices in the EU have soared to record levels as more countries adopt carbon pricing regulations



Source: CDP Report, *Putting a price on carbon : The state of internal carbon pricing by corporates globally* (2021)

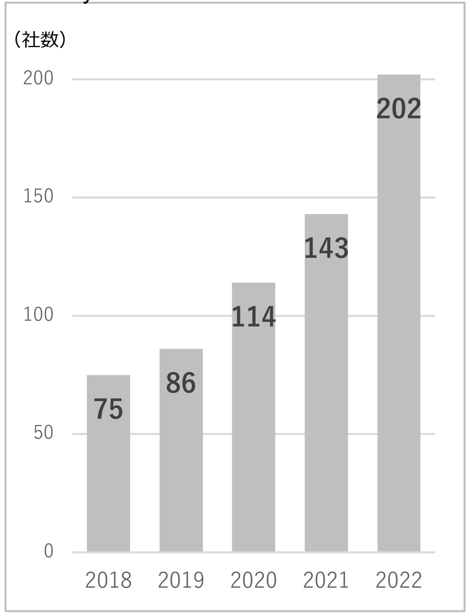
Current status of ICP introduction > Japan

In Japan, the number of companies that have introduced ICP is expanding, with the number of companies that have already introduced ICP or will introduce it within two years approaching half of the total. However, the state of introduction, type, and price seem to vary greatly among sectors.

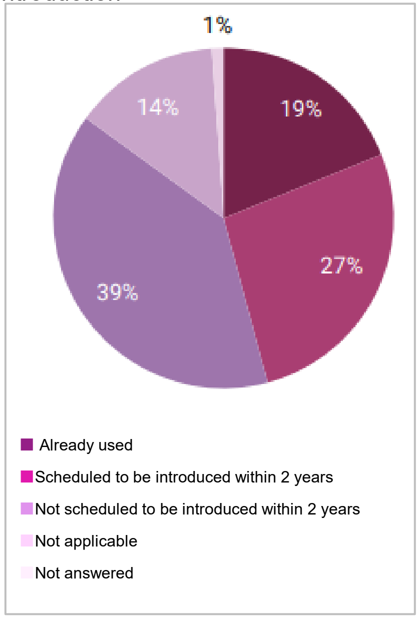
Trends in introduction and review status of ICP (2022)

- In Japan, the number of companies that have adopted ICP has **increased rapidly** from 75 in 2018 to 202 in 2022.
- 27% of companies are planning to introduce the ICP within two years, and **46% of companies, including those that have already introduced the ICP, have answered positively about incorporating the ICP into their corporate management**.
- It can be said that the interest in and the understanding of the introduction of the ICP have increased due to the issuance of additional guidance on the TCFD and the increase in the number of introduction cases.

Introduction of internal carbon pricing by fiscal year



Current status of internal carbon pricing introduction



Overview of companies that have introduced ICP

- By sector, **the manufacturing sector accounted for the largest share**, followed by the materials sector, the service sector, and infrastructure sector.
- The distribution of ICP by type shows that shadow prices are the most common, followed by implicit prices and internal costs.
- As for pricing, there is a large difference in the median value between the retail sector (**14,000 yen**) and the power generation sector (**2,000 yen**).

Figure 17. Number of companies implementing internal carbon pricing

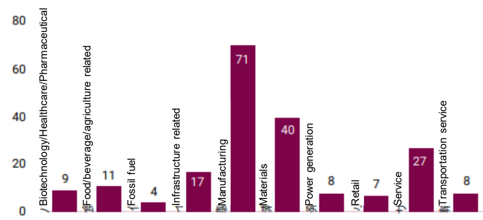
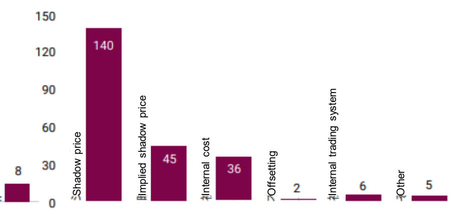
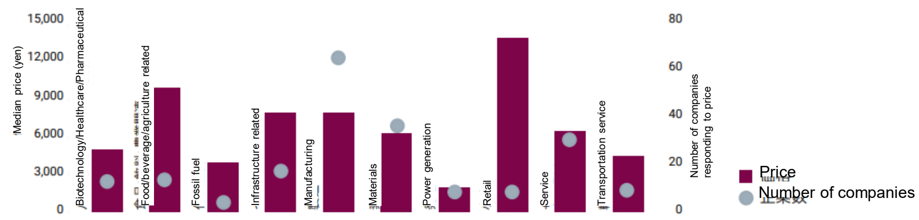


Figure 18. Number of companies implementing internal carbon pricing by type



gure 19. Price of internal carbon pricing



Media price	5,000	10,000	4,000	8,000	8,000	6,300	2,000	14,000	6,500	4,500
Number of companies responding to price	9	9	3	17	61	36	7	7	27	8

Source: CDP, *Climate Change Report 2022: Japan* (February 2023)

Current Status of ICP Introduction in Japanese Companies

Among Japanese companies, 278 companies have introduced ICP or plan to do so within 2 years

Companies that responded that they have introduced	Companies that say they plan to implement ICP within two years
282 companies	**392** companies

ICP and those that plan to introduce it within two years among companies that received an " A " rating in CDP 's climate change questionnaire

Apparel	YKK	
Infrastructure	Kumagai Gumi / Mitsui Fudosan / Sekisui Chemical / Taisei Corporation / Daiwa House Industry / Toda Construction / Sekisui House / Toho Gas	Ichigo / Daiseki / Mitsubishi Estate / Kajima Corporation / New Nippon Airways / Mori Building Fujita
Service	Services /NTT Data / Askul / SECOM / Benesse HD/ Recruit HD/ Marui Group / Sommon Japan Nipponkoa / Daito Trust Construction Chugai Pharmaceutical / Dainippon Printing / Daiwa House REIT Investment Corporation Daiwa House Industries / Tokyu Land HD/ Tokio Marine HD / Toppan HD/ NEC / Nippon Telegraph and Telephone (NTT) / Fujitsu / Meiji Yasuda Life Insurance Company / Nomura Research Institute	Concordia Financial Group / Mitsubishi Estate Logistics REIT Investment Corporation / Industrial Fund Investment Corporation / Japan Prime Realty Investment Corporation / Hakuhodo DY HD/ Hachijuni Bank /
Biotechno Healthcare	Biotechnology, Healthcare, Pharmaceuticals / Astellas Pharma/Shionogi & Co./Ono Pharmaceutical / Otsuka HD / Daiichi Sankyo/Chugai Pharmaceutical / Fujifilm HD / Takeda Pharmaceutical	
Transportation services	ANA HD/ Mitsui O.S.K. Lines / Kawasaki Kisen / NYK Line	SGHD
Retail	Toyota Tsusho	J.Front Retailing / Mitsukoshi Isetan HD/ Joshin Electric / Fuyo General Lease / AEON
Food/Beverage/ Agriculture	Asahi Group HD/ Suntory HD/ Japan Tobacco / Ajinomoto / Meiji HD	Coca-Cola Bottlers Japan HD/ Sumitomo Forestry /
Manufacturing	Panasonic HD/ Ricoh / Nitera /LIXIL/TOTO/Aisin/ Canon / Kubota / JTEKT / Seiko Epson / Sony Group / Denso / Toyota Boshoku / Nabtesco / Nikon / Bridgestone / Yamaha / Yamaha Motor / Yokogawa Electric / Kyocera / Mitsubishi Electrical equipment / Komatsu Manufacturing / Kawasaki Heavy Industries Kawasaki Heavy Industries / Murata Manufacturing / Hitachi / Fuji Electric / Honda Motors	Azbil / FP Corporation / Fanuc / Yokohama Rubber / Okamura Manufacturing
Material	KAO/ Taiheiyo Cement / Tokyo Steel	Kose / Paula Orbis HD/ Shiseido

Source: Created by the Ministry of the Environment with information provided by CDP Worldwide-Japan

External environment surrounding the ICP (1): TCFD and ICP (1/2)

Introduction of the ICP is recommended in the disclosure requirements section of the TCFD

- The TCFD published the "**TCFD Recommendations**" in June 2017, which provide a framework for requiring companies to disclose information on **climate change-related risks and opportunities**.
- It calls on companies to promote management that is responsive to climate change through disclosure of four elements: "governance", "strategy", "risk management", and "indicators and targets". Among them, the disclosure of "**indicators and targets**" section recommends the introduction of ICP.

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

References to the ICP

TCFD TASK FORCE ON CLIMATE-RELATED FINANCIAL DISCLOSURES

Metrics and Targets

Disclose the metrics and targets used to assess and manage relevant climate-related risks and opportunities where such information is material.

Recommended Disclosure a)
Disclose the metrics used by the organization to assess climate-related risks and opportunities in line with its strategy and risk management process.

Guidance for All Sectors
Organizations should provide the key metrics used to measure and manage climate-related risks and opportunities, as described in Tables 1 and 2 (pp. 10-11). Organizations should consider including metrics on climate-related risks associated with water, energy, land use, and waste management where relevant and applicable.

Where climate-related issues are material, organizations should consider describing whether and how related performance metrics are incorporated into remuneration policies.

Where relevant, organizations should provide their internal carbon prices as well as climate-related opportunity metrics such as revenue from products and services designed for a lower-carbon economy.

Metrics should be provided for historical periods to allow for trend analysis. In addition, where not apparent, organizations should provide a description of the methodologies used to calculate or estimate climate-related metrics.

- TCFD "Indicators and Targets" Section
  -> **Companies in all sectors** are required to provide **indicators to manage climate-related risks and opportunities**.
- **The ICP is mentioned as a concrete example of the indicator, and its implementation is recommended.**

Source: TCFD, *Recommendations of the Task Force on Climate-related Financial Disclosures* (June 2017)

External environment surrounding the ICP (1): TCFD and ICP (2/2)

The TCFD guidance on indicators and targets describes the use and setting of the ICP

- The guidance on indicators and targets released by the TCFD in October 2021 explains the **purpose of using the ICP**, the methodology for setting ICP, and ICP disclosure

TCFD "Guidance on Metrics , Targets, and Transition Plans"

References to the ICP

Sections	Contents
General use of the ICP	• **Measuring Performance:** **Carbon-adjusted earnings per share, expected profitability, incentives for energy savings, identification of revenue opportunities and risks, procurement and supply chain management, etc.** • **Position management:** Valuation of assets, etc. • **Investment decisions:** **identification of low-carbon, high-return investment opportunities, fixed investment plans, and determination of the cost-effectiveness and net present value of projects,** etc. • **Strategy:** Assessment of future policy responses to climate change, including the potential for explicit and implicit carbon pricing, impacts on overall economic growth and sector demand, and technology and cost benefits • **Risk management:** Measurement, modeling, and management of GHG emissions
About ICP Settings	• In order to set an ICP, it is necessary to understand how to use the ICP, the appropriate form for the various uses of the ICP, and the approach to determine the price level • Effective carbon pricing also has the following characteristics • Prices and pricing methods should be based on reliable and reputable scientific research in the light of social climate objectives. **At a minimum, the organization should consider a carbon price aligned with the thermometer path well below 2°C** • The organization's ICP price must be consistent with the price implied by the organization's climate-related targets (e.g., the 2050 net zero, the Paris Agreement) • **The ICP should rise over time to reflect the decline in the carbon budget** • The organization should **recalculate as necessary** to take into account climate policies and regulations, or the lack thereof, that suggest rapid price increases • The ICP **may need to reflect geographical and sectoral differences** when significant impacts or reliable sources of information are found
About Disclosure of the ICP	• Consideration should be given to providing the following detailed information regarding the ICP • **Methodology** used to set the ICP • How the ICP reflect the implicit costs of various climate policies (e.g., performance standards, renewable energy portfolio standards, explicit costs of GHG emissions (e.g., carbon taxes, cap and trade)) • Types and shares subject to carbon pricing (Scope 1, 2, 3) • **Assumptions about how the ICP will change over time** in response to reductions in carbon budgets, policy changes and changes in emission projections • Scope of ICP implementation (region/business) and whether it is applied as a margin-based cost • **Whether the organization uses a common ICP or a differentiated ICP**

Source: TCFD, *Guidance on Metrics, Targets, and Transition Plans* (October 2021)

External environment surrounding the ICP (2): CDP and ICP

The CDP's Climate Change Questionnaire requires responses regarding the ICP

- Version control - climate change
- CDP disclosure cycle 2023
- About the CDP climate change questionnaire
- C0 Introduction
- C1 Governance
- C2 Risks and opportunities
- C3 Business strategy
- C4 Targets and performance
- C5 Emissions methodology
- C6 Emissions data
- C7 Emissions breakdown
- C8 Energy
- C9 Additional metrics
- C10 Verification
- C11 Carbon pricing
- C12 Engagement
- C15 Biodiversity
- C16 Signoff
- Important information
- Terms for responding (2023 Climate Change)
- Copyright

(C11.3) Does your organization use an internal price on carbon?

•Yes
•No, but we anticipate doing so in the next two years
•No, and we don't anticipate doing so in the next two years

(C11.3a) Provide details of how your organization uses an internal price on carbon

1	Type of internal carbon prices	Select from: Shadow price/Internal fee/Internal trading/Implicit price/Other, please specify
2	How the price is determined	Select all that apply: Alignment with the price of allowances under an Emissions Trading Scheme/Alignment with the price of a carbon tax/Social cost of carbon/Price/cost of voluntary carbon offset credits/Cost of required measures to achieve emissions reduction targets/Benchmarking against peers/Price with material impact on business decisions/Other, please specify
3	Objective(s) for implementing this internal carbon price	Select all that apply: Change internal behavior/Drive energy efficiency/Drive low-carbon investment/Identify and seize low-carbon opportunities/Navigate GHG regulations/Stakeholder expectations/Stress test investments/Reduce supply chain emissions/Set a carbon offset budget/Other, please specify
4	Scope(s) covered	Select all that apply: Scope 1/Scope 2/Scope 3 (upstream)/Scope 3 (downstream)
5	Pricing approach used - spatial variation	Select from: Uniform/Differentiated/Other, please specify
6	Pricing approach used - temporal variation	Select from: Static (on time axis)/Evolutionary (on time axis)/Other, please specify
7	Indicate how you expect the price to change over time*	Text field [maximum 1,000 characters]
8	Actual price(s) used - minimum (currency as specified in C0.4 per metric ton CO_2)	Numeric field [Enter a number from 0-999,999,999,999,999, using a maximum of 2 decimal places and no commas]
9	Actual price(s) used - maximum (currency as specified in C0.4 per metric ton CO_2)	Numeric field [Enter a number from 0-999,999,999,999,999, using a maximum of 2 decimal places and no commas]
10	Business decision-making processes this internal carbon price is applied to	Select all that apply: Capital expenditure/Operations/Procurement/Product and R & D/Remuneration/Risk management/Opportunity management/Value chain engagement/Public policy engagement/Other, please specify
11	Mandatory enforcement of this internal carbon price within these business decision-making processes	Select from: Yes, for all decision-making processes/Yes, for some decision-making processes, please specify/No
12	Explain how this internal carbon price has contributed to the implementation of your organization's climate commitments and/or climate transition plan	Text field [maximum 2,500 characters]

Source: CDP, *Climate Change 2023 Questionnaire*, https://guidance.cdp.net/ja/guidance?cid=46&ctype=theme&idtype=ThemeID&incchild=1&microsite=0&otype=Questionnaire&page=1&tags=TAG-646%2CTAG-605%2CTAG-599 (As of February 2024)

External environment surrounding the ICP (3): ISSB and ICP

Disclosure of information on whether and how the ICP are applied, and on carbon prices is required according to IFRS S2 "Climate-related disclosures" of the IFRS "Sustainability Disclosure Standard" which the ISSB has published in 2023

(Outline of standards)

- The International Sustainability Standards Board (ISSB), which was established by the IFRS Foundation in November 2021 for the purpose of developing international standards (global baselines) that contribute to the improvement of consistency and comparability of corporate sustainability disclosures, published the "General Requirements for Disclosure of Sustainability-related Financial Information" (S1) and "Climate-related disclosures" (S2) of the IFRS "Sustainability Disclosure Standard" in June 2023.

(Application schedule)

- The application of both S1 and S2 has been begun in January 2024, and the IFRS Foundation has recommended their application to the regulatory authorities of each country. In line with the recommendations, it is expected that regulatory authorities of each country will develop sustainability disclosure rules based on both standards as a baseline, and companies will be required to disclose in accordance with the rules of their jurisdiction.

- It calls for climate-related disclosures in line with four core competencies: governance, strategy, risk management, and indicators and targets based on the TCFD Recommendations.
- Call for more sophisticated and detailed information disclosure than the TCFD, including mandatory disclosure under Scope 3.
- Set disclosure items for 11 industries and 68 sectors as industry-specific disclosure requirements, and call for disclosure in line with these items.

ICP Disclosure Request (Indicators and targets)

Original text
(f) internal carbon prices—the entity shall disclose:
(i) an explanation of whether and how the entity is applying a carbon price in decision-making (for example, investment decisions, transfer pricing and scenario analysis); and
(ii) the price for each metric tonne of greenhouse gas emissions the entity uses to assess the costs of its greenhouse gas emissions;

External environment surrounding the ICP (4): CSRD and ICP

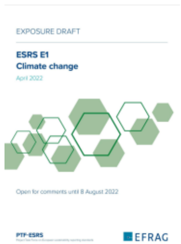
The CSRD requires disclosure of information on the applicability of the ICP, types, purpose of their use, scope, price levels and the background of their settings

(Outline of standards)

- The final article of the Corporate Sustainability Reporting Directive (CSRD) was published by the European Commission on December 16, 2022 as a new directive on corporate sustainability disclosure. It was proposed to improve the sufficiency, reliability, comparability, and accessibility of sustainability-related information.

(Application schedule)

- The schedule for the mandatory reporting of sustainability-related information under the CSRD varies by company size and other factors. Listed companies with 500 or more employees will be subject to the CSRD from January 2024, large companies other than those listed above will be subject to the CSRD from January 2025, and listed SMEs will be subject to the CSRD from January 2026.



- Requires companies to report using the European Sustainability Reporting Standards (ESRS) developed by the European Financial Reporting Advisory Group (EFRAG).
- Among the topical standards, ESRS E1 is the disclosure standard on climate change-related information.

ICP Disclosure Request

Original text
AG 10. The undertaking shall disclose whether it applies internal carbon pricing schemes, and if so, how they support its decision making and incentivise the implementation of climate-related policies and targets.
AG 11. The information required by paragraph AG10 shall include: (a) the type of internal carbon pricing scheme, for example shadow prices for CapEx or research and development investment decision making, internal carbon fees or funds; (b) the specific scope of application of the carbon pricing schemes (activities, geographies, entities, etc.); (c) the carbon prices applied according to the type of scheme and critical assumptions made to determine the prices, including the source of the carbon prices applied and why they are deemed relevant for their purpose of application; the undertaking may disclose the calculation methodology of the carbon prices, to which extent they have been set using scientific guidance and how the future development of carbon prices is related to science-based carbon pricing trajectories; and (d) the approximate current year gross GHG emission volumes by Scope 1, 2 and 3 in metric tons of CO2 equivalent covered by these schemes, as well as their share of the undertaking's overall GHG emissions in the respective Scope.
AG 12. If applicable, the undertaking shall briefly explain how the carbon prices used in internal carbon pricing schemes are compatible with those used in financial statements and financial planning particularly for the assessment of useful life and residual value of intangibles, property, plant and equipment, for the impairment of assets or for the fair value measurement of business acquisitions.

External environment surrounding the ICP (5): SEC and ICP

The SEC is also preparing for a climate change-related disclosure requirement. As for the ICP, disclosure of information such as carbon prices, application scope, and effects on climate-related risk assessment and management will be required.

(Outline of standards)

- The U.S. Securities and Exchange Commission (SEC) has published a draft for rules on climate change disclosure on March 21, 2022. The draft establishes disclosure items for both non-financial and financial information, and the non-financial information disclosure is based on the Task Force on Climate-Related Financial Disclosures (TCFD) protocol and the GHG protocol.

(Application schedule)

- The application date is expected to be phased based on the status of SEC-registered companies. Application will begin in fiscal year 2023 for large accelerated filers, which is the earliest among the filers, in fiscal year 2024 for accelerated filers and for non-accelerate filers, and in fiscal year 2025 for SRCs.

Title 17 Commodity and Securities Exchanges
Chapter I Commodity Futures Trading Commission
Chapter II Securities and Exchange Commission
Part 200 Organization; Conduct and Ethics; and Information and Requests
Part 201 Rules of Practice
Part 202 Informal and Other Procedures
Part 203 Rules Relating to Investigations
Part 204 Rules Relating to Debt Collection
Part 205 Standards of Professional Conduct for Attorneys Appearing and Practicing Before the Commission in the Representation of an Issuer
Part 209 Forms Prescribed Under the Commission's Rules of Practice
Part 210 Form and Content of and Requirements for Financial Statements, Securities Act of 1933, Securities Exchange Act of 1934, Investment Company Act of 1940, Investment Advisers Act of 1940, and Energy Policy and Conservation Act of 1975
Part 211 Interpretations Relating to Financial Reporting Matters
Part 227 Regulation Crowdfunding, General Rules and Regulations
Part 228 [Reserved]
Part 229 Standard Instructions for Filing Forms Under Securities Act of 1933, Securities Exchange Act of 1934 and Energy Policy and Conservation Act of 1975 - Regulation S-K

The updated proposal for Regulation S-K (qualitative disclosure) is presented as a disclosure requirement item in response to the TCFD frame. Regulation S-K Item 1502 on "Strategy" calls for disclosure of information on price levels, application scope, and methods of use of the ICP, as well as description of risks and opportunities and consideration of business impacts based on the TCFD classification.

ICP Disclosure Request

Original text
(e) (1) If a registrant maintains an internal carbon price, disclose: (i) The price in units of the registrant's reporting currency per metric ton of CO_2e; (ii) The total price, including how the total price is estimated to change over time, if applicable; (iii) The boundaries for measurement of overall CO_2e on which the total price is based if different from the GHG emission organizational boundary required pursuant to § 229.1504(e)(2); and (iv) The rationale for selecting the internal carbon price applied.
(2) Describe how the registrant uses any internal carbon price described in response to paragraph (e)(1) of this section to evaluate and manage climate-related risks.
(3) If a registrant uses more than one internal carbon price, it must provide the disclosures required by this section for each internal carbon price, and disclose its reasons for using different prices.

Investor's assessment of the ICP

Financial institutions and investors place importance on how the introduction of the ICP is utilized in management strategies

How do financial institutions and investors integrate the ICP into their existing investment decisions?

Investors and experts

- **By the introduction of ICP, we put emphasis on how we will draw up the business portfolio of the future (the decarbonized society).** It is reasonable to include ICP as one of the means to draw up a future business portfolio that takes into account the external and internal environment.
- **The process of experiencing** for oneself what was effective and what was not effective as a result of the ICP introduction, **clarifying the findings and issues gained from the introduction, and moving on to the next stage is important**.
- A mechanism to effectively operate the ICP is important. Investors do not evaluate the effectiveness only by the ICP price, but are **interested in how the PDCA is carried out**.
- Because the divisions responsible for ICP design are mainly CSR, etc., not corporate planning divisions, and there is a gap in understanding, investors are calling for synchronization with corporate planning divisions.
- **The ICP** are seen by investors as **one of a variety of perspectives in assessing a company's resilience**.
- It is **important to consider how the introduction of ICP will lead to effective governance, including decision making, and how this will be utilized in strategies**.

From what perspective do financial institutions and investors engage?

Investors and experts

- ICP is a good idea as a way of pricing the positive/negative effects of economic activities on CO2 and biodiversity, and a good way of allocating resources. During engagement, we encourage companies whose profits are linked to carbon to introduce ICP.

What are the benefits of disclosing ICP?

Investors and experts

- Considering the introduction of something like a carbon tax in Japan in the future, promoting and disclosing ICP initiatives is synonymous with including a carbon price in investment decisions, and thus disclosure is meaningful. It is advisable to disclose not only the price but also the usage, the state of reflection in decision making, and the state of incorporation into the strategy.

The explanation of the introductory purpose of and how to use ICP will be easier to understand by the following considerations:

: Reference page

• **Set price of the ICP**	2-2-1. Consideration of price setting
• **Methods of use of the ICP**	2-2-2. Consideration of utilizing method
• **Structure of ICP**	2-2-3. Consideration of internal structure and future initiatives
• **Scope of application of ICP and applicable companies**	2-3-5. Consideration (4)
• **Linkage between CO2 reduction targets and investment**	2-3-6. Consideration (5)
• **Budgetary controls and budget caps for ICP**	2-3-7. Consideration (6)

Source: Prepared based on hearings

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Appendix

Key Issues in the ICP System Implementation Process and Design Considerations

To introduce ICP, it is necessary to first understand the contents of Chapter 1, and then consider the "set price," "application," and "system related to ICP

		Step	Key issues	Keywords
How to set the ICP	1	**Consideration of the introductory purposes**	• What is the purpose of introducing ICP on the basis of internal emissions?	• Current status of internal emissions • Emission reduction target
	2	**Consideration of the set price**	• Which of the four methods (external pricing, internal discussions, etc.) should be used? • What is the use of internal ICP, and is it used as an investment standard?	• External prices • Peer companies' price benchmark • Internal discussion on decarbonizing prices • Mathematical analysis of CO2 reduction targets
How and to what extent should the ICP be applied?	3	**Consideration of application purpose and decision-making processes**	• What is the use of the ICP and is it used as an investment standard? • First of all, in cases where reference values (visualization) for investment are used, which document (e.g., request for investment decision) should be included as reference values?	• Visualized as a reference value for investment • Use in investment indexes (investment standard value) • Use in investment indexes (lowering of investment standard) • Internal fee (recovery of funds based on emissions)
	4	**Consideration of organizational structure**	• How will the ICP be promoted? • Which departments/divisions are involved in the promotion?	• Use in existing departments/divisions • Launching of new departments/divisions
	5	**Consideration of scope of applications and applicable companies**	• Among Scope 1 (investment in energy-saving), Scope 2 (investment in renewable energy), and Scope 3 (e.g., procurement of raw materials, R&D, M&A), what is the scope to which the ICP applies? • (In case of holdings) How far should ICP be introduced in domestic, overseas, and group companies?	• Scope 1 (energy-saving), Scope 2 (renewable energy), Scope 3 (procurement of raw materials, R&D), etc. • Domestic head office, domestic group companies, overseas sites/subsidiaries
How to manage investments and budgets regarding ICP	6	**Consideration of linkage between reduction targets and investments**	• Is there currently a quota for investment and is the amount of decarbonization investment linked to the company's climate objectives (e.g., the 2050 net zero)?	• Set the amount of investment for decarbonization linked to CO2 reduction targets • (Not set)
	7	**Consideration of budget control and budget cap**	• (When ICP are reflected in investment standards) How will the budget be managed?/Which departments/divisions will be responsible for budgetary controls and the accumulation of ICP-related investment information (e.g., which facilities, investment amounts)? • (When ICP are reflected in investment standards) Should budget cap be implemented?/If so, how? (Set according to the annual CO2 reduction target)	• Budget control/business divisions apply for ICP budget at corporate headquarters/Apply for ICP budget and allocate budget to business divisions • Calculate the budget based on the results of the previous year's ICP utilization and the annual CO2 reduction target

Section 2 introduces "price setting," "applications," and "in-house systems and future initiatives"

	Consideration of price setting Consider setting prices for ICPs that are used uniformly within the company	Consideration of applications and decision-making processes Decide how to use ICPs to promote decarbonization investment	Review of internal systems Determine internal systems and future initiatives based on set prices and usage methods
Overview	• Set ICP price per t-CO2 • There may be multiple prices depending on the investment and timelines. • The price varies depending on why ICP is implemented, the level of understanding throughout the company, and the adoption methods.	• Adoption methods are also classified according to whether or not funds are exchanged within the company. • When there is no exchange of funds, there are two methods: one is to use ICP for investment decision-making, and the other is to first visualize the CO2 value and present it as reference information for investments.	• Determine the main internal organization, post-implementation plan (roadmap), scope of application, and time frame for implementation. • It is necessary to involve the relevant departments and obtain the commitment of upper management to make progress.
Decision process	• Determined based on external prices, past results, reduction targets, etc.	• Determined based on the existence of internal fund transactions and the degree of understanding (usage) of ICP within the company	• Although the success factors differ from company to company, this guideline introduces the following examples: • Development of an implementation roadmap that defines the scope of application and milestone timelines • Examining the organizational structure and division of roles within the company Example: Establishment of departments and committees in charge Obtaining commitment on decarbonization from senior management
Examples	• Examples of the following patterns exist • Single price point • Set multiple prices Example: Set according to the purpose of use such as R & D	• Examples of the following patterns exist • Visualization of economic impact • Use of investment thresholds • Easing of investment criteria • Establishing a decarbonized investment fund	
Key points	**Considering pricing based on objectives**	**Present realistic trajectories based on the degree of understanding within the company (whether investment criteria can be applied immediately)**	**A timeline that aligns with corporate realities is critical**

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Consideration of price setting

Proceed with a 3-stage price setting process

1 -> 2 -> 3

1 Understand price types

- Understand **ICP price types (Shadow price, Implicit carbon price)**
- The type selected depends on **how ICP is used**

2 Consider pricing methodology

- Pricing methodologies can be classified into the following four types
  - **Referencing external prices**
  - **Peer benchmarks**
  - **Past internal discussions**
  - **Analysis based on CO2 reduction targets**
- Consider which method to use based on difficulty and the effectiveness of the climate-change initiative

3 Determine degree of internal agreement

- Understand **degree of agreement on decarbonization investments** within the company
- Consideration of ICPs in line with the degree of internal agreement
  - Initially set based on current circumstances (external carbon price, results of past internal discussions, etc.)

1 Understand price types

ICP prices are classified into two types

- Shadow price: Setting a hypothetical carbon price **based on assumptions** (a priori)
- Implicit carbon price: A price calculated **based on historical performance, etc.**

	Categorized by pricing method	Examples
Shadow price	**Explicit** Carbon pricing based on assumptions	Use of external pricing (Emissions right price, etc.)
Implicit carbon price	**Implicit** Prices calculated and set based on historical performance	Mathematical analysis based on price benchmarks of other companies in the same industry, internal discussions on prices that encourage decarbonization investments, and CO2 reduction targets

WBCSD, *Emerging Practices in Internal Carbon Pricing A Practical Guide* (December 2015)., CDP Disclosure Best Practice, *HOW-TO GUIDE TO CORPORATE INTERNAL CARBON PRICING* (December 2017)

2 Consider pricing methodology

It is important to select an ICP pricing methodology that is in line with the company's initiatives, while taking into account the "difficulty of price setting" and the "effectiveness of decarbonization measures."

- There are four types of pricing methods - from the use of external information such as the price of emission credits and price benchmarks of other companies in the same industry, to internal decision-making
- Consider the degree of difficulty and the effectiveness of climate-change initiatives, and **choose a method that is simple for your company to implement.**

Shadow price	Implicit carbon price		
External market unit price forecast	Determined unit price of another company	Past investments and unit price	Corporate targets and implementation of economically rational reduction measures
1 Use of external pricing (Emissions right price, etc.)	2 Benchmark of competitor prices	3 Internal discussion on pricing to encourage decarbonization investments	4 Mathematical analysis of CO2 reduction targets
Example: Refer to IEA and GX League emission rights prices (2030: 5-100 USD/tCO2)	Example: CDP Report Refer to the amounts listed	Example: Calculated from ICP levels that would have influenced past decisions	Example: Calculated from CO2 reduction targets and marginal cost curve

Low ← Difficulty of price setting → High

Small ← Effectiveness of decarbonization measures → Large

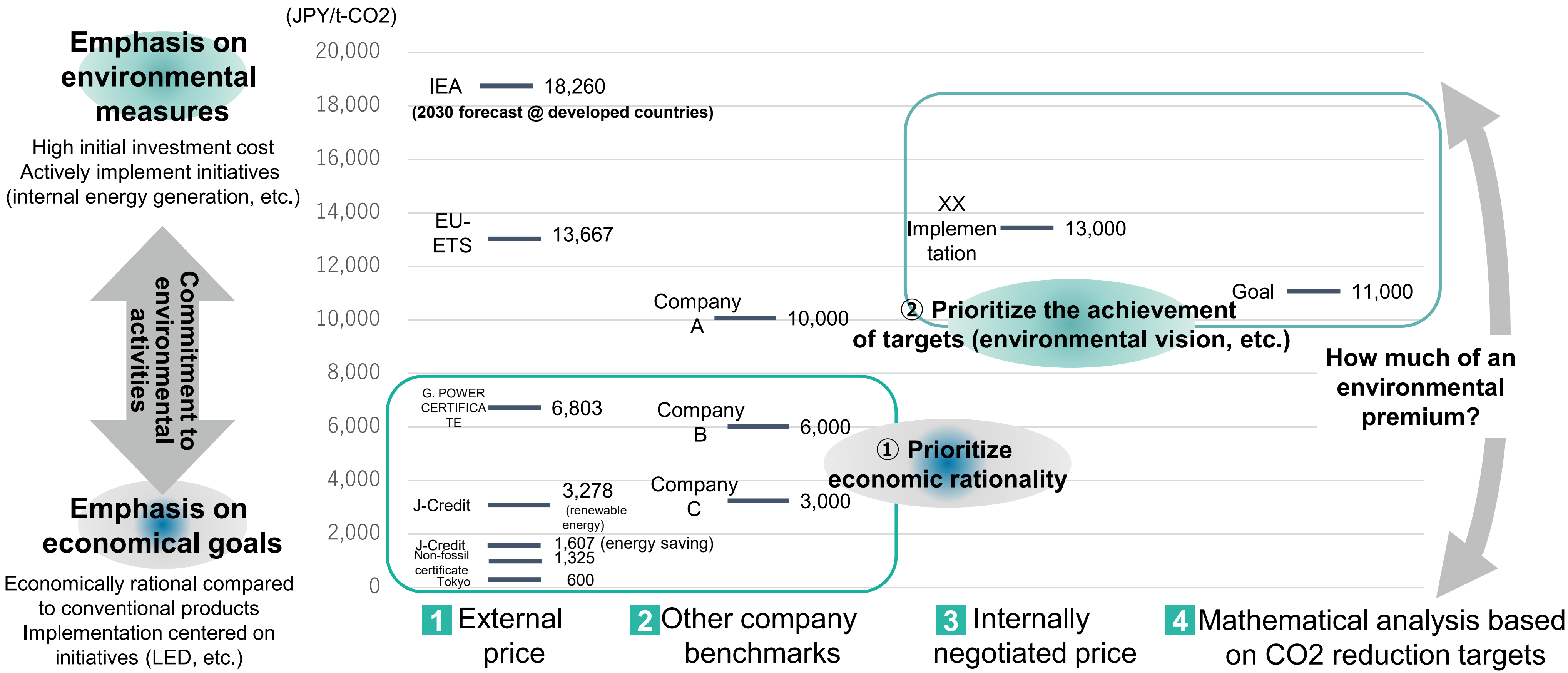
Source: Ministry of the Environment, *Guidelines for the Use of Internal Carbon Pricing - Promotion of Decarbonized Investment by Companies - FY 2022* Version, partially revised.

2 Consider pricing methodology > Rough standard for each method

Options vary depending on the degree of agreement on environmental initiatives within the company

- **There are 4 methodologies for pricing as outlined below.**
- It is important to determine the price based on the degree of agreement on environmental initiatives within the company by clarifying the "degree of willingness of the company to take measures" and the "size of the economic tolerance."

ICP prices by pricing method (example)

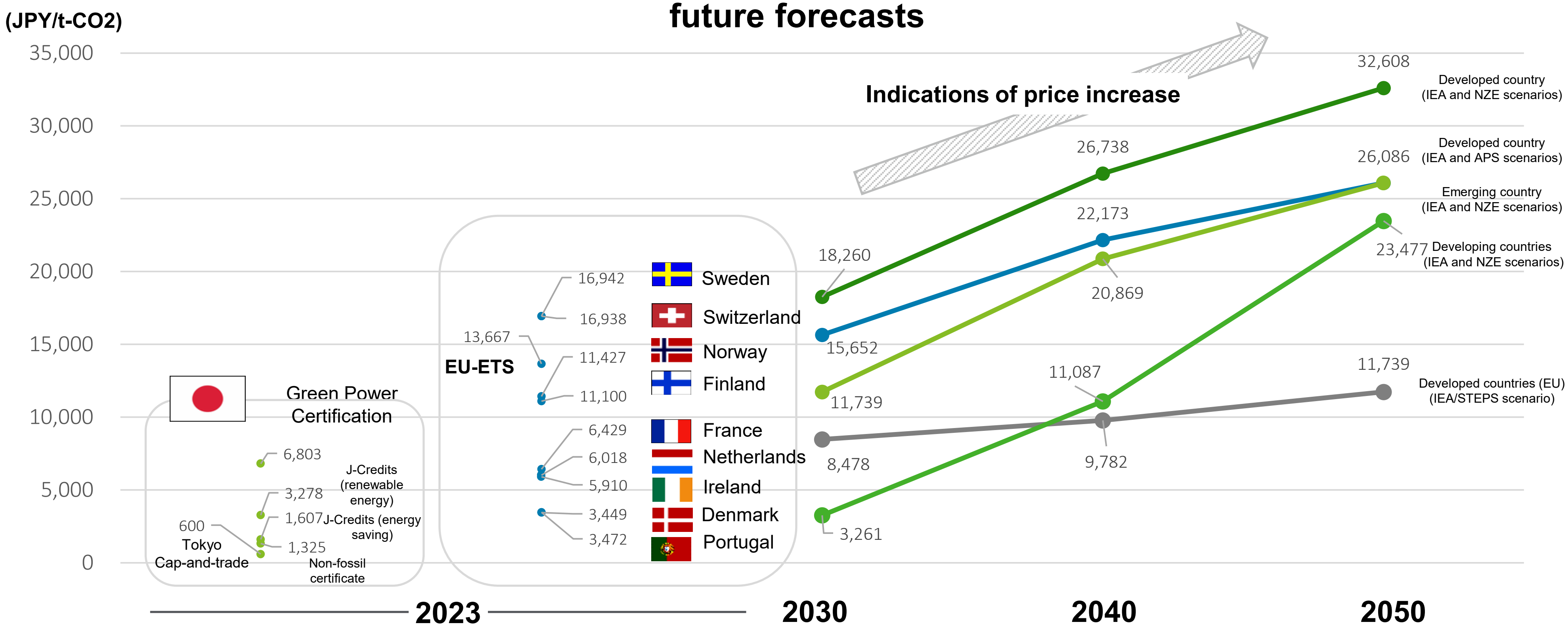


2 Consider pricing methodology > 1 Use of external prices

Determine levels based on the carbon price linked to each country's carbon tax, emissions trading, etc., and the future price projected by the IEA and other organizations

- Applicable to carbon prices linked to carbon taxes, emissions trading, etc.
- The IEA suggests that carbon pricing will increase between 2030 and 2050 to achieve the 1.5°C threshold

Market prices in each country (2023) and future forecasts



* USD 1 = JPY 150.94, EUR 1 = JPY 161.62 (as of November 9, 2023) * EU-ETS prices as of January 31, 2023 are used. * Future forecasts for 2030, 2040 and 2050 are based on IEA WEO2022 and exchange rates as of January 31, 2023 are used.
* The Green Power Certification is provisionally set at JPY3/ kWh. * The CO2 emission factor for electricity is the Ministry of the Environment's "Emission Factor for Each Electricity Utility (for calculating greenhouse gas emissions from specified emitters) - Results for FY2021 - R5.1.24." Alternative value "0.000441 (t-CO2/kWh)" announced by the Ministry of the Environment and the Ministry of Economy, Trade and Industry. https://ghg-santeikohyo.env.go.jp/calc
Source：Non-fossil certificate: Agency for Natural Resources and Energy website（https://www.enecho.meti.go.jp/category/electricity_and_gas/electric/nonfossil/katsuyou_joukyou/）, J-Credit System average successful bid price（https://japancredit.go.jp/tender/）, Tokyo Cap-and-trade: Bureau of Environment, Tokyo Metropolitan Government website（http://www.kankyo.metro.tokyo.jp/climate/large_scale/trade/）、EU-ETS （https://tradingeconomics.com/commodity/carbon）、IEA「World Energy Outlook2023」（https://iea.blob.core.windows.net/assets/66b8f989-971c-4a8d-82b0-4735834de594/WorldEnergyOutlook2023.pdf）、World Bank "Carbon Pricing Dashboard"（https://carbonpricingdashboard.worldbank.org/）- price rate 1 (highest value)

In addition to the EU-ETS, there is also a method of determining levels by referring to multiple external prices in Japan

Detailed external pricing list

	Carbon price	Business scope	Transaction target	Categorization for reference	Source
EU-ETS	10,381 (JPY/tCO2) (calculated using 159.71 JPY/€)	EU+EEA EEA (Iceland, Liechtenstein, Norway)	GHG emissions (For large-scale emission facilities such as power plants, oil refineries, iron foundries, and cement plants)	■ Locations in Europe ■ Appeal to European investors	65€/ tCO2 (end of January 2024) https://tradingeconomics.com/commodity/carbon
Green Power certificate	Prices are relative. Private (If 3 (JPY/kWh) is assumed, 6,803 (JPY/tCO2) (3 (JPY/kWh) ÷ 0.000441 = 6,803))	JAPAN	Environmental added value of electricity generated from natural energy	■ Introduction of renewable energy ■ Achieving RE100 target	Prices are relative and undisclosed (general values from interviews)
Non-fossil certificate	1,325 (JPY/tCO2) (0.6 (JPY/kWh)/0.000453 = 1,325)	JAPAN	Electric power consumption from renewable energy power sources (Non-FIT pricing)	■ Locations in Japan ■ Introduction of renewable energy ■ Achieving RE100 target	Japan Electric Power Exchange http://www.jepx.org/market/nonfossil.html
J-Credit	3,246 (renewable energy) 1,551 (energy saving) (JPY/tCO2)	JAPAN	GHG reductions through introduction of renewable energy and energy-saving equipment	■ Locations in Japan	J-Credit System (average successful bid price from 14th round) https://japancredit.go.jp/tender/
Tokyo Cap-and-trade	600 (JPY/tCO2) * As of the end of February 2022	Tokyo	GHG reductions (Only the amount below the obligatory reduction amount can be traded)	■ Locations in Tokyo	Bureau of Environment, Tokyo Metropolitan Government http://www.kankyo.metro.tokyo.jp/climate/large_scale/trade/

* The Green Power Certification is tentatively set at JPY3/kWh. * The CO2 emission factor for electricity is based on the Ministry of the Environment's "Emission Factor for Each Electricity Utility (for calculating emissions of greenhouse gases by specified emitters) - Results for FY2021 - R5.1.24" using alternative value "0.000441 (t-CO2/kWh)" announced by the Ministry of the Environment and the Ministry of Economy, Trade and Industry, https://ghg-santeikohyo.env.go.jp/calc

One method is to explore the company's own sense of standards based on the sense of standards set by other companies in the industry

- Benchmark survey of prices of other companies in the same industry, etc., based on CDP responses and other published values.
- In addition to peer companies, it is also useful to survey companies in one's own supply chain

Company	Sector	Country	ICP Type	Price	SBT	Detail
Company **A**	XX		Shadow price	**USD XX**	Targets Set	
Company **B**	XX		Implicit carbon price	**USD XX**	Targets Set	
Company **C**	XX		Implicit carbon price	**USD XX**	Targets Set	
Company **D**	XX		Shadow price	**USD XX**	Targets Set	
Company **E**	XX		Shadow price	**USD XX**	Targets Set	
Company **F**	XX		Shadow price	**USD XX**	Targets Set	

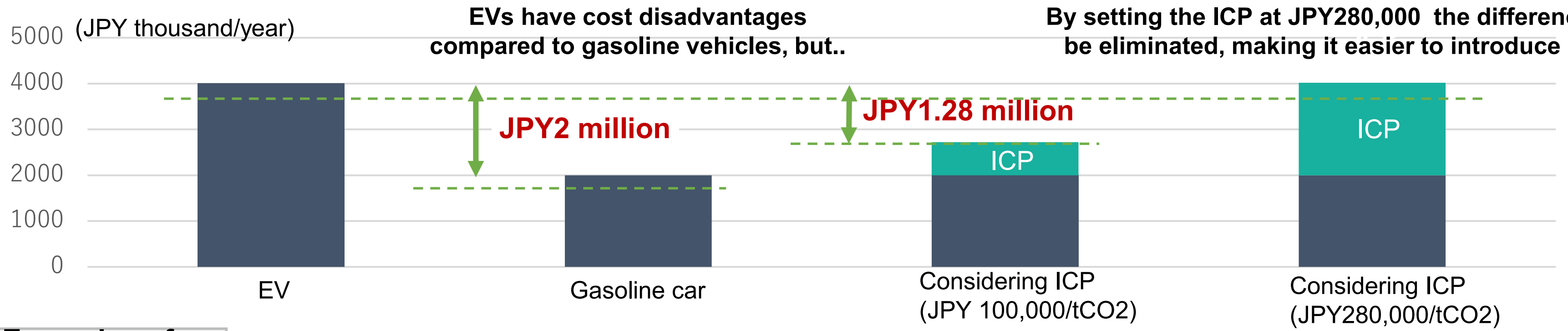
2 Consider pricing methodology > 3 Internal discussion on pricing to encourage decarbonization investments

The cost of reducing carbon emissions in-house can be calculated and used to determine the price level

- **Calculate ICP prices that may have influenced past decisions**
- **Calculate the ICP price at which investment decision-making will be reversed** for the measure you want to invest in, and encourage investment.

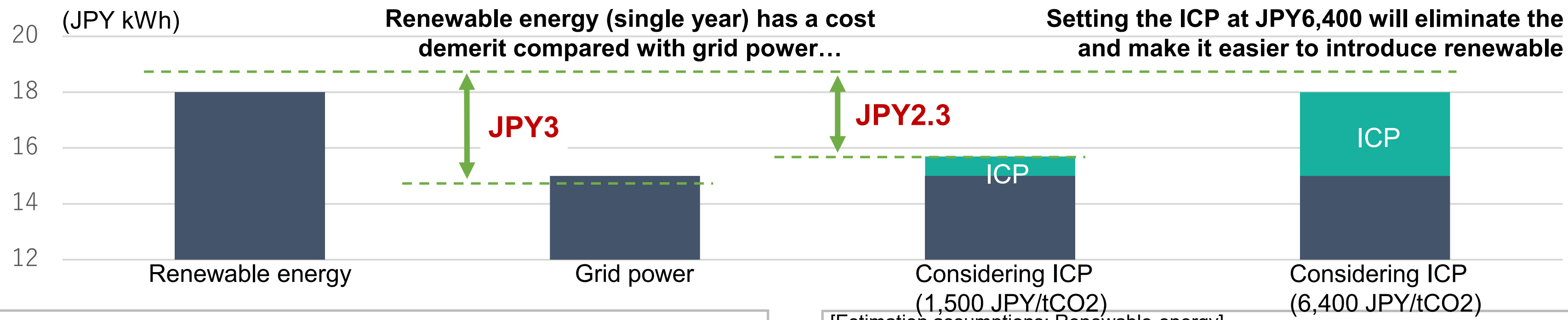
Examples of energy saving

Example: Cost Comparison between EVs and Gasoline Vehicles



Examples of renewable energy

Example: PPA (Single year) vs. Grid Power Cost Comparison



[Estimation assumptions: Energy saving]
- EV:10 units, CO2 reduction calculated from mileage, fuel consumption, and emission factor
- Mileage: 10,000 km, Fuel consumption: 6km/kWh (EV) 15.1km/L (gasoline vehicle)

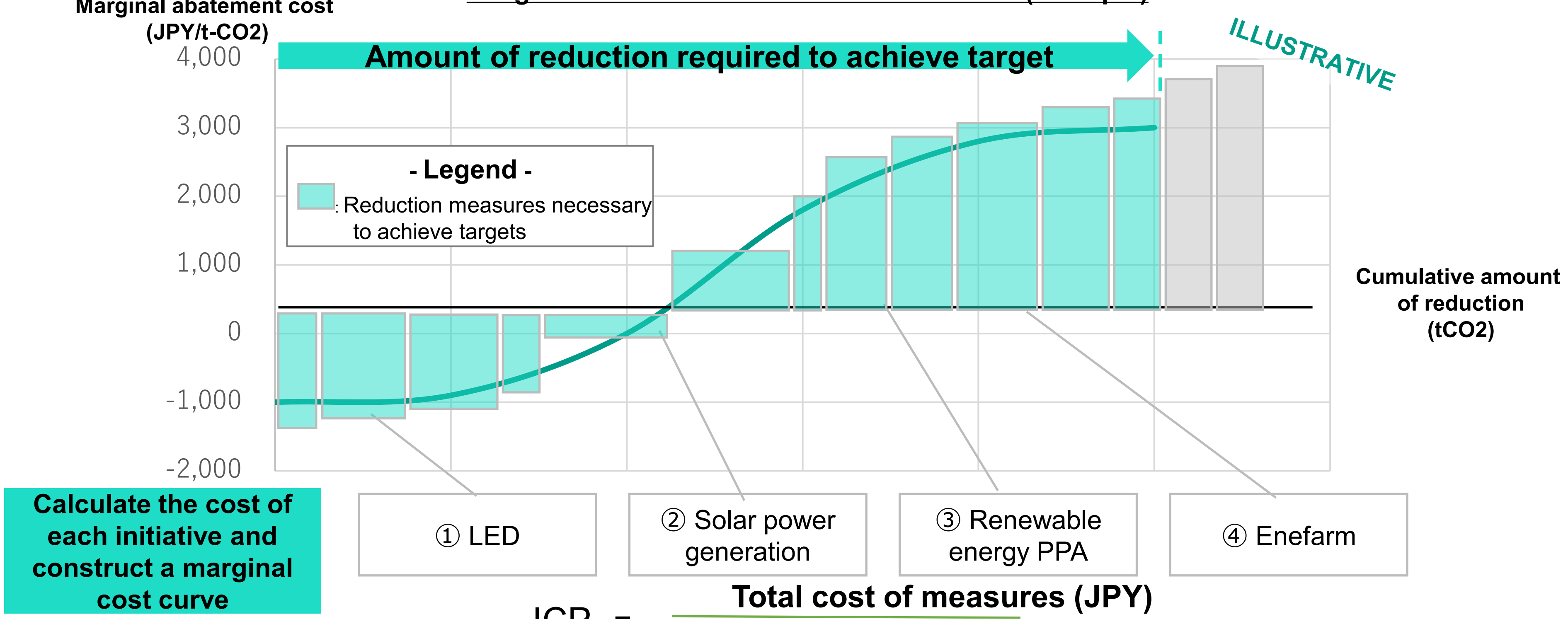
[Estimation assumptions: Renewable energy]
- PPA (single year): Assuming the current price level (grid price of JPY15 and renewable energy price of JPY18 . The emission factor is based on the IEA projection (@ 2019).
- JPY1,500 is set as the price equivalent to J-Credit, and JPY6,400 is set as the price to cover the cost difference between renewable energy and grid system.

Source: Calculated based on various public information provided by METI, NEDO, Keiyo Gas, etc.

There is also a method of calculating the ICP price from the total cost of measures and the cumulative reduction (tCO2), after identifying the company's decarbonization initiatives (introduction of LED, solar power, renewable energy, etc.)

- In order to achieve the CO2 reduction target set by the company, the ICP price can be calculated from **the total cost of initiatives and the cumulative reduction amount (tCO2)** after identifying the company's decarbonization initiatives (introduction of LED, solar power, renewable energy, etc.).
- This makes it possible to shift from **high cost-to-effective decarbonization initiatives to more efficient ones to achieve targets**.

Marginal cost curve for reduction initiatives (example)



$$\text{ICP} = \frac{\text{Total cost of measures (JPY)}}{\text{Cumulative Savings (tCO2)}}$$

Calculate the marginal reduction cost for each initiative and implement them in order of efficiency.

3 Determine degree of internal agreement

Assess the degree of agreement on environmental initiatives and select the pricing method that best suits your company

- The degree of agreement on environmental measures within companies is classified into "no agreement on additional decarbonization investment," "agreement with an understanding of future uncertainties," and "priority on achieving targets/goals"
- As the type of price that can be set varies depending on the degree of agreement within the company, identify the degree of agreement within your company and **choose a method that is consistent with the company's objectives and policies**

Pricing method

Degree of agreement/importance of environmental initiatives \ Price	1 External prices (as-is) / 3 Past decarbonization investments	1 External prices (future)	2 3 4 Individual prices
No agreement on additional decarbonization investments	Cost-Effective ICPs for decarbonization investments Example: Current price of carbon O	~~Losses occur when carbon prices do not rise due to future price uncertainties~~ X	Different from market price, independent price cannot be explained with economic rationality X
Agreement on decarbonization investments with an understanding of future uncertainties		O ICP for long-term profitability, such as R&D, can be used. Example: IEA future prices	
Priority on achieving targets/goals (agreement on additional decarbonization investments)		O Target-achieving ICPs based on high awareness of environmental matters Example: Better pricing than competitors, costs required to achieve SBT, marginal abatement costs, etc.	

3 Determine degree of internal agreement

Assess the degree of agreement within the company and select the pricing method that best suits your company

- Many companies have yet to agree on additional decarbonization investments
- For such companies, it is possible to set the ICP price based on current conditions and past investment amounts
  ⇒ After setting the climate-change targets of your company, **work towards changing the prices as needed to align with targets**

Pricing method

Degree of agreement/importance of environmental initiatives \ Price	1 External prices (as is) / 3 Past decarbonization investments	1 External prices (future)	2 3 4 Individual prices
No agreement on additional decarbonization investments	Current conditions: Current price of carbon or past investments		
Agreement on decarbonization investments with an understanding of future uncertainties	N/A		
Priority on achieving targets/goals (agreement on additional decarbonization investments)	N/A	Goal: Target-achieving ICPs based on high awareness of environmental matters Example: Better pricing than competitors, costs required to achieve SBT, marginal abatement costs, etc.	

First implement pricing based on current conditions or past investments
- Start with a unit price that does not require additional environmental investments, and drive knowledge/acceptance within the company
- Be prepared to respond when carbon prices increase

If the company sets its own target (environmental vision, etc.), the ICP can be changed to a price that meets the target
- Build a marginal cost curve for your reduction efforts in order to meet your target
- Keep track of external pricing information to use as reference for pricing

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Appendix

2 Utilization method

Promote utilization method process in two stages

1

Understand the types of utilization methods

- Understand that there are four types of utilization methods:

(1) **Visualize** economic impact

(2) Use in **investment criteria values**

(3) **Lower investment criteria**

(4) Build a **decarbonization investment fund**

→

2

Determine direction for expanding ICP

- Consider which of the four utilization methods can be adopted by own company
  - First, one option is to **visualize** as reference values for investment criteria
  - Then, gradually aim to reflect this in investment criteria (**use in investment criteria values, lower investment criteria**)
  - Finally, expand into a **decarbonization investment fund**, and promote company-wide decarbonization

1 Understand the types of utilization methods

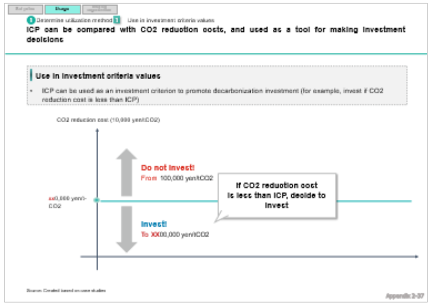
Utilization methods are classified into three categories, depending on whether there are capital interactions between related departments

1

No capital interaction between related departments

Use as investment criteria values

Determine need to invest,
by comparing ICP with CO2 reduction (yen/t-CO2) due to investment

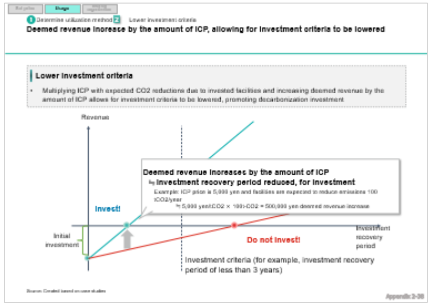


2

No capital interaction between related departments

Lower investment criteria

Lower investment criteria,
by handling value calculated from “ICP × CP2 reduction” as “deemed revenue”

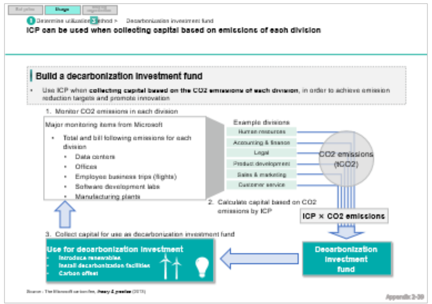


3

Capital interaction between related departments: **Yes**

Build a decarbonization investment fund

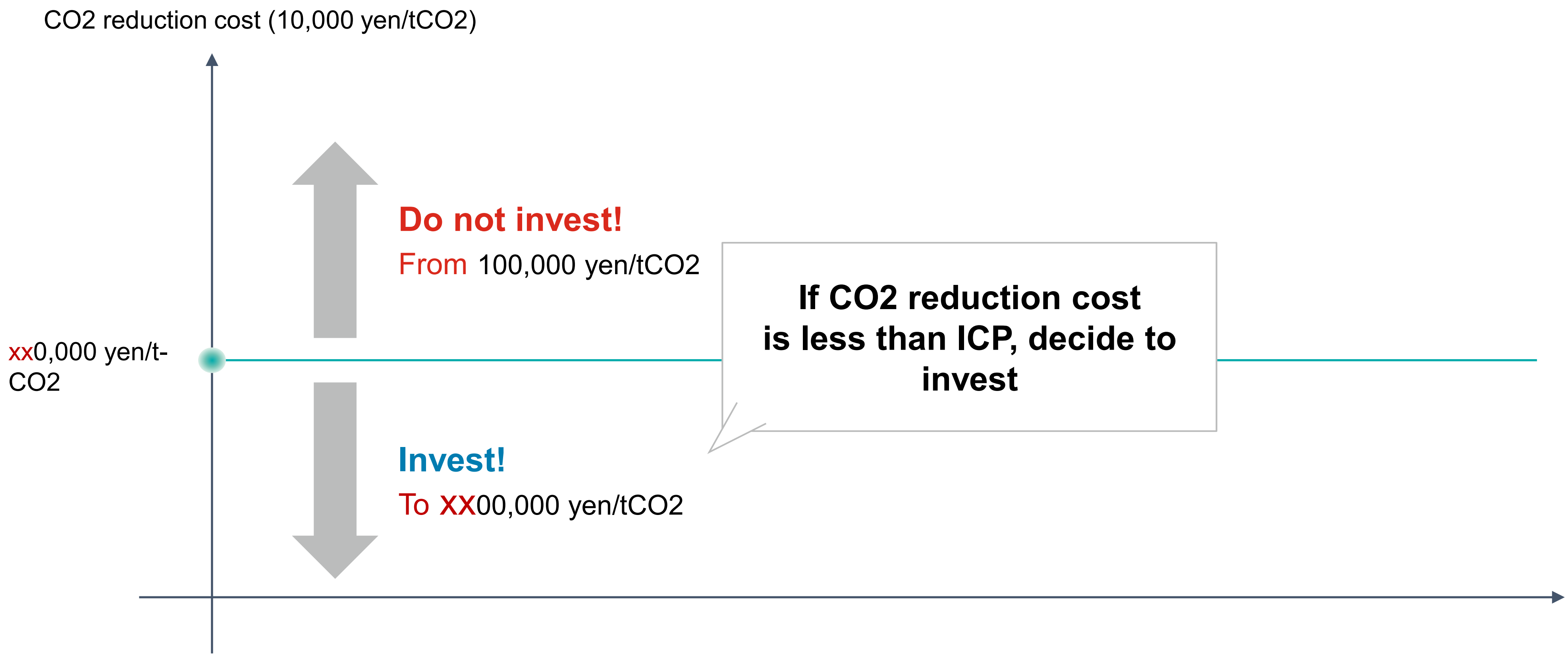
Collect capital from each division, based on “ICP × division emissions.”
Use collected capital to form a fund used for decarbonization investment.



ICP can be compared with CO2 reduction costs, and used as a tool for making investment decisions

Use in investment criteria values

- ICP can be used as an investment criterion to promote decarbonization investment (for example, invest if CO2 reduction cost is less than ICP)

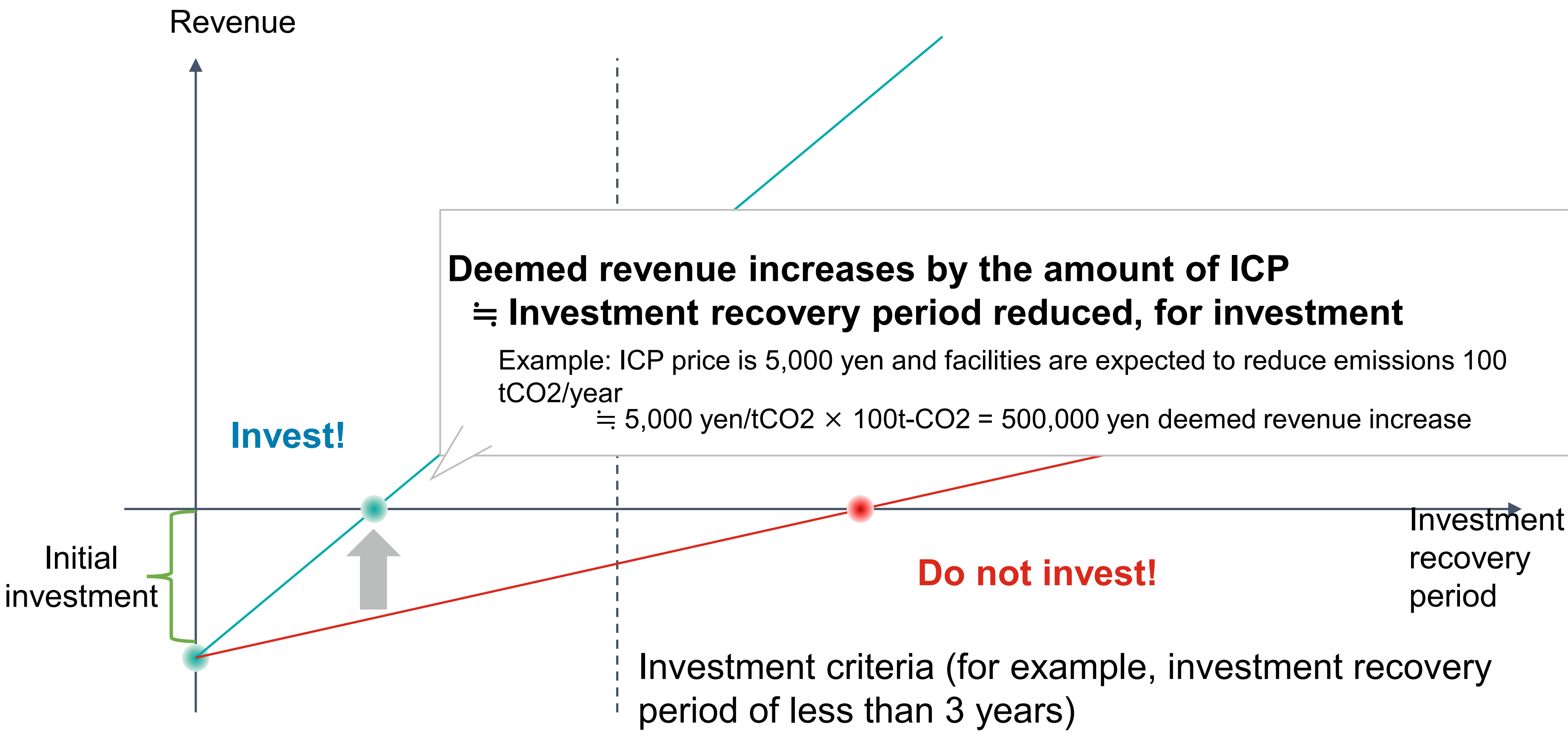


Source: Created based on case studies

Deemed revenue increase by the amount of ICP, allowing for investment criteria to be lowered

Lower investment criteria

- Multiplying ICP with expected CO2 reductions due to invested facilities and increasing deemed revenue by the amount of ICP allows for investment criteria to be lowered, promoting decarbonization investment



Deemed revenue increases by the amount of ICP
≒ Investment recovery period reduced, for investment

Example: ICP price is 5,000 yen and facilities are expected to reduce emissions 100 tCO2/year
≒ 5,000 yen/tCO2 × 100t-CO2 = 500,000 yen deemed revenue increase

Source: Created based on case studies

ICP can be used when collecting capital based on emissions of each division

Build a decarbonization investment fund

- Use ICP when **collecting capital based on the CO2 emissions of each division**, in order to achieve emission reduction targets and promote innovation

1. Monitor CO2 emissions in each division

Major monitoring items from Microsoft

- Total and bill following emissions for each division
  - Data centers
  - Offices
  - Employee business trips (flights)
  - Software development labs
  - Manufacturing plants

Example divisions

- Human resources
- Accounting & finance
- Legal
- Product development
- Sales & marketing
- Customer service

CO2 emissions (tCO2)

2. Calculate capital based on CO2 emissions by ICP

ICP × CO2 emissions

Decarbonization investment fund

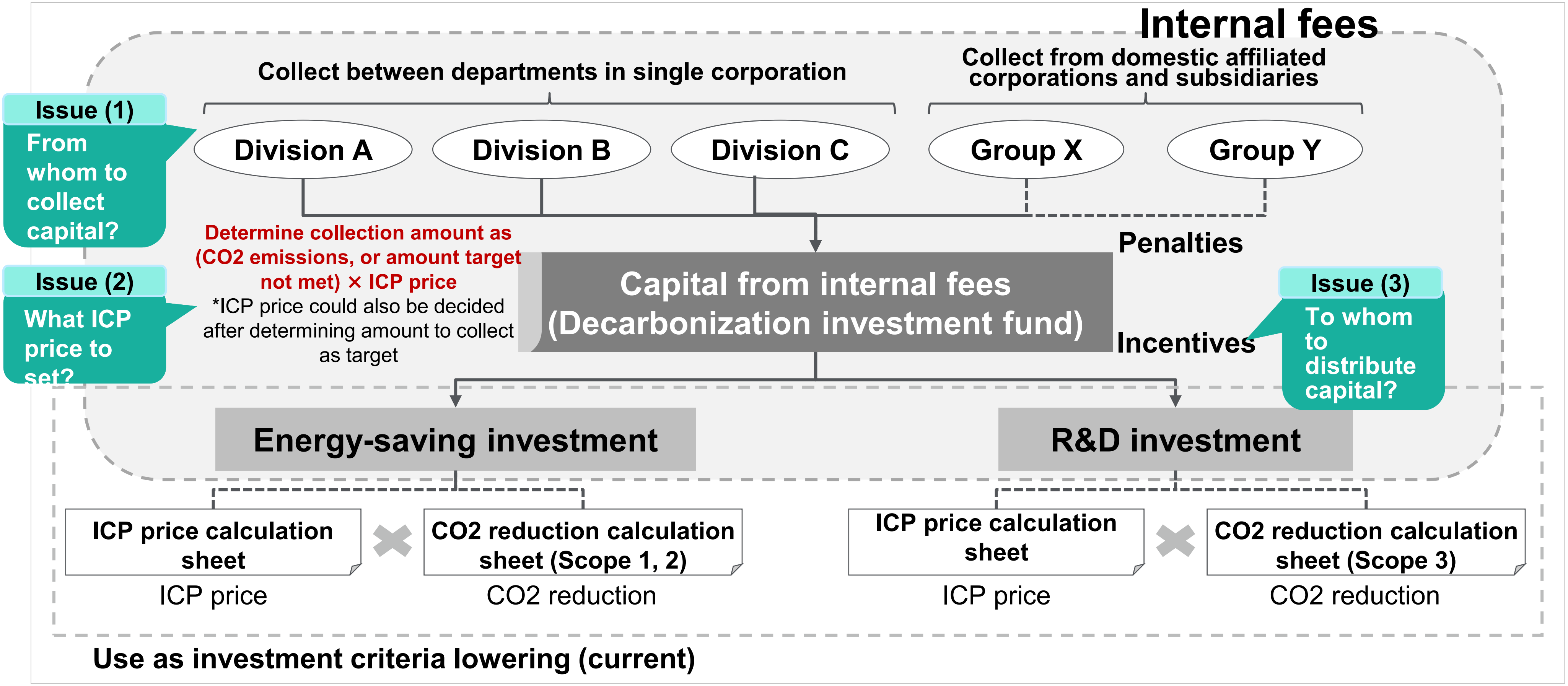
3. Collect capital for use as decarbonization investment fund

Use for decarbonization investment

- **Introduce renewables**
- **Install decarbonization facilities**
- **Carbon offset**

Source : The Microsoft carbon fee, *theory & practice* (2013)

When forming a decarbonization investment fund, consider (1) collection method, (2) price setting, and (3) distribution method



Issue (1)	Collection method: From whom to collect capital?
Issue (2)	ICP price setting: What ICP price to set?
Issue (3)	Distribution method: To whom to distribute capital?

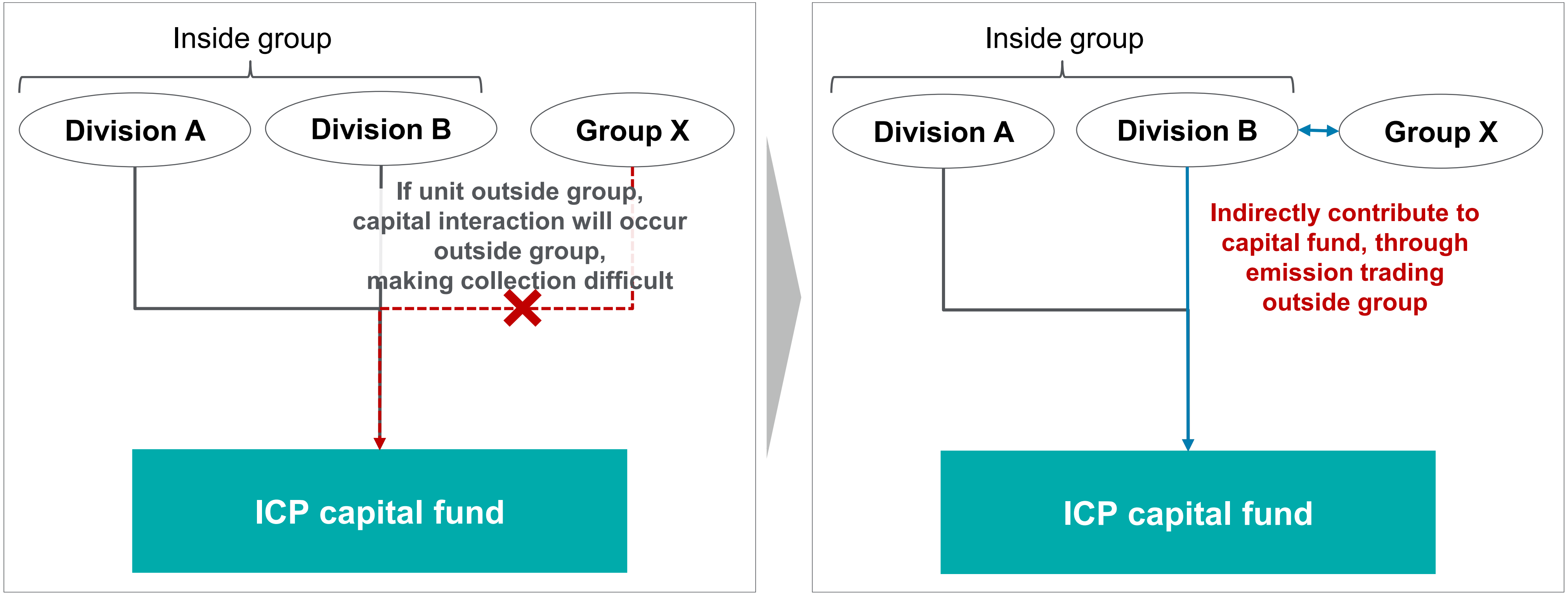
Source : The Microsoft carbon fee, *theory & practice* (2013)

Organize issues and solutions for system design. The department in charge of overall management and whether the system needs to be built must also be considered

Item	Key issues to consider
Internal fee usage	**Usage of internal fee capital** • Assume two patterns, after setting as capital for Scope 1/2/3 emission reduction • Collect all investments using ICP as internal fees • Partially cover as penalties/incentives
Issue (1) From whom to collect capital?	**From whom to collect capital?** • Collect between departments in single corporation • Collect from domestic affiliated corporations and subsidiaries **How to process when collecting?** • Reflect through reducing budget • Reflect by reducing division evaluation • Collect actual department capital **How to determine amount to collect?** • Determine amount by multiplying CO2 emission by ICP price • Determine amount by multiplying amount target not met by ICP price
Issue (2) What ICP price to set?	**What ICP price to set?** • Set ICP price that satisfies collection level considered for Issue (1) • Does same ICP price as investment decision making satisfy collection level? • Must a new ICP price be set for internal fees?
Issue (3) To whom to distribute capital?	**To whom to distribute capital?** **How to process during distribution?** • Reflect through increasing budget • Reflect through increases during division end of term evaluation • Distribute actual department capital

Organize issues and solutions for system design. The department in charge of overall management and whether the system needs to be built must also be considered

If a group is split, what should be done for the capital pool mechanism?



Instead of internal fees[*1] (capital interactions), another option is to use internal trade[*2] (CO_2 emission interaction) to implement emission trading outside the group.
In this case, new mechanisms and internal rules would need to be established for emissions outside the group

*1: **Internal fee (internal carbon charge):** Creating an **ICP capital fund** to help reduce Scope 1/2 **within the group, and collecting/managing capital**
*2: **Internal trade (internal emissions trading): Trading emissions between groups**

2 Direction of assumed expansion

Organize direction for expansion based on "reflection to investment criteria" and "whether there is capital interaction"

- Organize ICP usage based on "reference (visualization, not investment criteria)" and "(partial) reflection to investment criteria"
- Organize direction of expansion based on whether decarbonization capital is "fixed budget in division" or "internal budget is financed/redistributed"

Expansion direction

ICP usage \ Decarbonization capital	Fixed budget in division	Internal budget is financed/redistributed (Internal fee)
Reference (Visualization, not investment criteria)	**Consider current economic activity, and introduce current prices and past investment prices as "reference (visualization)"**	N/A
(Partial) reflection **to investment criteria**	**Increase ICP to environment goal support price, and use as tool to make internal investment decisions**	**Once some degree of internal understanding has spread, finance budget internally**

2 Determine direction for expanding ICP (1/2)

Start with use as reference, and then reflect in investment criteria

- Start with the "consider current/past investment prices, and introduce as reference (visualization)" utilization method, and then gradually perform "(partial) reflection to investment criteria"
- Assume that carbon prices will increase, determine decarbonization goals such as own company SBT, and promote efforts

Expansion direction

Decarbonization capital / ICP usage	Current: Fixed budget in division	Internal budget is financed/ redistributed (Internal fee)
Reference (Visualization, not investment criteria)	1	N/A
(Partial) reflection to investment criteria	2	N/A

Most recent possible processes

1 First, introduce current prices and past investment prices as "reference (visualization)"

- Start from setting unit prices that allow for current economic activities to continue, and promote the spread of internal understanding
- First, set unit prices with reference to current carbon prices or past investment prices
- Make it possible to respond to rising carbon prices

Once decarbonization goals (SBT, etc.) have been decided

2 Increase ICP to SBT support price, and use as tool to make internal investment decisions

- Increase ICP price to price where SBT can be supported
- Introduce ICP for large financial investments, such as installing energy-saving devices and renewables
- Also, visualize carbon prices to increase recognition of employee carbon prices (carbon tax)

2 Determine direction for expanding ICP (2/2)

If deemed effective for own company, introducing internal fees can have an effect that makes up for or even exceeds reflection to investment criteria

- Start from “considering current/past investment prices, and introducing as reference (visualization).” If deemed effective for own company, aim to introduce internal fees as a “framework for collecting capital from each division and providing capital for energy-saving and R&D investment”
- Actions such as obtaining additional investment in decarbonization and promoting internal understanding will likely be required

Expansion direction

Decarbonization capital / ICP usage	Current: Fixed budget in division	Internal budget is financed/ redistributed (Internal fee)
Reference (Visualization, not investment criteria)	1	N/A
(Partial) reflection to investment criteria	2	3

Most recent possible processes

1 **First, introduce current prices and past investment prices as “reference”**

- Start from setting unit prices that allow for current economic activities to continue, and promote the spread of internal understanding
- Make it possible to respond to rising carbon prices

2 **Partially reflect to investment criteria**

After acquiring decarbonization investment

2 **Increase ICP to goal achievement price**

- Build path to achieve goals
- Set prices consistent with this path

Once some degree of internal understanding has spread

3 **Finance budget internally**

- Create budget pool based on ICP for internal fees
- Prioritize and allocate decarbonization investment

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Organizational structure

Department in charge organizes the items necessary for the introduction of ICP and coordinates and collaborates with related departments

- Departments in charge (e.g., Sustainability/Environment/CSR Department) organize items necessary for the introduction of ICP
- Coordinate with related departments and develop an environmental vision in parallel

Department/division in charge
Example: Sustainability/Environment/CSR Department

Organize items required for introduction of ICP
- Scope of application
- Time frames for the promotion
- Operational structure

Coordination

Drafting

Accounting	• Revision of the application form: visualization • Examination of main organizations (e.g., expert committees, new divisions)
Business divisions	• Pricing considerations • Scope of application considerations (Scope 1, 2, 3/Domestic and overseas)
Corporate planning	• Commitment to decarbonization (e.g., carbon neutral, SBT, RE100) • Examination of main organizations (e.g., expert committees, new divisions)

Cooperation

Company as a whole	• Commitment from the senior management • Establishment of the environmental vision • Increased level of agreement on internal zero carbon investments

Future initiatives: Example of NYK Line

Prepare the scope of application and promotion time frame (draft)

- It is required that the scope of application and the promotion time frame (draft) are prepared and discussed with the related departments. The following is an example prepared by Nippon Yusen Kabushiki Kaisha (herein referred to as NYK Line)

✓ Set the time frames for the promotion

✓ Set the scope of application

	Phase 1 ('18 to '19)	Phase 2 ('20 to '2X)	Phase 3 ('2X to '3X)
Core business (General freight transportation business)	Reference value	**2,500 yen**	Used as an investment indicator **Increases with regulations**
Peripheral businesses (Bulk shipping and cruise businesses)	Reference value	**2,500 yen**	Used as an investment indicator **Increases with regulations**
Other (Other businesses)	Reference value	**2,500 yen**	Used as an investment indicator

Measures to utilize ICP

Visualize current carbon prices (Reference value)

After the decision to introduce MBM*, the ICP price will be adjusted to comply with the regulations (Investment indicators)

At the same time, forward-looking ICP prices will be set for green business investment and R&D investment

*Market-Based Measures (MBM)

Source: Prepared from materials provided by Nippon Yusen Kabushiki Kaisha (NYK Line)

Examples of organizational structure determination

Consider pricing review methods and organizational structure

- Determine the operational structure such as **the price review method and the main organizations** (e.g., expert committee, new division)
- Involve senior management and formulate an environmental vision from a long-term perspective

Point

Operational Structure Reference Case

Case 1: Price review (external environment)

Company A
- Check Tradable Green Certificate, EU-ETS (EU Emissions Trading System), IEA, changes in electricity prices

Regularly monitor prices

Company B
- Used to prepare for the introduction of emissions credit trading in the industry
- Disseminate the system as one of the internal systems so that it can respond smoothly to the decision of introduction

Implemented as a system to comply with regulations

Case 2: Price review (internal target)

Company C
- Review target prices in accordance with mid- and long-term targets

Review based on our own corporate targets

Company D
- Although it is a reference value, the price is reviewed every year based on the market price, trends of other companies, internal performances, cases, etc.

Internal performance based on past cases

Case 3: Consideration of Main Internal Organizat

Company E
- Committee formed within the company. Set up a special team to review prices after analyzing market and social trends

Establishment of a specialized organization

Company F
- The CSR Committee regularly discusses price revisions. Consider based on the results of regulations, renewable energy procurement prices, and environmental investments

Regular committee meeting

Company G
- For projects for which investment has been decided, an internal committee assesses energy-saving investment projects investment amounts, and investment reduction effects

Monitoring of investments

Case 4: Senior Commitment

Company H
- Chief Administrative Officer (CAO) and Chief Compliance Officer (CCO) are involved in price review and setting

Involvement of executives and other managements

Summary: Points that form the premise of the set price, methods of use, and organizational structure

Introduce ICP after clarifying the status of agreement, introductory purposes, and the future image within the company

Point

	Point
Consideration of the set price	**Consider the price according to the introductory purposes** • First, understand the types of prices and how to set them • Decide which information to refer to, considering the difficulty and effectiveness of the setting. • Discuss with business divisions and other departments/divisions to confirm the level of agreement on decarbonization investment within the company
Consideration of methods of use	**Present a realistic development direction based on the level of understanding within the company (whether the investment standards are immediately applicable or not)** • Discuss with the sustainability, environment, and business divisions, etc. for what purpose the ICP should be introduced in the company • Do we just need to understand the impact of future carbon prices, or do we need to include investment standards?
Review of organizational structures and future initiatives	**The promotion with a time frame which is in line with the actual situation of the company is important** • Decide which organization will be the main body: new or existing internal departments/divisions, etc. • Discuss the scope of application with the organizations and departments/divisions in charge. • Determine the time frame for promotion • Request to obtain commitment from management • Draft long-term environmental vision and internal targets

(Reference) Purpose and scope of application of the ICP

When using ICP, the purpose, scope of the application, and business application (how they are applied to business decision-making) will be the keys

Purpose

There are three main purposes for implementing the ICP

Purpose	Potential goals/outcomes
Tool to assess and manage carbon-related risks	• Assess risk exposure • Inform strategic response & future-proof assets and investments against regulatory risk (ETS, carbon tax). (Including investment in new technologies or energy efficiency to decrease costs.) • Demonstrate management of risk to shareholders
Tool to identify carbon-related opportunities	• Reveal cost-cutting and resiliency investment opportunities throughout value chain in the transition to a low-carbon economy • Change employee and supplier behavior • Discover new markets and revenue opportunities • Influence R&D investment decisions
Transition tool for corporate behavior	• Align investment strategy and business with the Paris Agreement • Accelerate reduction of GHG emissions and drive investment in energy efficiency initiatives, renewable energy procurement, and R&D of low-carbon products/services • Generate revenue to reinvest in low-carbon activities

Scope of application

The scope of GHG emissions affects the relevant decision making

GHG emissions	Examples of relevant decisions
Scope 1	(Facility related) Investment and production decisions
Scope 2	Energy purchasing decisions
Scope 3 (Upstream)	Materials sourcing and procurement decisions
Scope 3 (Downstream)	R&D decisions for innovative products for the current/future market

Business application

- How the ICP are applied to business decisions (e.g., capital expenditure decisions, operational decisions, procurement decisions)
- Level of impact on the decision-making process (= to what extent does it enforce the use of ICP prices)

Source : CDP, *Carbon Pricing: CDP Disclosure Best Practice* (2018)

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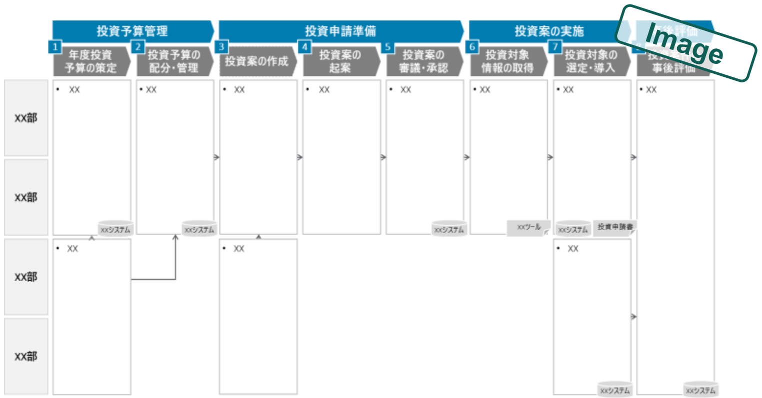
Appendix

Steps to consider application and decision-making process

Organize and review the current investment decision-making process and the decision-making process in ICP introduction

Results of companies' own considerations

3-1 Organizing the current investment decision-making process



3-2 Reviewing the decision-making process for investment after the introduction of ICP

Input

- Information on current investment decision-making (e.g., organizational structure, investment decision standards)

Process

① Organize the current investment decision-making structure, investment decision standards, and processes

Reference page: 2-3-4. Consideration (3) : Consideration of internal structure

① Organize which processes and roles will be added with the ICP introduction

Reference page: 2-3-4. Consideration (3) : Consideration of internal structure

3-1 Explanation on organizing the current investment decision-making process

Organize the current investment decision-making process and identify the departments and roles involved, as a prerequisite information for considering the process in ICP introduction

1 **Organize the current investment decision-making process, including the departments in charge, their roles, and standards. When the process differs depending on the investment target or department, it is advisable to organize the process for each.**
(If necessary, conduct interviews with the departments in charge.)

(Examples of perspectives in the organization)

- Who decides/allocates the annual investment amount and budget, and how?
- Who applies for the investment?
- Who has the authority to confirm/approve/decide on investment requests?
- Who purchases the investments?
- Who manages the data on investment applications/approvals/facility and product information?

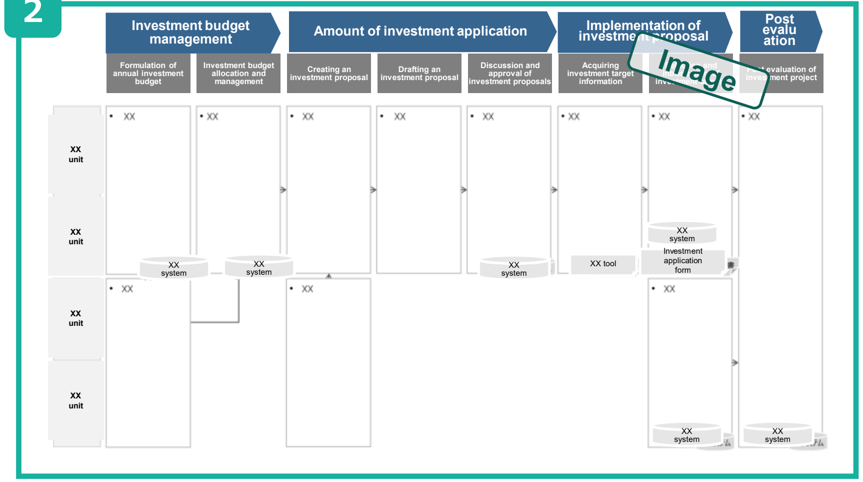
2 **Based on the above, organize the departments in charge, roles, and investment decision standards in the current decision-making process using process charts, etc.**

1

Image

Company	Investment target	Department	Responsibility	criteria
XXHD	Xxx	XX Department	Xxx	Xxx
	Xxx	XX Department	Xxx	Yyy
XXX	Xxx	XX Department	Xxx	Xxx
	Xxx	XX Department	Xxx	Zzz
XXX	Xxx	XX Department	Xxx	Xxx
XXX	Xxx	XX Department	Xxx	Xxx
XXX	Xxx	XX Department	Xxx	Xxx

2



3-2 Explanation on the review of the investment decision-making process after the introduction of ICP

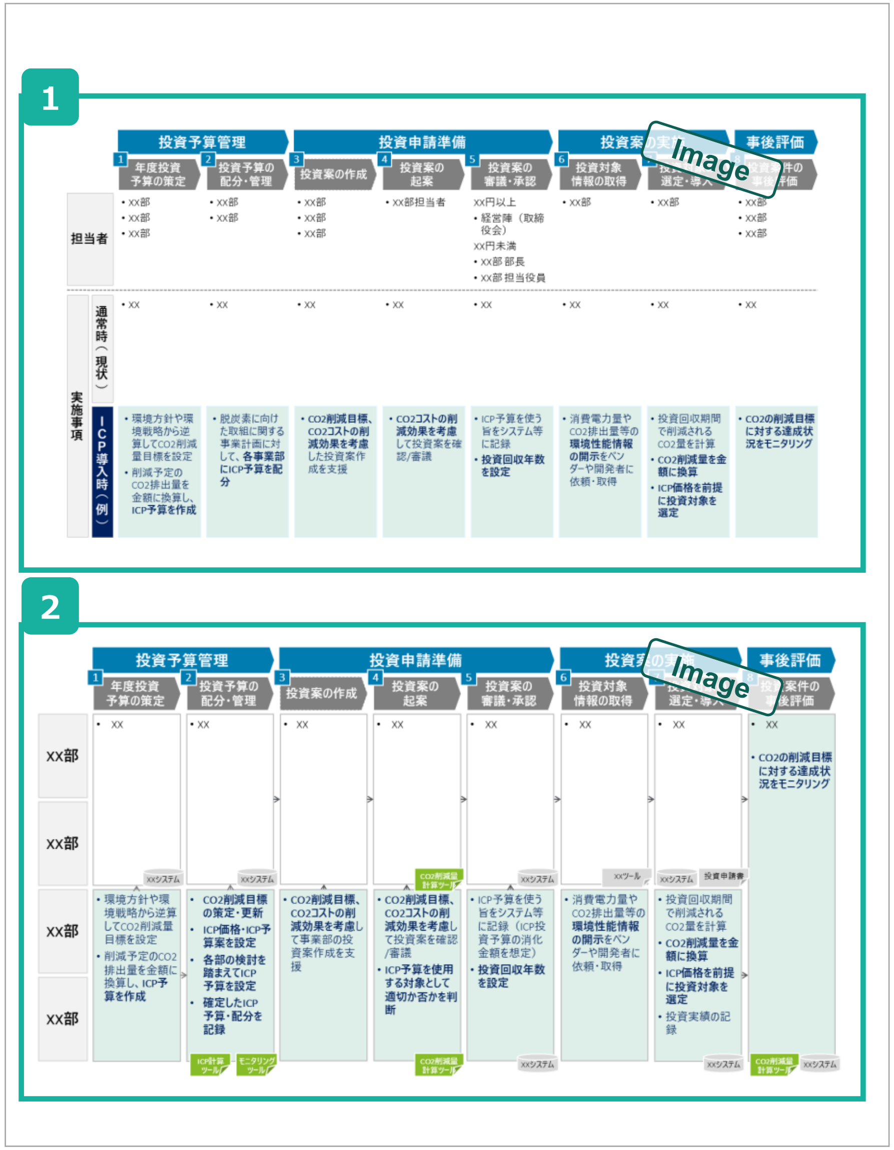
Clarify roles, processes, and rules that will need to be added/changed by introducing ICP

1 Organize roles, processes, and rules that will need to be added/changed by introducing ICP. Also consider whether it can be applied with existing roles, processes, and rules.

(Example of items to consider)

- Will the budget decision makers change?
- Will the applicants for investments and the details of their applications be changed?
- Will the authority to confirm/approve/decide on investment requests be changed?
- Will the person who manages investment application/approval/equipment/product information data change?
- Will the introduction of ICP require changes in internal rules?

2 Organize the above considerations in a process chart, etc.



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Chapter 3 fleshes out the issues discussed in Chapter 2 and discusses the scope of application, operational structures/methods of ICP

		Step	Key issues	Keywords
How to set the ICP	1	**Consideration of the introductory purposes**	• What is the purpose of introducing ICP on the basis of internal emissions?	• Current status of internal emissions • Emission reduction target
	2	**Consideration of the set price**	• Which of the four methods (external pricing, internal discussions, etc.) should be used? • What is the use of internal ICP, and is it used as an investment standard?	• External prices • Peer companies' price benchmark • Internal discussion on decarbonizing prices • Mathematical analysis of CO2 reduction targets
How and to what extent should the ICP be applied?	3	**Consideration of application purpose and decision-making processes**	• What is the use of the ICP and is it used as an investment standard? • First of all, in cases where reference values (visualization) for investment are used, which document (e.g., request for investment decision) should be included as reference values?	• Visualized as a reference value for investment • Use in investment indexes (investment standard value) • Use in investment indexes (lowering of investment standard) • Internal fee (recovery of funds based on emissions)
	4	**Consideration of organizational structure**	• How will the ICP be promoted? • Which departments/divisions are involved in the promotion?	• Use in existing departments/divisions • Launching of new departments/divisions
	5	**Consideration of scope of applications and applicable companies**	• Among Scope 1 (investment in energy-saving), Scope 2 (investment in renewable energy), and Scope 3 (e.g., procurement of raw materials, R&D, M&A), what is the scope to which the ICP applies? • (In case of holdings) How far should ICP be introduced in domestic, overseas, and group companies?	• Scope 1 (energy-saving), Scope 2 (renewable energy), Scope 3 (procurement of raw materials, R&D), etc. • Domestic head office, domestic group companies, overseas sites/subsidiaries
How to manage investments and budgets regarding ICP	6	**Consideration of linkage between reduction targets and investments**	• Is there currently a quota for investment and is the amount of decarbonization investment linked to the company's climate objectives (e.g., the 2050 net zero)?	• Set the amount of investment for decarbonization linked to CO2 reduction targets • (Not set)
	7	**Consideration of budget control and budget cap**	• (When ICP are reflected in investment standards) How will the budget be managed?/Which departments/divisions will be responsible for budgetary controls and the accumulation of ICP-related investment information (e.g., which facilities, investment amounts)? • (When ICP are reflected in investment standards) Should budget cap be implemented?/If so, how? (Set according to the annual CO2 reduction target)	• Budget control/business divisions apply for ICP budget at corporate headquarters/Apply for ICP budget and allocate budget to business divisions • Calculate the budget based on the results of the previous year's ICP utilization and the annual CO2 reduction target

Note: Budget control and budget cap will be considered from the stage of reflecting the ICP to the investment standards. No need to consider when using as visual control (visualization) (reference value)

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Appendix

Introductory purposes

Clarify the purpose of introducing ICP and check the status of internal emissions

Results of companies' own considerations

1-1 Sorting out the purpose of introducing ICP

	目標	Difficulty of achieving goals	Contribution by introducing ICP
	Achieving carbon targets (Achievement of SBT/RE100/environmental vision, etc.)		
1	Achieve carbon neutrality for the XX Group by 2050 (Scope 1,2) ● Reduce XX by XX% by XX fiscal year by XX (Method of realization) ● ・・・	**Large**	Low
2	By being aware of investments and reductions related to decarbonization through the introduction of ICP, we will change the mindset of employees and spread common goals throughout the company.	**Large**	Low-middle
	Preparing for and capturing opportunities for decarbonization regulations that may be strengthened and introduced		
3	If a carbon tax is imposed in the future, the amount of carbon tax paid should be kept to a minimum.	Small	Low-middle
4	Providing new services that contribute to carbon neutrality and contributing to reducing society's environmental impact.	**Large**	high
5	Increase customer engagement by providing products and services that meet customer needs	Small	high
6	Develop core technologies and improve production systems in preparation for rising raw material prices and increased demand for low-carbon products due to a low-carbon society.	**Large**	high
	Responding to existing decarbonization regulations		
7	Achieving business targets defined by the Energy Conservation Act (e.g. average annual energy consumption of 1%)	Small	Low-middle
	Promotion of information disclosure (responses to CDP etc.)		
8	Obtain a rank A rating for CDP responses.hfs6	Small	Low
9	To be recognized as an environmentally friendly company and to improve the company's image by including it in various reports, etc.	Small	Low

Reference page

Input

- Company's own decarbonization targets (long-term targets, reduction methods)

-

Process

① Organization and clarification of the purposes of introducing ICP

② Classification of degree of difficulty in achieving objectives and degree of contribution through introduction of ICP

1-1 Explanation on organizing the ICP introductory purposes

Clarify the purpose of introducing the ICP to make it more effective

1 Organize purposes related to the introduction of ICP as a list

(Examples of objectives)

- Achievement of decarbonization targets (e.g., long-term targets, reduction methods)
- Preparing for and seizing opportunities for decarbonization regulations that may be strengthened and introduced in the future
- Compliance with existing decarbonization regulations (e.g., compliance with the law concerning energy conservation)
- Promotion of information disclosure (e.g., CDP responses, TCFD responses)

2 The degree of difficulty in achieving the objectives and the degree of contribution from the introduction of ICP are classified as "Small" to "Large". The priorities for the objectives of the introduction of ICP are ranked based on these classifications

- Degree of difficulty in achieving the objective: Classify the degree of difficulty in achieving the objective itself
  (e.g., we classify the decarbonization target as "Large" because it takes a long time to achieve the target)
- Degree of contribution by introduction of ICP: Classification of whether the introduction of ICP contributes to the achievement of objectives
  (e.g., classification will be "Large" if the introduction of ICP can address future regulatory costs)

3 Check the status of CO2 emissions at the company (Details to be discussed at 4-1)

- Regarding the emissions in Scope 1 and 2 (including Scope 3 if possible), confirm the amount and breakdown of emissions, and identify the scope (business/facility) that is a hurdle to emission reduction

	1 目標	2 目的達成の難易度	3 ICP導入による貢献度
Achieving carbon targets (Achievement of SBT/RE100/environmental vision, etc.)			
1	Achieve carbon neutrality for the XX Group by 2050 (Scope 1,2) ● Reduce XX by XX% by XX fiscal year by XX (Method of realization) ● ・・・	**Large**	Low-middle
2	By being aware of investments and reductions related to decarbonization through the introduction of ICP, we will change the mindset of employees and spread common goals throughout the company	**Large**	Low-middle
Preparing for and capturing opportunities for decarbonization regulations that may be strengthened and introduced			
3	If a carbon tax is imposed in the future, the amount of carbon tax paid should be kept to a minimum.	Small	Low-middle
4	Providing new services that contribute to carbon neutrality and contributing to reducing society's environmental impact.	**Large**	high
5	Increase customer engagement by providing products and services that meet customer needs	小	high
6	Develop core technologies and improve production systems in preparation for rising raw material prices and increased demand for low-carbon products due to a low-carbon society.	**Large**	high
Responding to existing decarbonization regulations			
7	Achieving business targets defined by the Energy Conservation Act (e.g. average annual energy consumption of 1%)	Small	Low-middle
Promotion of information disclosure (responses to CDP etc.)			
8	Obtain a rank A rating for CDP responses	Small	Low
9	To be recognized as an environmentally friendly company and to improve the company's image by including it in various reports, etc.	Small	Low

(Reference) Hearing regarding the introduction of ICP

ICP introduction is linked to decarbonization targets and considered in investment planning. When promoting environment-related targets and environmental investment, some companies are considering its introduction to raise awareness on CO2 reduction measures within the company

What are the purposes and backgrounds of companies that have introduced ICP?

Achievement of the decarbonization target

Person in charge of Sustainability/ Environment Division, etc.

- To foster awareness of CO2 throughout the company and promote environment-related targets with the primary goal of reducing GHG emissions.
- One of the ways to promote decarbonization efforts in the company.
- There is a growing momentum for carbon neutrality, and the ICP will be introduced for company-wide and group-wide efforts, and we believe that it will support internal awareness and specific initiatives on decarbonization targets.

Preparing for and seizing opportunities for decarbonization regulations

Person in charge of Sustainability/ Environment Division, etc.

- In order to promote emissions reduction, it is linked to the GHG reduction targets for the entire company and the entire Group for 2030/2050. To achieve these targets, the ICP will be used to promote investment in energy conservation, while at the same time supporting business growth.
- To encourage environmental investment by responding in advance to expected border carbon tax which may be imposed by each country.
- Use ICP to assess the economic rationality of business operations in the event that carbon regulations become stricter, based on fuel price forecasts and regulatory risks.

Promotion of information disclosure

Person in charge of Sustainability/ Environment Division, etc.

- External ESG evaluations change depending on whether the ICP has been introduced. Therefore, obtaining external evaluations is one of the reasons for introducing it.
- In response to requests from investors and society, ideas on the introduction of ICP were presented by management.

Responding to the CDP

Person in charge of Sustainability/ Environment Division, etc.

- The background of the ICP introduction lies in the response to the CDP. As the management was familiar with the ICP through the response to the CDP, the introduction of the ICP was started amid the background of the popularity.

Source: Prepared based on hearing results

Table of contents

Main Part

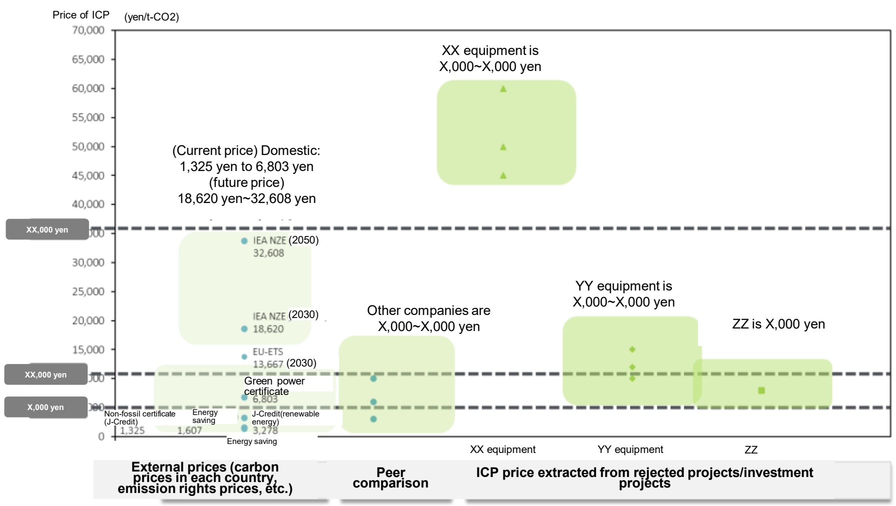
Appendix

Setup price review steps

Plot the ICP price and sort out the pros and cons of each set price

Results of companies' own considerations

2-1 Plotting of ICP price



2-2 Organizing implications of each price

Price	Pattern (1): XX,000yen	Pattern (2): XX,000yen	Pattern (3): XX,000yen	Pattern (4): XX,000yen
Implications of price	• Xxx • Xxx	• Xxx • Xxx	• Xxx • Xxx	• Xxx • Xxx
Ease of deployment	• Xxx • Xxx ×	• Xxx • Xxx △	• Xxx • Xxx ○	• Xxx • Xxx △
Achieving decarbonization goals	• Xxx • Xxx ○	• Xxx • Xxx △	• Xxx • Xxx ×	• Xxx • Xxx ○
Energy saving	• Xxx • Xxx ○	• Xxx • Xxx △	• Xxx • Xxx ×	• Xxx • Xxx ○
Renewable energy	• Xxx • Xxx ○	• Xxx • Xxx △	• Xxx • Xxx ×	• Xxx • Xxx ○

The ICP price was decided to be XX yen due to XX reason

Reference page

Input

- Carbon prices and emissions credit trading prices in each country
- ICP prices of other companies in the same industry
- ICP price based on past rejections/investments
- Products subject to CO2 reduction and catalog information

2-2-1. Consideration of price setting

Process

① Selection of ICP calculation targets
② Calculation of the ICP price
③ Plotting of calculation results
④ Setting of candidate ICP price

2-3-2. Consideration (1) : Consideration of ICP price

① Organization of price implications
② Selection of ICP price

2-3-2. Consideration (1) : Consideration of ICP price

2-1 Explanation on ICP price plots

After specifying the targets of calculation, comprehensively grasp the expected ICP price along with "external price" and "price of other companies in the same industry"

1 Select ICP calculation targets

(Examples of targets)

- Past rejections/investments related to decarbonization
- Planned investments related to decarbonization (e.g., reduction methods in long-term targets)
- Investment in facilities and products that currently emit large amounts of CO_2

2 Calculate the ICP price for the selected targets

(Examples of calculation)

- In the case of new introduction:
  ICP price = (Investment amount-cost reduction such as that of electricity)/CO_2 reduction amount
- To update from an existing one:
  ICP price = (Amount differences in investment-reduction in electricity and other costs)/CO_2 reduction amount

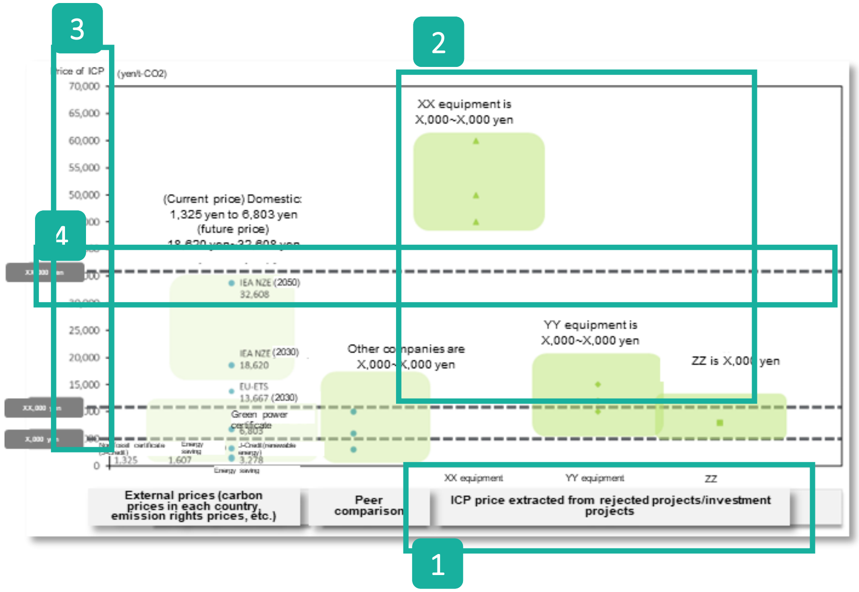
Note: Information on the latest facilities can be found in product catalogs and LD-Tech product information

3 Plot it on a graph together with external price and price of other companies in the same industry

- The calculation results, including carbon prices and emissions credit trading prices in each country and ICP prices of other companies in the same industry, are plotted on a graph

4 Set candidate ICP prices based on plot results

- Based on the plot results, set ICP price candidates so as to broaden the price range as much as possible
- When it is difficult to calculate the price, it is possible to refer to the external price or the price of other companies in the same industry



2-2 Explanation on organizing the implications of each price

Sort out the implications of each price, and set ICP prices that are in line with the purposes of ICP introduction and the level of understanding within the company

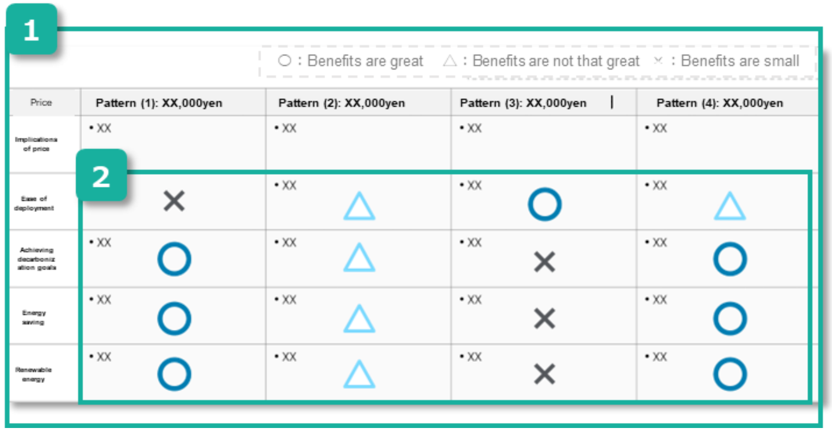
1 Sort out the price implications of candidate ICP prices classified in the previous step

(Examples of perspectives in price considerations)

- Source of the referenced prices and year covered (e.g., emissions trading price in Japan, IEA's projection of carbon price as of 2030)
- Ease of introduction (e.g., the lower the price, the lower the investment and the easier the introduction)
- Contribution to achieving decarbonization targets
- Time frame of investment targets (e.g., for investments that have a long useful life or are related to R&D, etc., future prices should also be considered)

2 Select ICP price based on price implications. To select the price, the level of internal understanding and commitment to decarbonization investments should also be taken into account.

- Level of internal understanding of ICP introduction
  When the internal understanding of ICP is immature, refer to external prices first
- Level of internal commitment to investments that contribute to decarbonization
  When there is a high awareness of achieving decarbonization targets, some higher prices can be set
- Multiple pricing for each investment objectives is also an option
  (e.g., separate pricing for energy conservation investment and R&D investment)

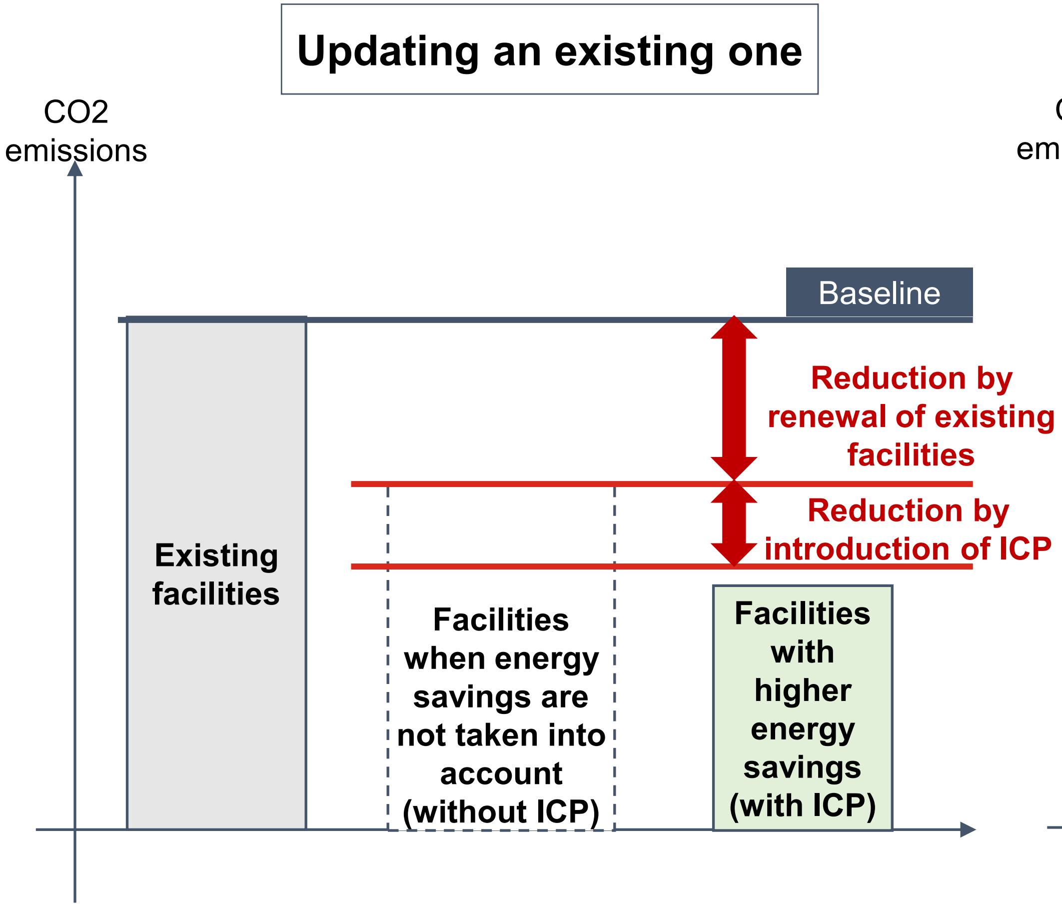


○ : Benefits are great △ : Benefits are not that great × : Benefits are small

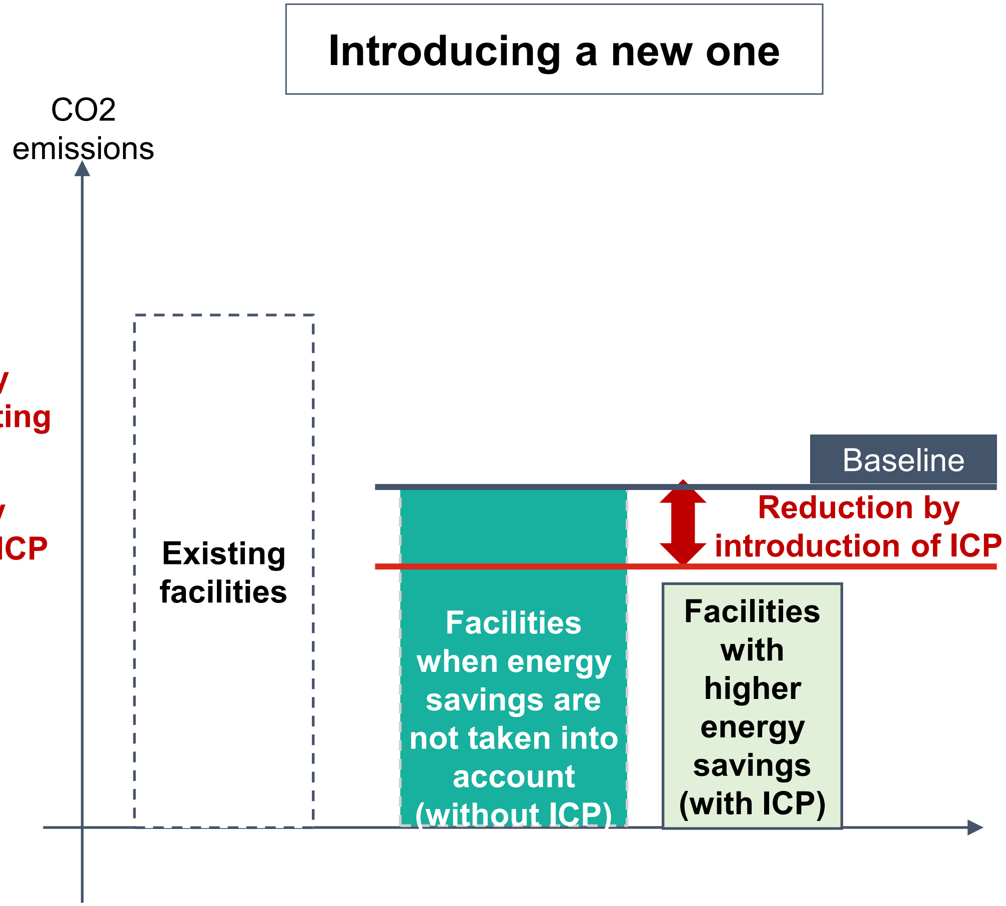
Price	Pattern (1): XX,000yen	Pattern (2): XX,000yen	Pattern (3): XX,000yen	Pattern (4): XX,000yen
Implications of price	• XX	• XX	• XX	• XX
Ease of deployment	×	• XX △	• XX ○	• XX △
Achieving decarbonization goals	• XX ○	• XX △	• XX ×	• XX ○
Energy saving	• XX ○	• XX △	• XX ×	• XX ○
Renewable energy	• XX ○	• XX △	• XX ×	• XX ○

2-2 2 Images of ICP price calculation for internal discussions towards a price that encourages decarbonization investments

Calculate reductions by using the existing facilities as the baseline when they are upgraded from existing facilities, or by using the normal facilities without energy conservation as the baseline when the facilities are newly introduced



Using the existing facilities as the baseline, calculate the difference in efficiency value between existing facilities and installed facilities



Using the normal facilities as the baseline, calculate the difference in efficiency value between normal facilities and the latest facilities

2-2 2 (Reference) Effects of ICP utilization on decarbonization investments

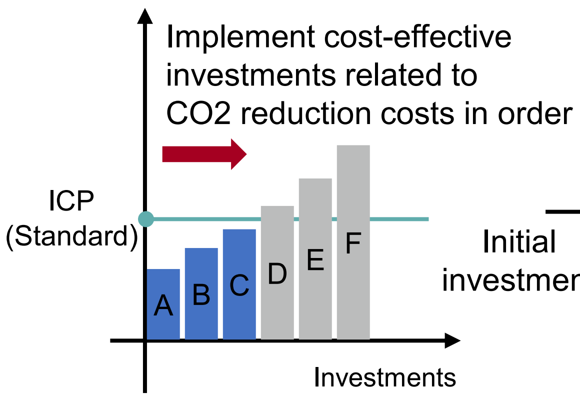
Energy-saving investments that cost-effectively reduce CO2 emissions can be implemented in the short term, while R&D investments that maximize profits can be promoted in the medium to long term

Energy-saving investments

Cost-effectively achieve reduction targets

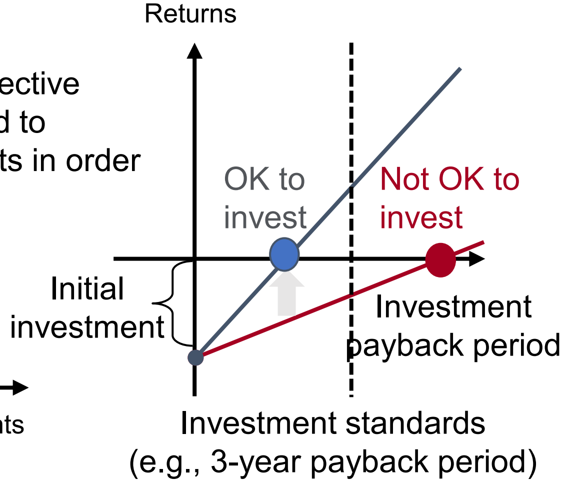
- Evaluating projects against a baseline allows sequencing of cost-effective investments with respect to CO2 reduction costs
- Reducing the payback period can promote decarbonization investments

Establishment of decarbonization standards



When the CO2 reduction cost is less than ICP, the investment is considered to be implemented

Reduction of investment standards

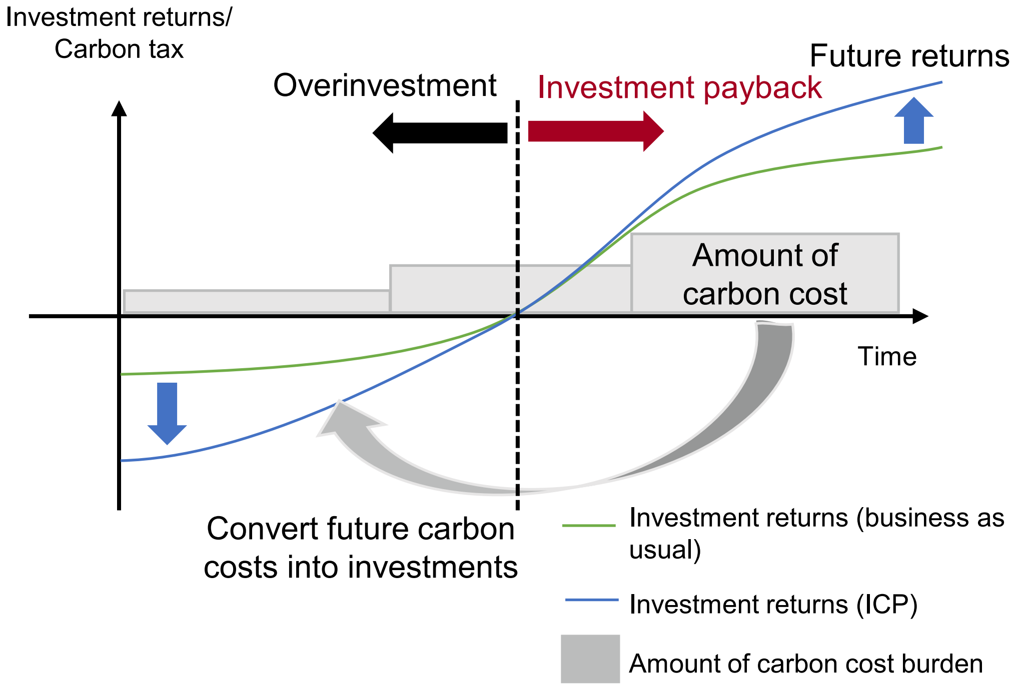


The payback period is reduced because of the increase in the estimated return for the ICP, making it an investment target

R&D investments

Convert future costs into investments in technology development

- Converting future costs borne as a carbon tax into investment will increase the amount of temporary investment. However, it is expected to generate a return in the future by directing it toward the development of technologies such as products that can be sold in a decarbonized world



(Reference) Hearing on ICP set price

Although there are various methods for setting ICP prices, many companies use IEA prices as a reference. In addition, some companies changed prices to speed up the process of meeting emission reduction targets.

How the price level was set

Method	Industry	Comment
Referenced current prices of IEA	Transportation	• Since there are multiple methods for setting the ICP price level, there was considerable debate as to which method to adopt. While the price would be higher in the level which the difference with zero-emission fuels could be filled, the IEA's figures were adopted because of the importance of using them for investment at a realistic level.
Referenced future prices of IEA	Consumer products manufacturer	• The carbon price is referenced to the 2035 level, not the IEA's current one, because we wanted to take a step ahead and show a steady path toward meeting the 2030 emission target. ICP price levels are unified globally and changed from yen to dollars due to the impact of exchange rates.
Referenced relevant taxes in Japan and other countries	Forestry	• In addition to Japan's gasoline tax and other taxation systems related to carbon emissions, the carbon tax price in South Korea and other taxation systems were used as a guide for setting the price. The price will first be set based on such external information, and then fine-tuned to a price level at which renewable energy facilities can be introduced.
Referenced both external and internal prices	Manufacturing	• The price level was set based on the projected carbon tax and other carbon pricing as of 2030, as well as the results of the calculation of the investment and reduction effect required by the company to reduce emissions.
Changed price level	Consumer products manufacturer	• Several years ago, when we first introduced ICP, we set the price at X,XXX yen/ton, but in recent years we have raised the price. The company uses ICP mainly when making capital investment decisions, but has found it difficult to achieve Scope 1 and 2, which it sets for itself, at the current price levels. The price was raised to a level that meets the Scope 1 and 2 reduction targets.

Source: Prepared based on hearing results

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Main Part

Appendix

Management resources required for ICP introduction and expected management and operation

Maximize effectiveness through the PDCA cycle while minimizing input resources by utilizing existing systems

Management resources	Current situation	Additional resources to be invested by ICP introduction	Expected effects
Personnel	Existing structure for investment process and CO_2 emissions calculation	The existing structure will basically be utilized. **One or two additional employees** may be added. Human resource costs ↗	The involvement of multiple departments, including sustainability promotion, corporate planning, and finance will enable decarbonization investments and initiatives to be made **in a more effective framework that is closer to normal business promotion**.
Materials	Conventional investment application forms, CO_2 calculation tools, etc. exists	New **investment application forms and internal ICP price calculation sheets which take ICP into account** are required. Documentation and sheet management costs ↗	Information on **investment performance and reductions (i.e., cost-effectiveness) related to decarbonization** will be accumulated
Money	Certain investment budgets for decarbonization exists, but are not linked to decarbonization targets	**Additional costs incurred** (Reduction × ICP price) Additional costs ↗	Potential for **cost savings and increased profit margins from capturing carbon-related opportunities** by addressing carbon costs that are expected to increase in price in the future
Information	Information exists on previous investment performance and CO_2 emissions	Track record of decarbonization investments related to ICP, **results of monitoring** CO_2 reductions from investments Information management costs ↘	**Monitoring** of information on investment performance and reductions **enables more effective reduction measures, investment budgets, and ICP pricing**

How to **minimize input resources**?
➡ **Promote budget control and budget operation using existing systems and frameworks**

How to **maximize effectiveness**?
➡ **Interact the effects extracted from each management resource in a PDCA cycle**

Steps to consider organizational structure

Formulate actions, etc., to build a system and create a roadmap for the ICP introduction

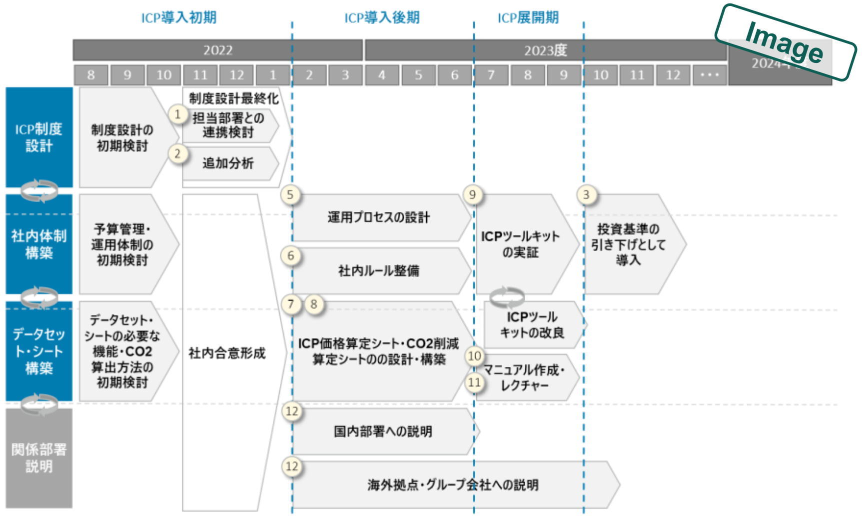
Results of companies' own considerations

4-1 Formulate actions, etc., to build a system

アクションプラン (大)	アクションプラン (中)	担当	主なタスク	達成年度	ゴール感
ICP制度設計	① 財務担当、調達担当部署との連携検討	サステナビリティ推進部	① 財務部（投資資金管理）、調達部（投資設備管理）がICPを導入する場合の要件を整理し、導入プロセスを明確化 ② 上記に関する担当者の設定	① 2023年3月 ② 2023年3月	① 運用プロセスを定義し、担当…要なアクションを明確化。また、制度設計の論点を整理し、社内で報告できるよう資料を作成 ② 各部との合意形成を実施し、担当者を決定
	② 追加分析	サステナビリティ推進部	① 過去の原材料調達を追加的に分析し、ICP設定の妥当性を検証	① 2023年3月	① 原材料調達に関するICP価格の算定
	③ 投資基準への本格的な適用	サステナビリティ推進部、経営企画部	① 投資の意思決定への反映（資金の付与）	① 2024年3月	① 運用プロセスを定義し、各担当に必要なアクションを明確化
	④ Internal Feeの導入	サステナビリティ推進部	① Internal Fee導入に向けた制度設計	① 2024年4月以降	① Internal Fee導入のためのプロセスを明確化
社内体制構築 ⑤	運用プロセスの設計	サステナビリティ推進部、調達部	① ICP価格設定→ICP適用→結果のモニタリングの一連のプロセス（誰がいつ何をどうするか）を設計	① 2023年3月	① 運用可能になるよう、現状の投資ルールにおけるICPの使い方を明確化
	⑥ 社内ルール整備	経営企画部	① 投資基準や投資申請書の改定	① 2023年9月	① 投資基準・申請書へICPを組み込み
データセット・シート構築	ICPに関するデータセット・シートの設計・構築 ⑦ ⑨	サステナビリティ推進部	① ICP価格算定シートの設計 ② ICP価格算定シートの検証	① 2023年9月 ② 2023年12月	① シートを作成し、使える状態にする ② 一部事業にシートを利用してもらい、改善する
	⑧ ⑨	サステナビリティ推進部	① CO2排出量算定シートの設計 ② CO2排出量算定シートの検証	① 2023年9月 ② 2023年12月	① シートを作成し、使える状態にする ② 一部事業にシートを利用してもらい、改善する
	⑩ ⑪	サステナビリティ推進部	① ICP制度・シートに関するマニュアルの作成 ② 重要部署へのシート・マニュアルのレクチャー	① 2023年9月 ② 2023年12月	① ICP概要・自社制度・申請方法等が一律で分かるマニュアルを作成 ② 主要部署が理解し使える状態にする
対象部署への説明・調整 ⑫	導入対象部署・会社への説明	サステナビリティ推進部	① ICP導入対象部署・会社への説明	① 2023年9月	① ICP導入の合意形成を達成

Image

4-2 Create a roadmap to ICP introduction



Image

Reference page

Input

3-2 Results of considering the decision-making process for investment after the introduction of ICP

2-3-3. Consideration (2) : Consideration of the decision-making process

Process

① Organize necessary actions, responsibilities, and major tasks

② Consider the order and timing of implementation and the expected goals for each year

2-3-4. Consideration (3) : Consideration of internal structure

① Roadmap actions and tasks for each fiscal year

2-3-4. Consideration (3) : Consideration of internal structure

4-1 Explanation on the formulation of actions, etc. for the establishment of the system

Organize the actions required for ICP introduction and list the order and timing of implementation and the expected goals for each year

1

In the introduction of ICP, necessary actions, the department in charge, and the order/timing of implementation will be discussed. The timing of implementation will be set with a multi-year perspective

(Minimum actions assumed to be necessary)

ICP system design

- Design of organizational structure related to ICP system and collaboration with other departments
- Consideration of future ICP utilization methods
- Design of investment process to be added/changed in ICP introduction
- Development of internal rules related to investment applications

Construction of datasets/sheets related to ICP

- "Internal ICP price calculation sheet" that compiles external information, etc. for reviewing ICP prices
- "Internal CO2 emissions calculation sheet" to calculate CO2 emissions of the investment target

(Organizational structure for ICP which is assumed to be required as a minimum)

- Overall supervision and point of contact for the ICP system (formulation of rules, internal notification, and Q&A response)
- Data management related to ICP (CO2 calculation results, budget application data, investment data, etc.)
- Budget control related to ICP

1

Image

アクションプラン		担当	主なタスク	達成年度	ゴール
(大)	(中)	–	–	–	–
ICP制度設計	1 財務担当、調達担当部署との連携検討	サステナビリティ推進部	① 財務部(投資資金管理)、調達部(投資設備管理)がICPを導入する場合の要件を整理し、導入プロセスを明確化 ② 上記に関する担当者の設定	① 2023年3月 ② 2023年3月	① 運用プロセスを定義し、担当ごとの必要なアクションを明確化。また、制度設計の論点を整理し、社内で報告できるよう資料を作成 ② 各部との合意形成を実施し、担当者を決定
	2 追加分析	サステナビリティ推進部	① 過去の原材料調達を追加的に分析し、ICP設定の妥当性を検証	① 2023年3月	① 原材料調達に関するICP価格の算定
	3 投資基準への本格的な適用	サステナビリティ推進部、経営企画部	① 投資の意思決定への反映(資金の付与)	① 2024年3月	① 運用プロセスを定義し、各担当に必要なアクションを明確化
	4 Internal Feeの導入	サステナビリティ推進部	① Internal Fee導入に向けた制度設計	① 2024年4月以降	① Internal Fee導入のためのプロセスを明確化
社内体制構築 5	運用プロセスの設計	サステナビリティ推進部、調達部	① ICP価格設定→ICP適用→結果のモニタリングの一連のプロセス(誰がいつ何をどうするか)を設計	① 2023年3月	① 運用可能になるよう、現状の投資ルールにおけるICPの使い方を明確化
	6 社内ルール整備	経営企画部	① 投資基準や投資申請書の改定	① 2023年9月	① 投資基準・申請書へICPを組み込み
データセット・シート構築	ICPに関するデータセット・シートの設計・構築 7 9	サステナビリティ推進部	① ICP価格算定シートの設計 ② ICP価格算定シートの検証	① 2023年9月 ② 2023年12月	① シートを作成し、使える状態にする ② 一部事業にシートを利用してもらい、改善する
	8 9	サステナビリティ推進部	① CO2排出量算定シートの設計 ② CO2排出量算定シートの検証	① 2023年9月 ② 2023年12月	① シートを作成し、使える状態にする ② 一部事業にシートを利用してもらい、改善する
	10 11	サステナビリティ推進部	① ICP制度・シートに関するマニュアルの作成 ② 重要部署へのシート・マニュアルのレクチャー	① 2023年9月 ② 2023年12月	① ICP概要・自社制度・申請方法等が一律で分かるマニュアルを作成 ② 主要部署が理解し使える状態にする
12 対象部署への説明・調整	導入対象部署・会社への説明	サステナビリティ推進部	① ICP導入対象部署・会社への説明	① 2023年9月	① ICP導入の合意形成を達成

4-1 1 ICP system design

In introducing ICP, cooperation with other departments is important. The future use of ICP and the development of investment processes/internal rules will also be considered.

Initial period of introduction: Time to design the system and develop the infrastructure for ICP introduction
Latter period of introduction: Time to implement specific actions to introduce ICP
Deployment period: Time to deploy the ICP system to target departments/companies
Development period: Time to further improve the ICP system

Item	Implementation period	Action	Overview of the action	Description of the action
ICP system design 1	Initial period of introduction	**Collaboration with other departments in ICP operations**	• Collaborate with departments/group companies that play additional roles in ICP introduction	• **Build consensus and coordinate implementation methods** with departments/group companies which play additional roles • To properly operate ICP, having a minimum system in place is essential
2	Latter period of introduction	**Implementation of additional research on missing information** **Note: Optional**	• Conduct additional research and analysis if there is missing information in the price calculation (e.g., gathering information on past investments)	• Conduct additional research and analysis **when there are investments that need to be further analyzed** to calculate the ICP price • Since information is naturally collected through the ICP introduction, **this is unnecessary when there is nothing to be analyzed as a priority**
3	Latter period of introduction	**Consideration of future ICP utilization**	• Consider future ICP utilization methods (e.g., application to investment standards)	• **Organize actions to be taken to apply ICP to actual investment standards/value reductions**, rather than merely referring to ICP values
4	Latter period of introduction	**Design of operational /investment process**	• Design the operational /investment process to be added with ICP introduction	• **Further clarify the timing of implementation** based on the results organized in 2-2
5	Latter period of introduction	**Development of internal rules**	• Develop internal rules related to investment applications, etc. that need to be revised with the introduction of ICP	• Implement any necessary **changes to internal rules** related to investment flow, application formats, and investment decisions when introducing ICP

4-1 1 Construction of datasets and sheets

Create an environment where anyone can use ICP through manuals and lectures to other departments as well as sheets for price review and reduction calculation. In addition, provide explanations to departments and others involved in the ICP system.

Initial period of introduction: Time to design the system and develop the infrastructure for ICP introduction
Latter period of introduction: Time to implement specific actions to introduce ICP
Deployment period: Time to deploy the ICP system to target departments/companies
Development period: Time to further improve the ICP system

Items	Implementation period	Action	Overview of actions	Description of actions
Construction of datasets/sheets related to ICP	6 Latter period of introduction	**Design of internal ICP price calculation sheet**	• Design an "ICP price calculation sheet" that summarizes external information and other data to review the ICP price	• **Create a calculation sheet to regularly review ICP prices**, reflecting the latest external information, the status of ICP introduction at other companies, and investment information that contributes to the company's own decarbonization • At the same time, determine the timing of the review, the department in charge, etc.
	7 Latter period of introduction	**Design of internal CO2 reduction calculation sheet**	• Design a "CO2 reduction calculation sheet" to calculate CO2 emissions in the investment target	• Create a **calculation sheet for CO2 reductions**, which is essential for ICP utilization • The department in charge will also be determined as emission factors, electricity prices, etc., are expected to need to be updated
	8 Deployment period	**Evaluation of calculation sheet** **Note: Not required, but recommended.**	• Evaluate the calculation sheet. (Pilot the use of the sheet after its creation, and pursue its ease of use, etc.)	• It is recommended to **evaluate the functionality of the created calculation sheet prior to company-wide rollout** • First, ask some departments to cooperate, and then make improvements as necessary
	9 Deployment period	**Creation of internal manuals**	• Create a manual that provides an overview of ICP, the company's ICP system, contact information, application procedures, how to use the calculation sheet, etc.	• Create a **manual that anyone can understand and use the ICP** • Information needs to be updated regularly, and the department in charge should be decided
	10 Deployment period	**Delivery of lectures on sheets and manuals to key departments**	• Lecture each business division on how to use the sheets and manuals	• **Lectures will be given** to departments that use the sheets and manuals frequently
Explanation and coordination to target departments	11 Deployment period	**Provision of explanations and internal coordination to ICP target departments/companies**	• Explain and coordinate the introduction of ICP to the departments/group companies involved in the ICP	• **Build consensus, coordinate, and promote understanding** toward the introduction of ICP to ICP target departments/companies

4-1 1 Image of the internal ICP manual and calculation sheet

An overview of each document and sheet and an image of its structure is as follows:

	ICP system and overview document	ICP price calculation methodology overview document	CO2 reduction calculation sheet
	Internal manual summarizing the ICP system, contact points, application procedures, etc.	**Sheet that consolidates external/company information necessary for annual ICP price review**	**CO2 emissions calculation sheet required for ICP investment applications**
Output image	Booklet	Excel, etc., "XX yen/tCO2"	Excel, etc., "▲XX tCO2/case"
Contents	• **ICP Utilization Guidelines (this guide)** • **Details of consideration (1)**	• **Internal ICP price calculation sheet** based on the investment project in the company in STEP 1 • **Details of consideration (1)**	• **Utilization of materials and tools used by the company to calculate CO2 reductions**
Table of contents (example)	• Introductory purposes of ICP • The company's structure for ICP introduction • ICP pricing in the company • ICP investment targets • How to apply for and use ICP investment (including a lecture on how to use the sheets and tools) • Contact point for the ICP system • Other Q&A	• External prices (carbon price and emissions credit price in each country) • ICP prices at benchmark companies • ICP price information based on the company's own investments (formula for calculating ICP)	• Emissions comparison between existing facilities and new facilities • Information on newest facilities • Reference information on emission factors, electricity prices, etc. for calculation
Update timing (example)	• Update whenever there is a change in the above items.	• Periodically (e.g., once a year) update information.	• Periodically (e.g., once a year) update values used to calculate emission factors, etc.

4-1 1 (Reference) Calculation sheet and PDCA cycle

In the future, more appropriate ICP pricing and budgeting will be possible through the PDCA cycle by utilizing the ICP calculation sheet and CO2 calculation sheet

Cycle to consider ICP price and ICP budget (initial draft)

New tools (assumption) | Existing tools (assumption)

Revising investment standards

- Define **projects for which investment and product selection decisions are made by taking ICP into account.**
- **Set payback period, expected yield (NPV and IRR thresholds), etc.,** for each target.

Aggregation of investment results

- Record **product information (selected/not selected products), CO2 reduction, and ICP budget used.**
- Link the digested ICP budget to the department that controls the budget.

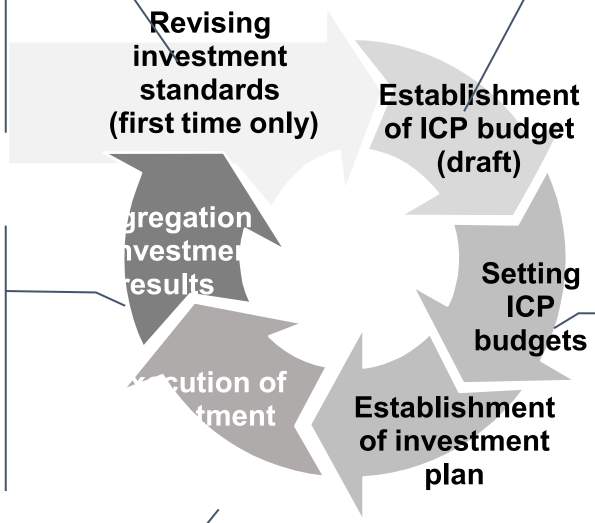
CO2 calculation sheet

Execution of investment

- After going through approval process, **execute purchases.**
- Execute purchase orders and investments after approval of purchase applications.

Budget control system

Investment facilities management system



Note: Update the budget formulation method/allocation timing, integration with existing tools, etc., according to the company's situation

Establishment of ICP budget (draft)

- **ICP price (draft) is established** based on the actual ICP investment results in the previous year, information on selected/non-selected products, and the latest external information.
- At the same time, the CO2 reduction targets, etc., are also taken into account when **establishing the ICP budget (draft).**

ICP calculation sheet

Setting ICP budgets

- **Establish master plan** for revenues, expenses, investment budgets, etc.
- **Set ICP budget and allocate to business divisions based on ICP budget (draft) and each business division's investment plan at the beginning of the fiscal year.**

Budget control system

Establishment of investment plan

- **Concretize** investment plans submitted at the beginning of the fiscal year, **including product information, etc.**
- For projects subject to ICP budget, calculate **investment effect by taking into account CO2 reduction effect over the payback period.**

CO2 calculation sheet

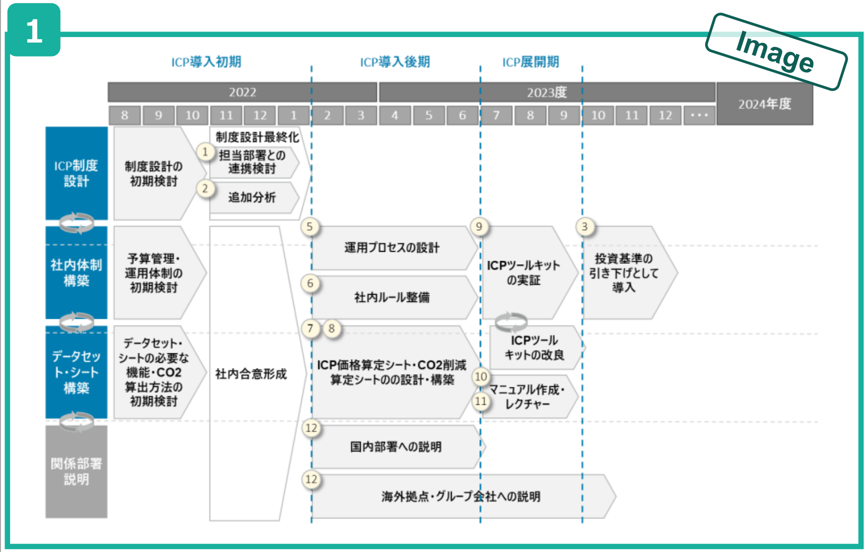
Investment application form

4-2 Explanation on developing an internal roadmap to ICP introduction

Put the actions for each fiscal year into a roadmap by item based on the results of the formulation in 4-1

1 Roadmap the actions and departments in charge for each fiscal year

- Roadmap the actions for each fiscal year
- Be aware of the possibility that failure to coordinate and collaborate within the company may not lead to the next action, and organize the necessary internal coordination and collaboration in as much detail as possible
- Even for those actions that have not yet been determined in detail (e.g., introduction of internal fees), organize them as rough actions and consider the overall expected goal



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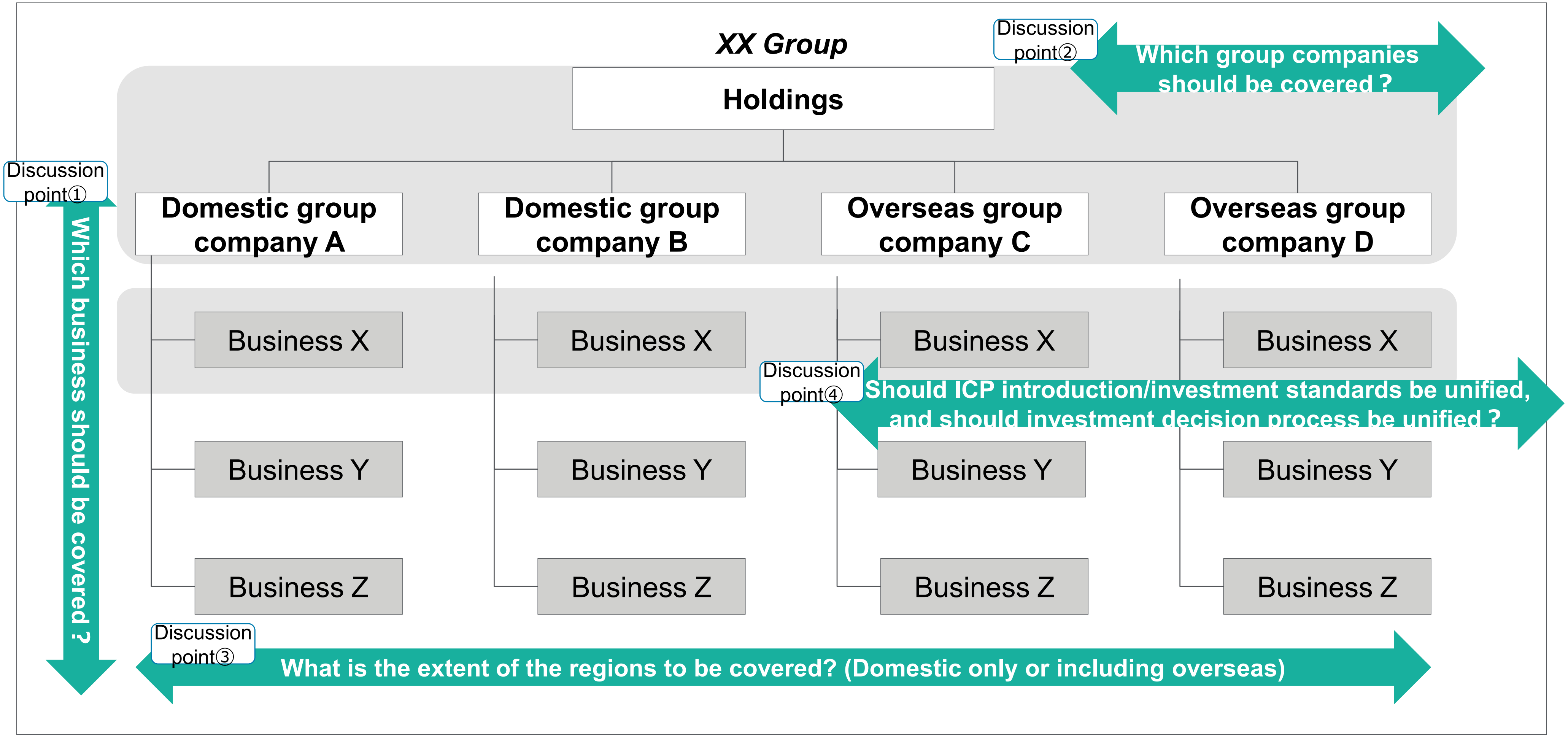
Main Part

Appendix

Expected corporate structure and the scope of ICP application and applicable companies

Consider (1) target businesses (2) target companies, (3) target regions, and (4) consistency of standards



Steps in the consideration of applicable targets and corporate scope

Consider Scope of ICP application and the scope of applicable companies

Results of companies' own considerations

5-1 Consideration of Scope of ICP application (Scope 1, 2, 3)

classification	Name of the company	Business types	GHG emissions (overall percentage)	Name of the unit (subdivide as necessary)	Time of introduction※		
					23/1-	24/1-	25/1-
domestic	XX	XX business	XX%		Scope1,2	→	Scope3
domestic	YY	YY business	XX%		Scope1,2	→	Scope3
domestic	ZZ	ZZ business	XX%		Scope1,2	→	Scope3
domestic	・・・	・・business	XX%		Scope1,2	→	Scope3
domestic	・・・	・・business	XX%		Scope1,2	→	Scope3
domestic	・・・	・・business	XX%		-	Scope1,2	→
domestic	・・・	・・business	XX%		-	Scope1,2	→
domestic	・・・	・・business	XX%		-	Scope1,2	→
overseas	・・・	・・business	XX%		-	Scope1,2	→
overseas	・・・	・・business	XX%		-	Scope1,2	→

5-2 Consideration of the scope of ICP applicable companies based on target businesses, regions, and the consistency of standards

		Reason of selection
Target business	**Whole business or partial business**	✓ XX
Target company	**Head office only/Includes group companies**	✓ XX
Target area	**Target area**	✓ XX
Uniformity of standards and processes	**Uniformity of standards and processes**	✓ XX

Reference page

Input

5-1:

- CO_2 emissions and breakdown (Scope 1, 2, 3)
- The result of consideration of Scope of ICP application (Scope 1, 2, 3)

Reference page: -

5-2:

① The current situation of consideration of the scope of ICP applicable companies

Reference page: -

Process

5-1:

① Organize internal CO_2 emissions situation
② Check the scope of ICP application to contribute to CO_2 reduction and consider when to introduce it.
③ Consider whether Scope 3 should be included in the scope of application

Reference page: -

5-2:

① Consider target businesses, target companies, target regions, and the consistency of standards and processes

Reference page: -

5-1 Explanation on consideration of the scope of ICP application and the timing of its introduction

First, confirm internal emissions status in Scope 1, 2, 3, and identify Scope/businesses/facilities with large emissions. Consider products/opportunities that contribute to emission reductions, and consider the scope of application

1 Organize the CO_2 emissions situation in the company (See the purpose of ICP introduction as well) 1-1

- Confirm emissions and a breakdown of Scope 1, 2 (if possible, include Scope 3) and identify Scope (businesses/facilities) that is a bottleneck for emissions reduction

2 Confirm whether the scope of ICP application currently under consideration will lead to CO_2 reduction

- Examine whether the scope of ICP application currently under consideration includes Scope/businesses/facilities with large emissions.
- If not, add them to the scope of application. If it is difficult to set the scope of application immediately due to internal circumstances, etc., consider the deadline for setting it
(**Note: See the next page for responses to each applicable target**)

3 If necessary, consider to include CO_2 reductions related to Scope 3 (raw materials procurement/R&D/M&A, etc.) in the scope of application

- Consider whether supply chain such as raw materials procurement/R&D/M&A and products and technologies of other companies that contribute to CO_2 reduction (=Scope 3) should be included in the scope of application.
- Whether the products and technologies contribute to CO_2 reduction can be examined by calculation of emission reduction/avoided emissions

2 3 1

Image

classification	Name of the company	Business types	GHG emissions (overall percentage)	Name of the unit (subdivide as necessary)	23/1-	24/1-	25/1-
domestic	XX	XX business	XX%		Scope1,2	→	Scope3
	YY	YY business	XX%		Scope1,2	→	Scope3
	ZZ	ZZ business	XX%		Scope1,2	→	Scope3
	・・・	・・business	XX%		Scope1,2	→	Scope3
	・・・	・・business	XX%		Scope1,2	→	Scope3
	・・・	・・business	XX%		-	Scope1,2	→
	・・・	・・business	XX%		-	Scope1,2	→
	・・・	・・business	XX%		-	Scope1,2	→
overseas	・・・	・・business	XX%		-	Scope1,2	→
	・・・	・・business	XX%		-	Scope1,2	→

5-1 2 The scope of applicable targets and actions needed

Advantages and disadvantages of each scope of applicable targets are as follows. R&D and M&A in Scope 3 require calculation of avoided emissions, but may lead to investments that contribute to future sales and corporate value.

	Scope 1, 2	Scope 3 Upstream, category 1 raw materials, etc.	Scope 3 Downstream, R&D or M&A that contributes to category 11
Pros	• **Internal CO2** will be reduced.		• Technology and product development related to decarbonization will advance, which may **lead to higher future sales and corporate value**
Cons	• Since this **only leads to cost reduction** through internal CO2 reduction, it is difficult for this to result in an increase in future sales and enterprise value, compared to its application to R&D and M&A.		Commonality • The calculation is difficult because it is necessary to **identify the company's products and technologies that contribute to reductions and to calculate the avoided emissions..** In the case of R&D • Creating rules and building consensus takes time, because it requires involvement of the department in charge of investment planning and allocation related to R&D and the department in charge of R&D. In the case of M&A • Creating rules and building consensus takes time, because it requires the involvement of the department in charge of M&A • Update on evaluation standards of M&A is required
		• **Data on supply chain** such as raw materials is required • Involvement of departments in charge of raw materials procurement is required	
Image of CO2 calculation	Calculate **emissions reduction** (Emissions from the existing facility - Emissions from facility to be introduced) × ICP price	(Emissions from existing raw materials procurement - Emissions from raw materials procurement to be introduced) × ICP price	Calculate **avoided emissions** (Emissions in the use phase of baseline products - Emissions in the use phase of new products) × ICP

5-2 Explanation on consideration of the scope of ICP applicable companies

Consider the scope of ICP applicable companies in terms of the whole business/part of businesses, the head office only/including group companies, and subsidiaries, including overseas/domestic only, standard setting methods, etc., and organize them in chronological order

1 Consider the scope of ICP applicable companies within the company

(Example of arguments)

- Will all businesses of the target company be covered or only some of them?
- Does it cover the head office only, or does it also cover group companies and subsidiaries?
- Does it cover overseas companies or only domestic companies?
- If ICP is to be introduced across businesses or companies, will the standards (ICP price, investment standards, and operation rules) and investment decision-making process be set across the board or individually?

2 Based on the result of consideration of the scope of ICP application/scope of ICP applicable companies, update actions for ICP introduction organized in consideration 3 as appropriate

(Example of viewpoints)

- Are there any departments, etc. that need to be involved?
- Are there any additional operational or internal rules that need to be developed?
- Are there any additional toolkits (ICP price calculation tool and CO2 emissions calculation tool) required?

1

Image

		Reason of selection
Target business	Whole business or partial business	✓ XX
Target company	Head office only/Includes group companies	✓ XX
Target area	国内のみ or 海外含む	✓ XX
Uniformity of standards and processes	Uniformity of standards and processes	✓ XX

2

Image

Action plan (大)	Action plan (中)	Responsi-bility	Major tasks	Achievement year	Goal image
ICP制度設計 ICP system design	Consider collaboration with finance and procurement departments	Sustainability Promotion Department	① Organize the requirements for the Finance Department (Investment Fund Management) and Procurement Department (Investment Equipment Management) to introduce ICP and clarify the implementation process ② Setting of person in charge of the above	① March 2023 ② March 2023	① Define the operational process, clarify the necessary actions for each person in charge. In addition, we organized the points at issue in system design and created materials that can be reported internally ② Build consensus with each department and decide on the person in charge
	Additional analysis	Sustainability Promotion Department	① Additional analysis of investments related to past raw material procurement and verification of the validity of ICP settings	① March 2023	① Calculation of ICP price for raw material procurement
	Full-scale application of investment standards	Sustainability Promotion Department, corporate planning department	① Reflection in investment decision-making (granting of funds)	① March 2024	① Define the operational process and clarify the necessary actions for each person in charge
	Introduction of internal fee	Sustainability Promotion Department	① System design for introducing internal fees	① After March 2024	① Clarifying the process for introducing internal fees
体制整備・導入 System development/introduction	Design operational process	Sustainability Promotion Department, procurement department	① ICP pricing→ICP adoption→Design series of processes for monitoring results (who does what and when)	① March 2023	① Clarify how to use ICP under current investment rules so that it can be operationalized
	Establish company rules	Corporate planning department	① Revision of investment standards and investment application form	① September 2023	① Incorporating ICP into investment standards and application forms
ツールキット構築 Toolkit building	Design and creation of ICP toolkit	Sustainability Promotion Department	① Design of ICP price calculation tool ② Validation of ICP price calculation tool	① September 2023 ② December 2023	① Create a tool and make it usable ② Have some businesses use the tool and improve it
		Sustainability Promotion Department	① Design of CO2 emissions calculation tool ② Validation of CO2 emissions calculation tool	① September 2023 ② December 2023	① Create a tool and make it usable ② Have some businesses use the tool and improve it
		Sustainability Promotion Department	① Creation of toolkit/ICP system manual ② Creation of toolkit/ICP system manual	① September 2023 ② December 2023	① Create a manual that uniformly explains ICP overview, company system, application method, etc. ② Make it understandable and usable by each department
Explanation to target departments	Explanation to departments/companies targeted for implementation	Sustainability Promotion Department	① Explanation to departments/companies targeted for implementation	① September 2023	① Achieve consensus for the introduction of ICP

5-2 1 Advantages and disadvantages regarding the scope of ICP applicable companies

Advantages and disadvantages of each option are as follows:

		Pros	Cons
Target businesses	The whole business	• ICP is introduced as a unified concept of decarbonization. **As a result, awareness of decarbonization will be fostered across the whole company**	• **Internal coordination/persuasion are required** including rule changes and investment process changes because the whole company must manage investments and data in a unified way
	Part of businesses	• Concentrating investments in businesses with high CO2 emissions **will enable investments that contribute to efficient decarbonization**	• While awareness about decarbonization will be fostered in businesses with large CO2 emissions, **awareness will remain the same in the other businesses**
Target companies	Head office only	• **Governance is easy to implement**, and it is easier to introduce ICP and monitor investment and CO2 reduction performance	• If companies with large emissions/opportunities are not included in the scope of ICP application, **decarbonization across the group will not be progressed**
	Including group companies	• **Decarbonization investment across the group** will be promoted	• **Management costs are huge** as investments and data need to be managed and monitored in a uniformed way across the group • **Internal coordination/persuasion are required** including rule changes and investment process changes in each company
Target regions	Domestic only	• **Governance is easy to implement**, and it is easier to introduce ICP and monitor investment and CO2 reduction performance	• **Decarbonization investments in overseas subsidiaries are not promoted**
	Including overseas	• Possible to **promote decarbonization across the globe**	• **ICP prices consideration and emissions calculations need to take into account carbon prices, regulation, emission factors, etc. in each region** • **Internal coordination/persuasion**, including rule changes and investment process changes, are **required** in overseas subsidiaries
Consistency of standards and processes	Unified throughout the company	• **It is easier to implement operations, management, monitoring** because ICP is applied as a standard across the company	• It takes time to introduce ICP due to **the need to change rules in each region and company and other internal adjustments**
	Set by each company	• **ICP** can be **introduced in accordance with the existing internal rules and investment standards of each region and company**	• **Processes to consolidate data** on investment performance and CO2 emissions is required • **Personnel responsible for operations in each region/company** are needed because it is necessary to operate the system in each region/company

(Reference) Hearing on the scope of ICP application

Many companies prioritize Scope 1 and Scope 2 as targets. Regarding business scope, it is one idea to give priority to business with large emissions and targets that are easy to utilize, while considering the degree of difficulty and other factors when expanding the scope.

What was the set scope of ICP?

Targeted Scope	Transportation	• As for Scope 1 and Scope 2, we disclosed ICP introduction only for the sectors that produce high emissions and are easy to address (e.g., sectors that require capital investment). Though we would like to expand the application of ICP to Scope 3, we need to improve the accuracy of emission measurements within Scope 3 first.
	Manufacturing	• As of now, ICP has been Introduced for Scope 1 and Scope 2. Based on this experience and system, we would like to expand the scope of ICP to Scope 3 in the future.
The scope of business	Consumption products manufacturer	• Treating business areas and countries or regions equally, we have adopted a standardized ICP system. We often use the ICP in the utility sector because it is easy to utilize the ICP when making facility investment decisions.
	Real estate business	• Among the Holdings, we have prioritized companies with high carbon emissions for the implementation of ICP. There is a possibility of expanding the scope of ICP in the future. However, as ICP is just one of the means to promote decarbonization, if we can achieve reduction targets by other means, it does not have to be expanded. • Depending on how well the entire Holdings achieves its reduction targets, we might consider ICP introduction across holdings. However, since the system is complicated, we need to consider whether to introduce ICP.

Source: Prepared based on hearing results

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Main Part

Appendix

Steps in consideration of reduction targets and investment linkage

To confirm the linkage between decarbonization targets and the amount of investment, estimate the amount of investment needed to achieve the target and organize it as available information when drafting a budget.

Results of companies' own considerations

6-1

Comparison between decarbonization targets and current investments

Estimate the annual resource and energy saving investment (estimate) required to achieve the 2050 CO2 reduction target

Image

		Current situation	Toward achieving the 2050 goals
Formula	CO2 reduction from current CO2 emissions	XX million t-co2/year (2020 value)	XX million t-co2/year (Cumulative amount between '20-'30)
Reference	GHG emissions on Scope1	—	XX – XX billion yen/year
	GHG emissions on Scope 2	—	XX – XX billion yen/year
	…	—	XX – XX billion yen/year
	…	—	XX – XX billion yen/year

Reference page

Input

- 1-0 Internal decarbonization targets (long-term targets, reduction methods) -
- Consideration of internal CO2 emissions reduction targets and the amount of investment -

Process

① Implementation of a simulation to determine the amount of investment based on ICP price

② Arrangement of consideration of CO2 emissions reduction targets and investment amounts in the company -

6-1 Explanation on comparison between decarbonization targets and current investments

To achieve decarbonization-related targets, examine whether the targets align with the current decarbonization-related budget, and organize the necessity of linking the decarbonization target with investments and the effects of introducing ICP.

1 Organize the current decarbonization-related budget, including the amount of budget and budgeting approach (e.g., budget drafting methods)

- ✓ Organize how budget amounts are determined, and whether it has a linkage with a decarbonization target

2 By estimating the amount of investment needed to achieve a decarbonization target, identify the gap between this amount and the current decarbonization-related budget. The above information can be used to persuade companies to introduce ICP and budgeting in the future

(Examples of calculation of the amount of decarbonization-related investment)

① Calculate the total reduction from current to the target year by "total usual CO2 emissions by target year - total CO2 emissions based on the target."

② Calculate "(total CO2 emissions reduction × ICP price) / number of years to target year" and estimate decarbonization-related investment needed by the target year

2

Estimate the annual resource and energy saving investment (estimate) required to achieve the 2050 CO2 reduction target

Image

	Current situation	Toward achieving the 2050 goals
Formula: CO2 reduction from current CO2 emissions	XX million t-co2/year (2020 value)	XX million t-co2/year (Cumulative amount between '20-'30)
Reference: GHG emissions on Scope1	–	XX – XX billion yen/year
GHG emissions on Scope 2	–	XX – XX billion yen/year
…	–	XX – XX billion yen/year
…	–	XX – XX billion yen/year

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Main Part

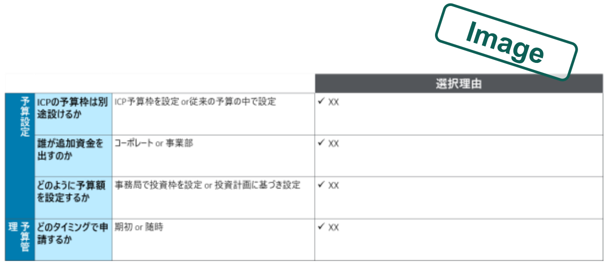
Appendix

Steps to consider budget control and budget cap

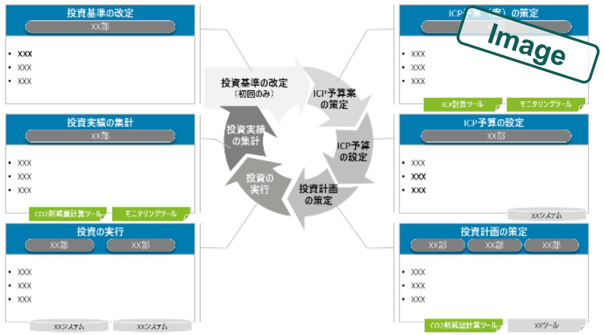
Consider budget control and budget drafting methods for ICP investment, PDCA cycle for budget control, and a budget cap

Results of companies' own considerations

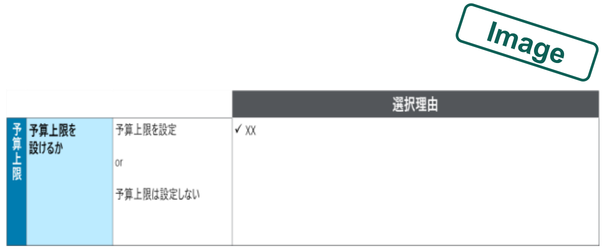
7-1 Consideration of budget control and budget drafting methods



7-2 Consideration of PDCA cycle in budget control for ICP



7-3 Consideration on budget cap setting



Reference page

Input

3-2 Results of consideration of the decision-making process for investment after the introduction of ICP

- Advantages and disadvantages regarding options for a budget cap

Process

① Consideration of investors, drafting methods, and management method of the ICP budget

① Update on the consideration of roles and departments in charge of ICP budget control and the PDCA cycle

① Considerations regarding the setting of a budget cap (Whether to set a cap or not)

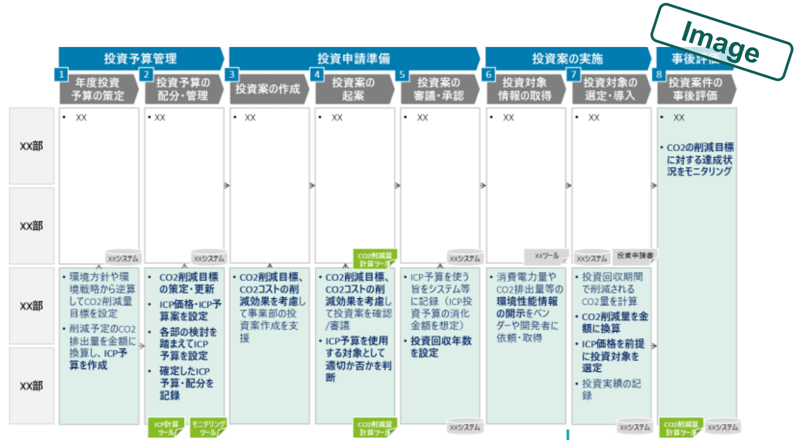
7-1 Explanation on consideration of budget control and drafting method for ICP

Consider the advantages and disadvantages regarding investors, drafting methods, and management methods of the ICP budget

1 **Organize the advantages and disadvantages regarding ICP budget control/budget drafting.**
By choosing a management method based on current investment application process, ICP can be introduced smoothly. (2-2 See consideration of investment decision-making process after the introduction of ICP as well.)

(Example of discussion points)

- Will ICP budget quota be established? (Established separately from a regular budget/managed within a regular budget)
- Who will provide the funds for the additional costs of ICP investments? (Corporate/each department)
- How will the ICP budget amount be organized? (Based on the investment plan submitted/secretariat sets the quota)
- When will budget application be filed? (beginning of term/at any time)



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			Pros	Cons
予算設定	ICPの予算枠は別途設けるか	ICP予算枠を設定	✓ 脱炭素取組用の予算を確保できる	✓ 予算枠確保のための社内調整が必要となる
		従来の予算の中で設定	✓ 予算枠の確保が必要なく、スタートしやすい	✓ 他の投資予算がひっ迫される可能性がある
	誰が追加資金を出すのか	コーポレート	✓ コーポレートで情報集約し、全社的なガバナンスを効かせることができる	✓ ICP予算の割り当てに関する仕組みが必要
		事業部	✓ 各部門の自律性を活かし、脱炭素投資を促進できる	✓ 各部門が削減量をコミットしていない場合、脱炭素投資が進まない可能性がある ✓ 各事業部の独自のルールにより運用されるため、管理が難しい
	どのように予算額を設定するか	事務局で投資枠を設定（トップダウン）	✓ 投資計画の事前提出が必要ないため、スタートしやすい（そのため初年度に有効と想定）	✓ 投資枠に過不足が生じる可能性があり、その場合、次の投資期間まで待つこととなる
		投資計画に基づき設定（ボトムアップ）	✓ 脱炭素投資の案件状況に合わせた予算額の設定が可能	✓ 事前に投資計画を収集する必要があるため、スタートに時間がかかる ✓ 投資計画外の脱炭素投資ができない
予算管理	どのタイミングで申請するか	期初	✓ 一挙に脱炭素投資案件が集まるため、投資案件を比較しながら案件を決定可能	✓ 申請期間外の脱炭素投資ができず、その場合、次の投資期間まで待つこととなる
		随時	✓ 有効な脱炭素投資が見つかった際、柔軟なタイミングで申請が可能となる	✓ （投資上限を設けない場合）投資額が際限がなくなってしまうリスクがある ✓ （投資上限を設けた場合）早いもの勝ちになるため、予算割当の仕組みが必要

7-1 1 Discussion points on budget control and its advantages and disadvantages

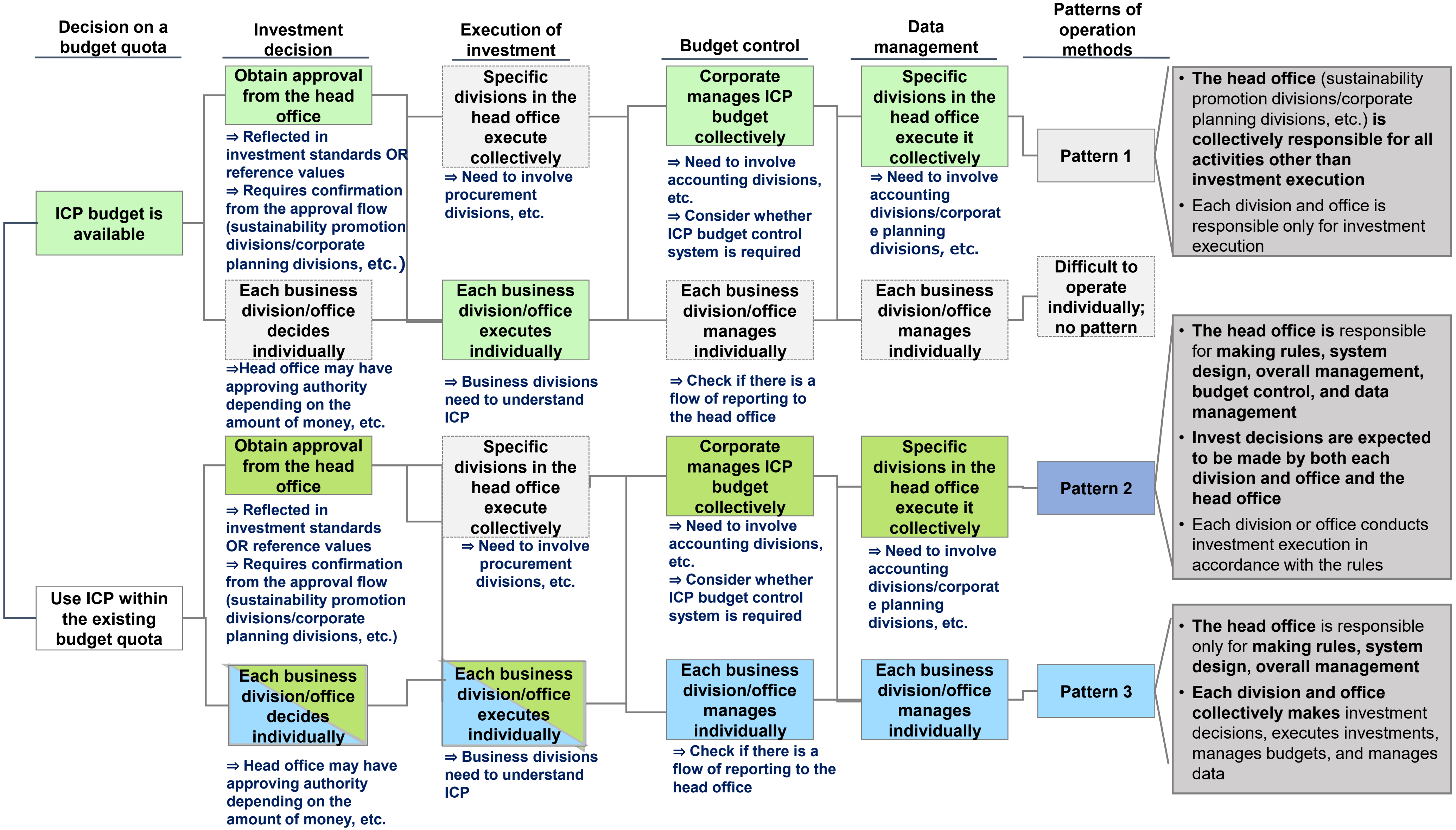
Discussion points on budget control and its advantages and disadvantages are as follows:

			Pros	Cons
Setting budgets	**Will ICP budget quota be established separately?**	Establish budget quotas for ICP	• Budget for decarbonization initiatives can be secured	• Internal coordination for securing budget quotas is required
		Establish ICP budget within the existing budget	• It is easy to get started because securing budget quotas is not required	• Other investment budgets may be strained
	Who will provide the additional funds?	Corporate	• By consolidating information at the corporate level, corporate governance can be effective	• A mechanism for allocation of ICP budget is required
		Business divisions	• Decarbonization investments can be facilitated by allowing each department to be autonomous	• If each department does not commit itself to reduction, decarbonization may not be promoted. • Management is difficult because each business division manages it individually
	How will the budget amount be set?	Secretariat decides investment quotas (top-down)	• As preliminary submission of investment plan is not necessary, it is easy to get started (thus, it is assumed to be effective in the first year)	• The investment quota might not be accurate, in that case, you have to wait for the next investment until the next application period
		Set based on investment plan (bottom-up)	• Budget amounts can be set in accordance with a situation of decarbonization investment projects	• It takes time to get started because it is necessary to gather investment plans in advance. • Decarbonization investment cannot be made outside an investment plan
Budget control	**When will the application be submitted?**	Beginning of term	• As decarbonization investment projects are gathered all at once, it is possible to decide on projects by comparing them	• Decarbonization investments cannot be made outside an application period, and in that case, you have to wait for the next investments until the next application period
		At any time	• When a valid decarbonization investment is found, it can be applied for at flexible timing	• (In the case of not setting a budget cap) there is a risk that the amount of investment becomes limitless. • (In the case of setting a budget cap) As it is first-come first-served basis, a mechanism for budget allocation is required

7-1 1 Reference) Patterns for implementing ICP

ICP operation methods can be divided into three main patterns

Legend :pattern 1 : pattern 2 : pattern 3



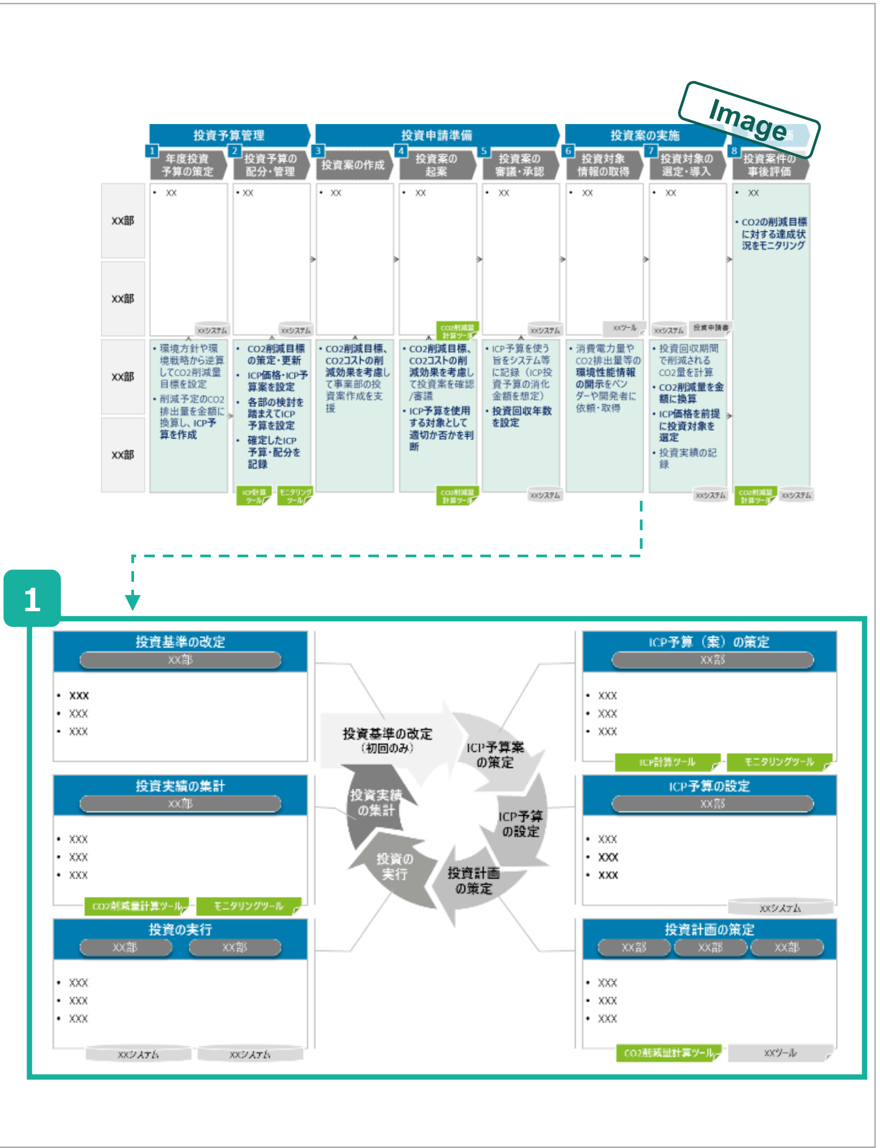
7-2 Explanation on roles in budget control for ICP, responsible departments, and PDCA cycle

3-2 See 3-2 and consider PDCA cycle for ICP budget control

1 Reorganize the roles/responsible departments/PDCA cycle related to ICP budget control, 3-2 based on the consideration of the decision-making process for investment after the introduction of ICP, taking 7-1 into account

(Example of discussion points)

- Is each role, such as budget drafting, investment planning, investment execution, investment performance accumulation and revision of investment standards clearly defined?
- Is PDCA cycle utilizing existing systems or processes? (are there any processes with overlapping roles and tasks?)
- Are investments that have utilized ICP or data on CO2 reduction made available to be applied to the ICP budget for the next year or ICP pricing? (is data accumulated in an appropriate location, and is the mechanism for data collection in place?)



7-3 Consideration on setting a budget cap for ICP

Consider whether to set a budget cap for ICP

1 **Consider whether to set a budget cap for ICP.**
Each option and its advantages and disadvantages are as follows:

- **In the case of setting a budget cap**
  - (Advantages) The costs do not exceed the predetermined amount of ICP investments
  - (Disadvantages) As the first one to invest wins, there is a possibility that investment will be postponed, or additional costs will be incurred if useful investments come up during the term
- **In the case of not setting a budget cap**
  - (Advantages) Investment can be executed regardless of the timing of application
  - (Disadvantages) Unexpected investment costs may be incurred

1

Image

			選択理由
予算上限	予算上限を設けるか	予算上限を設定 or 予算上限は設定しない	✓ xx

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Main Part

Appendix

Regarding set price

	FAQ	Example answer
About price setting	• **Should the price be set commonly for the entire group or separately set for each business/company?**	• **Unified pricing as a group** is becoming a standard
	• **Should ICP be operated using a single price setting?**	• There are examples of companies **changing prices depending on the time frame, investment target, and purpose**
	• Should ICP prices be **reviewed every year?**	• **If there is a clear change in the external environment, it should be reviewed in the following year. However, if there is no change, the price should be reviewed around once in three years** • **Many companies review other companies' CDP responses once every few years**
	• **If you have equipment with a long useful life, should you use an external price for the future**, such as 2050?	• **When using external pricing in the future, it is imperative to decide whether to use 1.5°C or 2°C, which depends on the level of commitment within the company** • There are few cases of companies using a price of 1.5°C for equipment with a long service life.

Source: Created from information released by each company and interviews

About internal structure

	FAQ	Example answer
About internal structure	• In promoting decarbonization projects, **there are oppositions from business units in increased costs.**	• Implementation of decarbonization within the organization should strongly be top-down led by the CEO. **Discuss with each department and construct simple cost structure to achieve targeted goals** • Following cases should be explained: Even if decarbonization solution seems to be increasing costs in the short term, there may be cases in which it does not necessarily lead to an increase in costs, as in the mid to long-term it will lead to avoidance of carbon taxes or the acquisition of opportunities for decarbonization • In some cases, **ICP control department provides information on subsidies and the latest technology as reference information for ICP utilization** • **Reference information such as a capital account plan reflecting ICP should be provided, in order to establish an image of investment taking decarbonization into account**
	• During the establishment period, after economic support (such as budget allocation from the head office) is no longer available, **how should employees maintain their motivation to continue their efforts with environmental awareness?**	• It is preferrable to maintain motivation **by linking it to the company's mid and long-term goals and evaluation system**
	• **Should decarbonization projects that do not utilize ICP be monitored?**	• **Monitoring is also necessary to identify investments that contribute to CO2 reduction and consider whether to include them in future ICP investment targets**

Source: Created from information released by each company and interviews

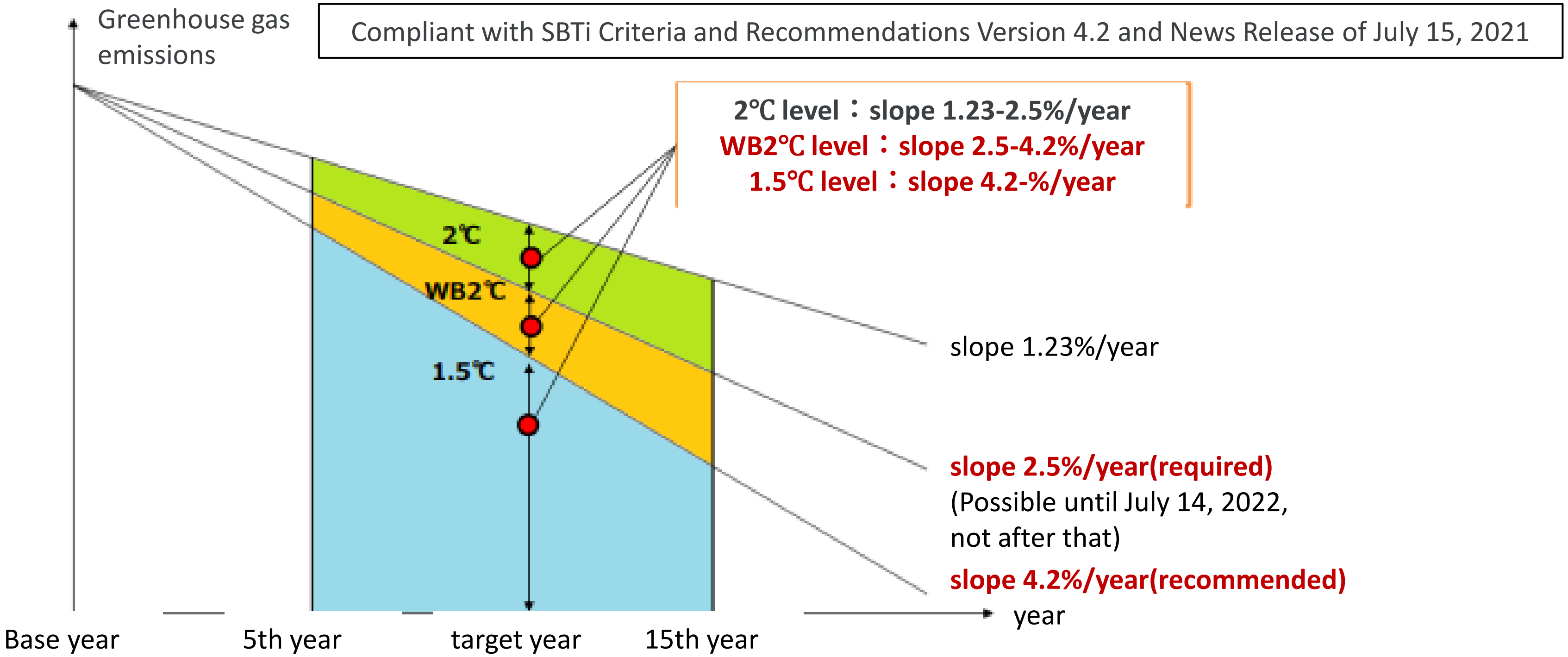
Regarding ICP applicable target range/applicable company range
About budget management/budget limits

	FAQ	Example answer
Regarding ICP target range/applicable company range	• **Is it better to think that investment using ICP is basically limited to capital investment?**	• **There are examples of ICP being used not only for capital investment but also for renewable energy introduction and R&D research and development expenses**
	• **What calculation method should be used when Scope 3 (raw material procurement) is applied?**	• **Calculate investment costs and basic units of raw material suppliers using actual measured values.** • In addition, Scope 3 (raw material procurement) needs to be received from the supplier because the emission factors and other basic units used by each supplier company are different
About budget management/budget limits	• When conducting business for long-term, **if the CO2 reduction effect changes every year, should numbers be revised each year?**	• Since present value is discounted using cash flow, **emission factors and efficiency values should not b changed.** Moreover, some companies temporarily calculate their service life as their legal service life
	• How should **ICP budget limits be set?**	• There are also cases where the ICP system is used for businesses that contribute to CO2 reduction within the preset ESG investment/environmental investment framework
	• **If the ICP budget frame is fixed, how should the budget amount be determined?**	• Rather than deciding the amount in detail, some companies decide on a budget amount (such as X% of sales) and start operating within that budget. Another option is to **use it within the investment framework for ESG and climate change response**

Source: Created from information released by each company and interviews

SBT is a greenhouse gas emission reduction target set by a company with a target year of 5 to 15 years in the future

- **Science-Based Targets (SBTs)** are GHG emission reduction targets set by companies aiming for 5 to 15 years future, consistent with the levels required by the Paris Agreement (which aims to limit global temperature increase to well below 2°C (WB2°C) and 1.5°C below pre-industrial levels)
- Number of participating companies：**4,523 companies worldwide** set such targets. **Japanese Company: 846 companies** (as of February 5, 2024)
- Jointly managed by CDP, UNGC (United Nations Global Compact), WRI (World Resources Institute), and WWF (World-Wide Fund for Nature)



For details of SBT, refer to the Ministry of the Environment's website "Green Value Chain Platform"
(http://www.env.go.jp/earth/ondanka/supply_chain/gvc/index.html)

Source: Created from Ministry of the Environment's "SBT Overview Material" （https://www.env.go.jp/earth/ondanka/supply_chain/gvc/files/SBT_gaiyou_20220208.pdf）

RE100 is an initiative aiming for businesses to supply energy by 100% renewable energy

- RE100 is a consortium of companies established in 2014 with the goal of 100% renewable electricity supply for their businesses
- Number of participating companies: 427 worldwide, 85 Japanese companies participating (as of February 8, 2024) Operated by The Climate Group and CDP
- Japan Climate Leaders Partnership (JCLP) is an administer of Japan region

List of 85 Japanese Companies participating in RE100

Apparel
- ASICS

Infrastructure
- Envipro Holdings Inc.
- Daibiru
- Prime Life Technologies Corporation
- Kumagai Gumi
- Toda Corporation
- Nishimatsu Construction
- Sekisui House
- Sekisui Chemical Group
- Tokyu Construction
- Tokyo Tatemono
- Nomura Real Estate Holdings
- Ichigo
- INFRONEER Holdings
- Hazama Ando Corporation
- Hulic
- Mitsui Fudosan
- Mitsubishi Estate
- MORI Building
- Daito Trust Construction
- Daiwa House Group

Service
- KDDI
- LY Corporation
- T&D Insurance Group
- Asset Management One
- Coop Sapporo
- Japan Real Estate Investment Corporation
- SECOM
- BIPROGY Group
- Johnan Shinkin Bank
- Dai-ichi Life Insurance
- Dentsu
- Tokyu Land Corporation
- NEC Corporation
- Fujitsu
- Fuyo General Lease
- Nomura Research Institute

Biotech, health care & pharma
- HOYA
- Eisai
- Ono Pharmaceutical
- Otsuka Holdings
- Daiichi Sankyo
- Shimadzu

Hospitality
- Watami

Retail
- J. Front Retailing Group
- Seven & i Holdings
- Rakuten
- Marui Group
- Shiseido
- Tokyu Corporation
- ASKUL
- AEON
- Takashimaya

Food, beverage & agriculture
- Asahi Group Holdings
- Sumitomo Forestry Group
- Nissin Foods Holdings
- Ajinomoto Group
- Kirin Holdings
- Meiji Holdings

Material
- Kao
- LIXIL
- Asahi Kasei Homes

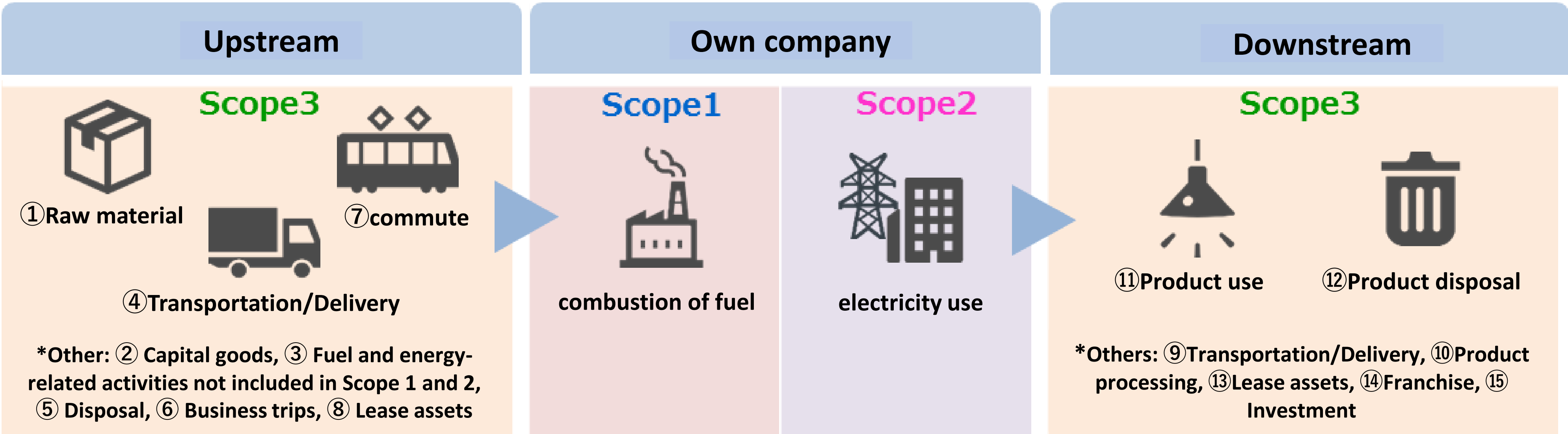
Manufacturing
- TDK
- TOTO
- Advantest
- AMADA
- Alps Alpine
- Casio
- Konica Minolta
- Seiko Epson
- Sony Group
- Diamond Electric Holdings
- Nikon
- Noritz
- Panasonic Holdings
- Fujikura
- Unicharm
- RICOH
- ROHM
- Okamura
- Sumitomo Rubber Industries
- Murata Manufacturing
- NGK INSULATORS
- Hamamatsu Photonics K.K.
- FUJIFILM Holdings

Source: Created from the Company list of RE100 (RE100 (RE100 (there100.org)))

Glossary: What are supply chain emissions?

Supply chain emissions are the sum of emissions from business operations and business-related activities

- **Refers to emissions that include not only the emissions of the business itself but also all emissions related to business activities**
- **Greenhouse gas emissions** generated from the entire process such as material procurement, manufacturing, logistics, sales, and disposal
- **Supply chain emissions = Scope 1 + Scope 2 + Scope 3 emissions**
- The GHG Protocol Scope 3 standard classifies Scope 3 into 15 categories



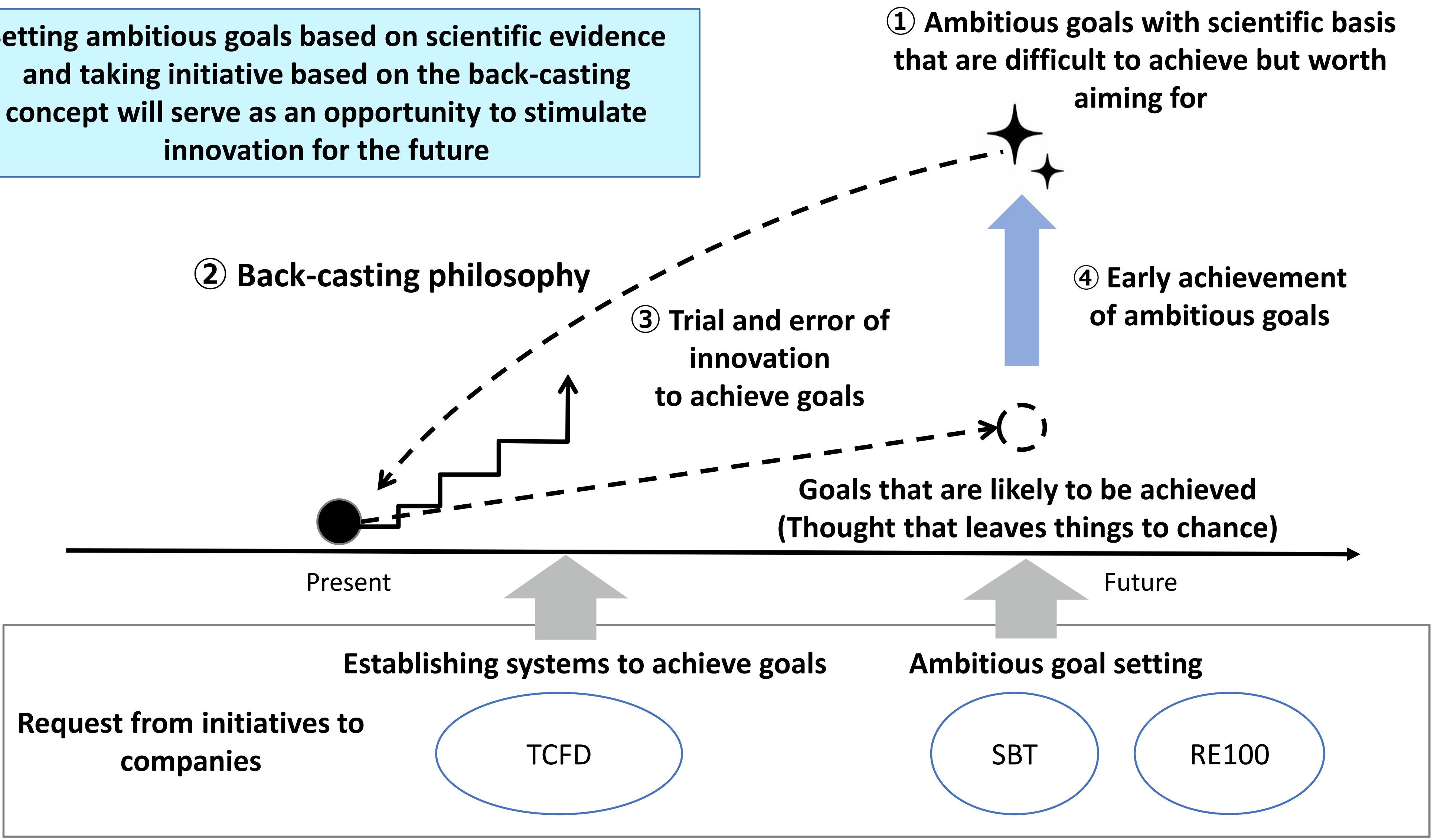
The numbers shown within ○ are Scope 3 categories

Scope1: Direct greenhouse gas emissions by businesses (fuel combustion, industrial processes) Scope2: Indirect emissions associated with the use of electricity, heat, and steam supplied by other companies Scope3: Indirect emissions other than Scope1 and Scope2 (emissions of other companies related to the business's activities)

Source: Created from the Ministry of the Environment's "Summary of Supply Chain Emissions" (https://www.env.go.jp/earth/ondanka/supply_chain/gvc/estimate_tool.html#no00)

The TCFD system is useful for achieving SBT/RE100, etc. ICP is also one of the recommended mechanisms

Setting ambitious goals based on scientific evidence and taking initiative based on the back-casting concept will serve as an opportunity to stimulate innovation for the future



Classification of ICP by CDP

ICP type	Explanation
Shadow price	• Set virtual price of carbon • Use as a tool to understand potential risks and opportunities in operations and supply chains, and to support decision-making regarding capital investments to achieve climate-related goals.
Implicit carbon price	• Calculated as procurement cost/reduction • Quantifying capital investments to meet climate-related goals • Often used as a benchmark for strategic ICP settings
Internal fee	• Claim payments based on carbon emissions by business unit • Reinvest recovered funds in clean technology and low carbon transition
→ **Internal trading**	• Internal fee development model • Business units and companies trade carbon credits allocated according to emissions. • Reinvest recovered funds in clean technology and low carbon transition
→ **Carbon offsets or credits**	• Aiming to achieve goals such as emissions reduction and carbon neutrality • Introducing the purchase cost of offsets as the ICP price • Focus is on reducing emissions within the company

Case

Seven Generations

Shadow price set in response to Alberta's announcement that the carbon tax will be set at $20/t. Although carbon tax is exempted until 2023, we recognize that incorporating carbon tax into business economics using ICP is necessary for future planning and capital investment.
(Country: Canada, Sector: Energy)

Viña Concha y Toro

Introduced an internal fee to make business departments aware of their impact on climate change and how to deal with it. We hope that ICP will encourage product and process innovation and lead to investment in low-carbon technologies.
(Country: Chile, Sector: Consumer Goods)

TD Bank Group

Set ICP based on the cost of RECs and carbon offsets. Calculate the relative reduction contribution to the group's overall carbon emissions on an annual basis. Depending on the results, the business division will be repaid.
(Country: Canada, Sector: Finance)

Source: Created from Carbon Pricing: CDP Disclosure Best Practice (CDP, 2018)

Classification of ICPs by UN Global Compact/UNEP

Classification in Executive Guide to Carbon Pricing Leadership (UN Global Compact/UNEP,2015)

Shadow price	Implicit carbon price	Internal fee
"Shadow price" is an approach attaches a hypothetical or assumed cost for carbon to better understand the potential impact of external carbon pricing on the profitability of a project	Calculating the implicit cost per Mt-CO2 based on how much the company spends to reduce GHG emissions	Creating an internal tax or fee that is assessed on various activities or expenditures, or setting up internal trading programs where business units or facilities buy and sell credits to meet GHG targets

Source: Created from Executive Guide to Carbon Pricing Leadership (UN Global Compact, etc.)

Classification of ICP by WBCSD (World Business Council for Sustainable Development)

Classification in Emerging Practices in Internal Carbon Pricing A Practical Guide (WBCSD,2015)

Shadow price	Implicit carbon price	Internal fee
If carbon emissions have a potential cost to the company in the future, putting a price on carbon internally is a means of managing that cost. This practice is referred to as “shadow carbon pricing”	N/A	An internal carbon fee is to incentivize emissions reduction for current operations. It differs from a shadow carbon price by the fact that it involves money transfer within the organization

Source: Created from Emerging Practices in Internal Carbon Pricing A Practical Guide (WBCSD)

Example of classification of ICP in the private sector①

Classification in How to Guide to Corporate Internal Carbon Pricing (Generation Foundation / CDP / Ecofys, 2017)

Shadow price	Implicit carbon price	Internal fee
Shadow pricing mechanisms generally embed a carbon price in the overall calculations for potential investments or climate risk analyses, but do not result in actual financial flows or monetary transfers	N/A	Internal carbon fee mechanisms is charging business units or departments for the GHG emissions associated with their energy use

Source: Created from HOW-TO GUIDE TO CORPORATE INTERNAL CARBON PRICING (Ecofys, etc.), etc.

Example of classification of ICP in the private sector②

Classification in Putting a Price on Carbon (CDP,2017)

Shadow price	Implicit carbon price *There is no clear definition stated, Described below in the text	Internal fee
Shadow price is attaching a hypothetical cost of carbon to each tonne of CO2e as a tool to reveal hidden risks and opportunities throughout its operations	Some companies calculate their “implicit carbon price” by dividing the cost of procurement by the tonnes of CO2e abated. This calculation helps quantify the capital investments required to meet climate-related Targets	Internal fee is charging responsible business units for their carbon emissions. These programs frequently reinvest the collected revenue back into activities that help transition the entire company to low-carbon

Source: Created from Putting a Price on Carbon (CDP, 2017)

OECD carbon pricing classification

- The above-mentioned Implicit carbon price is a term defined in Internal Carbon Price, and is the same as the implicit carbon price defined in OECD (OECD, (2013) Climate and carbon: Aligning prices and policies). It should be noted that these are different things

OECD (OECD, (2013) Climate and carbon: Aligning prices and policies)
Classification of carbon pricing

Explicit carbon price **(The price per ton is explicitly attached to the carbon emitted)**		**Implied Carbon Price** **(Those taxed on energy consumption rather than carbon emissions,** **Items that require emission reduction costs to comply with regulations and standards)**		
Carbon tax	**Emission allowance price through emissions trading**	**Energy tax**	**Regulatory compliance costs**	**Other**

Source: Created from OECD (2013) Climate and carbon: Aligning prices and policies

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Main Part

Appendix

Introducing advanced cases in Japan and abroad that can be used as a reference for considering ICP implementation

Company name	Price setting				Implementation			Organizational structure		Reference
	Utilizing external prices (current)	Utilizing external prices (future)	Benchmarking of prices of other companies in the same industry	Internal Discussions on Decarbonizing Investments	Reference price	Partially reflected in investment standards	Internal fee	Establishment of operational system	Commitment from upper management and involvement of related departments	
Askul	●		●	●	●			●		p.113
Astellas Pharma						●		●	●	p.114
AGC	●		●		●					p.115
KAO						●		●		p.116
Mitsui O.S.K. Lines		●			●					p.117
Taisei		●				●				p.118
Daiwa House REIT Investment					●					p.119
Nomura Research Institute							●			p.120
Fujitsu	●						●			p.121
Mitsubishi UFJ Financial Group					●					p.122

Introducing advanced cases in Japan and abroad that can be used as a reference for considering ICP implementation

Company name	Price setting				Implementation			Organizational structure		Reference
	Utilizing external prices (current)	Utilizing external prices (future)	Benchmarking of prices of other companies in the same industry	Internal Discussions on Decarbonizing Investments	Reference price	Partially reflected in investment standards	Internal fee	Establishment of operational system	Commitment from upper management and involvement of related departments	
BMW AG							●			p.123
Groupe Renault		●			●					p.124
International Airlines Group		●			●	●				p.125
Microsoft							●	●		p.126
Philip Morris International	●					●				p.127
Safran	●	●			●					p.128
Saint-Gobain					●					p.129
Société Générale							●			p.130
Solvay S.A.		●				●				p.131
Tetra Pak	●				●		●		●	p.132
Unilever Plc	●				●					p.133
Volkswagen AG					●		●			p.134

The scope of applying ICP is expanding from visualization of CO_2 emissions to capital investment and PPA in stages

Purpose of use	①For reference	②Partially reflected in investment standards	③Internal fee (Budget allocated within the company)
	●		

Scope of application	Target range			Company range			
	Scope 1	Scope 2	Scope 3	Domestic only	Domestic/ Overseas	Head office only	Group/ Subsidiary
	●	●	●	●			

Pricing/Setting Methodology

- Set price：8,500yen/tCO_2
- ICP Type：Implicit Price
- Price setting methodology：Prices are set based on the company's **past environmental investment results**, such as the introduction of LED lighting and electric vehicles, using global emissions rights prices and benchmarks from other companies as reference values

Implementation

- Expanding the use of ICP in stages
  - ① **Visualization of CO_2 reduction amount** due to implementation of energy saving measures and introduction of renewable energy at 10 distribution centers nationwide.
  - ② **When making environmental investments** such as energy-saving equipment in logistics centers such as lighting and air conditioning, **multiply the expected CO_2 reduction by installing the equipment by ICP and use it as a reference value to promote environmental investments**
  - ③ **Compare the premium price from non-fossil certificates and renewable energy with ICP to determine the validity of the value**

Organizational structure, Future initiatives

- The Sustainability Committee **regularly discusses price revisions** based on regulations, renewable energy procurement prices, and environmental investment performance
- They predict that prices will fluctuate in the future as carbon prices may rise as CO_2 reductions progress.
- **In fiscal 2025, they plan to incorporate internal carbon pricing into investment recovery and use it as a guideline for decision-making on environmental investment standards**

Introduction example

- PPA and VPPA were considered as a means of introducing renewable energy into distribution centers by verifying the validity of the premium price provided by renewable energy

Source: CDP response (2023)

Astellas Pharma's initiatives（Biotechnology, Healthcare, Pharmaceuticals, Japan）

Setting investment standards to reduce annual 1 ton CO2 reduction cost to 100,000 yen or less, and utilize ICP for capital investment, etc.

Purpose of use	①For reference	②Partially reflected in investment standards	③Internal fee (Budget allocated within the company)
		●	

Scope of application	Target range			Company range			
	Scope 1	Scope 2	Scope 3	Domestic only	Domestic/ Overseas	Head office only	Group/ Subsidiary
	●	●		●			●

Pricing/Setting Methodology

- Set price：100,000yen/tCO2 (Cost required to reduce 1 ton of CO2 per year)
- ICP Type：Implicit Price
- Price setting methodology：Prices are set by studying social trends in carbon markets.

Implementation

- **Evaluate investments by comparing GHG reductions for each low-carbon or high-energy efficiency project** across Astellas' business units
  - If the ratio of “investment cost/annual greenhouse gas reduction” is lower than the internal standard indicator of 100,000 yen, the plan will be approved

Organizational structure, Future initiatives

- Price Setting methodology: Set by EHS/Corporate Risk Management, a team specializing in internal responsibility at the Tokyo head office and proposed to the Chief Ethics and Compliance Officer
- Management of investment projects: The EHS Committee develops medium- and long-term action plans and investment plans for Astellas as a whole, ensures annual budgets, and **collects from each facility a list of investment plans including estimated costs, estimated CO2 savings, reductions, payback period, and CO2 reductions**
- Investment approval: **Decision-making by top management such as CEO, CSTO, CAO, CFO, etc.**

Introduction example

- In 2019, as part of the Toyama Technical Center's energy conservation promotion activities, insulation (cover wrap) was installed on the boiler bodies of six boilers (2t-2/3t-4 boilers) in the second fermentation building to prevent thermal energy loss in the body. The energy saving effect was analyzed at the time of proposal, and the annual CO2 reduction effect was calculated to be 13.46 tCO2, and the installation cost was 1.06 million yen. The investment amount per ton of CO2 reduction per year was 79,000 yen, which was less than 100,000 yen, so the proposal was approved

Source: CDP response (2023)

AGC's initiatives（Material, Japan）

Prices are set depending on the purpose, and ICP is widely used for M&A, capital investment, technology development, etc.

Purpose of use	①For reference	②Partially reflected in investment standards	③Internal fee (Budget allocated within the company)
	●		

Scope of application	Target range			Company range			
	Scope 1	Scope 2	Scope 3	Domestic only	Domestic/ Overseas	Head office only	Group/ Subsidiary
	●	●			●		●

Pricing/Setting Methodology	• Set price：6,500-10,000yen/tCO2 • **Three prices are set depending on the purpose (capital investment, price setting for business investment, technology development investment)** • ICP Type：Shadow Price
Implementation	• **Utilize ICP for stress testing (carbon risk management) in the decision-making process for business investments such as capital investment and technology development to reduce emissions, plant construction, and M&A**
Organizational structure, Future initiatives	• **In 2021, an ICP framework was designed to be introduced across the AGC Group in order to incorporate carbon costs into investment decisions for carbon pricing, which is expected to be introduced in each country in the future** • **Introduced carbon cost simulation in 2020 and started full-scale implementation of ICP company-wide from 2022**
Introduction example	• **ICP is applied to glass manufacturing capital investment in China mainly for stress testing, and it is determined that it will be profitable in the long term** • When investing in renewable energy in-house power generation equipment in Taiwan, **the NPV turned positive after considering ICP, so the investment was decided after considering other factors as well** • After considering ICP, **AGC Group companies decided to introduce solar power generation systems**

Source: CDP response (2023), AGC, *Sustainability Data Book 2023*, https://www.agc.com/sustainability/pdf/agc_sus_jp_2023.pdf

Kao is conducting price increase and reflect them into investment decisions. ICP is utilized in sectors which accounts for majority of emissions

Purpose of use	①For reference	②Partially reflected in investment standards	③Internal fee (Budget allocated within the company)
		●	

Scope of application	Target range			Company range			
	Scope 1	Scope 2	Scope 3	Domestic only	Domestic/ Overseas	Head office only	Group/ Subsidiary
	●	●		●			

Pricing/Setting Methodology	• Set price：21,000yen/tCO2 • ICP Type：Shadow Price • Price setting methodology：Price was set at 3,500yen until 2021, but was revised that it is impossible to install equipment to achieve the SBTi 1.5°C target. Hence, **the price was raised by setting CO2 reduction targets in Scope 1 and 2 according to SBT 1.5°C**
Implementation	• **Capital investment decisions are made based on the condition that economic value added (EVA) will be positive within the reference year set for each item** • The sum of the energy costs reduced by introducing energy-saving equipment and the carbon price of reduced CO2 emissions is calculated as cost benefit and reflected in investment standards
Organizational structure, Future initiatives	• Decisions on making capital investments is managed by the ESG Committee. • Kao's SCM department, which accounts for majority of Scope 1 and 2 emissions, utilizes ICP
Introduction example	• Through ICP, we have implemented project investments such as the installation of hot water heat pumps at the Toyohashi Plant (scheduled for completion in May 2023) and the installation of solar power generation facility (generation capacity: 400kW) at the Kashima Plant (2024)

Source: CDP response (2023)

Multiple prices are set depending on different time frames. ICP is applied to all investment projects related to the international shipping business

Purpose of use	①For reference	②Partially reflected in investment standards	③Internal fee (Budget allocated within the company)
	●		

Scope of application	Target range			Company range			
	Scope 1	Scope 2	Scope 3	Domestic only	Domestic/ Overseas	Head office only	Group/ Subsidiary
	●	●					●

Pricing/Setting Methodology	• Set price：7,150-19,250 yen/tCO2, **Setting multiple prices on time axis** for future price • ICP Type：Implicit Price • Setting method：Adopts IEA's popular carbon price assumption. **Setting multiple prices according to the IEA time axis** 　• **From 2025 to 2039：9,588yen/tCO2（65US$/tCO2）** 　• **From 2040～：25,813yen/tCO2（175US$/tCO2）**
Implementation	• Applies to all investment project approvals related to the group's main business, ocean shipping business, and incorporates ICP into both revenue and expenses 　• **Assessing the profitability of new technologies, taking into account the impact of carbon taxes and trading on the market** 　• **ICP is also applied to investment projects other than the international shipping business through consultation on a case-by-case basis**
Organizational structure, Future initiatives	• **The policy will be reviewed as appropriate while ensuring consistency with the various conditions in scenario analysis, with reference to external organizations such as the IEA and trends in the application of carbon taxes to international shipping such as the EU-ETS**
Introduction example	• Since internal operation of ICP began in September 2021, ICP has already been used for more than 10 investment decisions (e.g., introduction of LNG fueled ships, introduction of Wind Challenger (rigid sail)) • The company determined that it would simultaneously reduce fuel costs through energy savings and reduce GHG emissions, that the economic benefits of GHG emission reductions would be properly evaluated by ICP, **that the benefits of installing the equipment would outweigh the disadvantages of increased capital costs, and that the payback period for the investment would be quicker as a result**

Source: CDP response (2023)
Exchange rate: 1 dollar = 147.50 yen, 1 euro = 159.71 yen (using exchange rates as of the end of January 2024)

Taisei's initiative（Infrastructure related, Japan）

Utilize ICP for capital investment, technology development investment, and environmental impact reduction activities

Purpose of use	①For reference	②Partially reflected in investment standards	③Internal fee (Budget allocated within the company)
		●	

Scope of application	Target range			Company range			
	Scope 1	Scope 2	Scope 3	Domestic only	Domestic/ Overseas	Head office only	Group/ Subsidiary
	●	●	●	●			●

Pricing/Setting Methodology

- Set price：8,000yen/tCO2
- ICP Type：Implicit Price
- Setting method：Based on the IEA's price forecast, **the price will be 8,000 yen until 2025**, and the future price after 2025 will be set to gradually increase based on the IEA's NZE (Net Zero by 2050) scenario assumed carbon price

Implementation

- **① Promote decarbonization-related capital investment (Scope 1,2)**
  - **Convert the CO2 emission reduction effect of equipment installation into monetary terms and include it in return calculations when making investment decisions**
- **② Promote investment in decarbonization-related technology development (Scope 1, 2, 3)**
  - **The CO2 emission reduction effect expected from the practical application of the technology is converted into a monetary amount and is used as one of the investment performance indicators**
- **③ Promotion of environmental impact reduction activities (TSA: TAISEI Sustainable Action) (Scope 1,2)**
  - Promote environmental load reduction activities (TSA) by converting CO2 emitted by the head office, branches, and group companies into monetary values and establishing environmental management indices that relate CO2 emission costs to sales and administrative profit/loss at each location

Organizational structure, Future initiatives

- Prices are to be **reviewed once a year based** on IEA projections

Introduction example

- ① In FY2021, it will be used to make investment decisions in renewable energy facilities and make investments
- ② It is assumed that this will lead to **the promotion of the development of low-carbon construction materials such as carbon recycled concrete**, and for 30 of the technologies that began research and development in FY2021, the CO2 reduction amount when put into practical use will be estimated and the ICP The CO2 reduction effect was visualized by converting it into monetary amounts
- **③ Raising internal awareness by linking performance indicators such as sales and profits to CO2 emission costs**

Source: CDP response (2023)

Daiwa House REIT Investment's initiative（Service, Japan）

Utilize ICP in low-carbon promotion construction, investment decisions for target properties, and supplier selection

Purpose of use	①For reference	②Partially reflected in investment standards	③Internal fee (Budget allocated within the company)
		●	

Scope of application	Target range			Company range			
	Scope 1	Scope 2	Scope 3	Domestic only	Domestic/ Overseas	Head office only	Group/ Subsidiary
	●	●	●	●			

Pricing/Setting Methodology	• Set price：10,000yen/tCO2 • ICP Type：Shadow Price
Implementation	• ① Incentives for construction to promote low carbonization： 　• **In cases where GHG emissions expected to be reduced by implementation of construction work such as LED lighting and air conditioning upgrades can be calculated, the amount converted by applying ICP is taken into consideration and used as a reference for judging the implementation of the construction work** • ② Guidelines for investment decision making： 　• **Income and expenses are calculated based on the conversion amount by applying ICP to the GHG emissions of the target property and are used as a reference for investment decisions** • ③ Identification of risks related to future cost increases： 　• **By selecting suppliers with low emissions, we aim to reduce the risk of increased procurement costs when a carbon tax is introduced in the future**
Organizational structure, Future initiatives	N/A
Introduction example	• As an incentive for low-carbon construction work, such as LED lighting, **the ICP is taken into account when the amount to be transferred to rent from tenants is small, which influences project decisions** • In FY2022, when ordering the installation of solar power generation equipment at DPL Nagareyama III, **a logistics facility, investment decisions are made based on the capital investment yield, which is the amount of income obtained by multiplying the amount of GHG emissions to be reduced by ICP, to the electricity usage fees received from tenants**

Source: CDP response (2023)

Nomura Research Institute's initiatives（Service, Japan）

Charging the "difference" between carbon and renewable energy by operational units in the headquarters. Charged carbon pricing is used to procure renewable energy and pay electricity bills

Purpose of use	①For reference	②Partially reflected in investment standards	③Internal fee (Budget allocated within the company)
			●

Scope of application	Target range			Company range			
	Scope 1	Scope 2	Scope 3	Domestic only	Domestic/ Overseas	Head office only	Group/ Subsidiary
		●		●			●

Pricing/Setting Methodology	• Set price：4,000yen/tCO2 • ICP Type：Internal Fee
Implementation	• **Charges equivalent to the difference between carbon energy and renewable energy to business headquarters** that utilize NRI Group data centers. • **The collected levies will be saved for future renewable energy procurement, and a portion will be used to pay data center electricity bills**
Organizational structure, Future initiatives	• Collected by departments.
Introduction example	• **In FY2021, a surcharge of approximately 1 billion yen will be collected**, equivalent to approximately 1% of the internal sales of the Data Center Business Headquarters (a portion of the collected funds will be used for data center electricity bills, as well as future renewable energy (Planned to be used during procurement) • **The system of collecting levies on a department-by-department basis changed the mindset of management, which led to the decision to join RE100**

Source: CDP response (2023)

Fujitsu's initiative（Service, Japan）

Charges for exceeding emission targets to compensate for the purchase of renewable energy certificates and investment in energy-saving equipment

Purpose of use	①For reference	②Partially reflected in investment standards	③Internal fee (Budget allocated within the company)
			●

Scope of application	Target range			Company range			
	Scope 1	Scope 2	Scope 3	Domestic only	Domestic/Overseas	Head office only	Group/Subsidiary
	●	●		●			●

Pricing/Setting Methodology	• Set price：4,000yen/tCO2 • ICP Type：Internal Fee
Implementation	• Internal billing: **If group-wide emissions at factories, data centers, and offices exceed the target, the amount collected from each business unit in proportion to the excess is used to compensate for the purchase of renewable energy certificates and investment in energy-saving equipment, etc.** • **If profits are generated from activities that exceed the target of 100,000 tons, 1.1 times that amount is added to the annual capital investment in additional energy-saving equipment and other measures to combat global warming**
Organizational structure, Future initiatives	• **Utilize implicit price when reporting on internal calculations of CO2 reduction costs and return on investment at the sustainability management meeting chaired by the CEO**
Introduction example	N/A

Source: CDP response (2023)

Mitsubishi UFJ Financial Group's initiative（Service, Japan）

Utilizing ICP in verifying investments and loans on whether such investments contributes to CO2 reduction

Purpose of use	①For reference	②Partially reflected in investment standards	③Internal fee (Budget allocated within the company)
	●		

Scope of application	Target range			Company range			
	Scope 1	Scope 2	Scope 3	Domestic only	Domestic/ Overseas	Head office only	Group/ Subsidiary
			●	●			

Pricing/Setting Methodology	• Set price：4,400yen /tCO2（Convert 40 USD/tCO2 using internal proprietary exchange rate of 110 yen/USD） • ICP Type：Shadow Price
Implementation	• Companies that make investments and loans, including banks, decide on investment and loan recipients by considering costs and returns, **but if CO2 can be reduced due to investment and loans, the reduction amount is multiplied by the ICP. By converting the carbon costs incurred into revenue supplements, investment and loan decisions are made not only from the perspective of the effects associated with investments and loans, but also from the perspective of reducing carbon costs**
Organizational structure, Future initiatives	N/A
Introduction example	• By incorporating an impact investment mechanism into the investment process, **three investments have been made in advanced funds that conduct impact evaluations, and the impact is expected to be approximately 67,000 tons of CO2 reduction per year on an investment basis**

Source: CDP response (2023)

BMW AG's initiative（Manufacturing, United States）

ICP was introduced to comply with regulations and establish a system to regularly review price validity

Purpose of use	①For reference	②Partially reflected in investment standards	③Internal fee (Budget allocated within the company)
			●

Scope of application	Target range			Company range			
	Scope 1	Scope 2	Scope 3	Domestic only	Domestic/ Overseas	Head office only	Group/ Subsidiary
	●	●	●	●			●

Pricing/Setting Methodology	• Price①（SCOPE1-3(Upstream)）：**0-15,971yen/tCO2（0-100 euro/tCO2）** • **Set by combining the reduction cost curve and the EU-ETS external carbon price** • Price②（SCOPE3(Downstream)）：**0-75,862yen/tCO2（0-475 euro/tCO2）** • Based on the penalty costs of the EU Fleet Regulation, the price tag for investments in technical measures to reduce CO2 emissions is **set at 475 euros tCO2 for 1g below the overall target value.** • ICP Type：Shadow Price
Implementation	• Drive investment in Efficient Dynamics technology and low carbon products (BEV, PHEV) across all vehicle projects across the company • **Set g-CO2/km target line and use bonus/malus system in business case (BC) calculations for all vehicles** Example：BEV CO2 emissions are 0g/km, which provides a large bonus that contributes positively to BC. On the contrary, the BC of conventional cars above the target line is adversely affected by malus
Organizational structure, Future initiatives	• **The adequacy of the carbon internal price is regularly reviewed** and adjusted in the event of major changes in framework conditions or adaptation of steering effects deemed necessary
Introduction example	• Efficient Dynamics technology as standard in all BMW Group cars • 433,792 electrified vehicles were sold (BEV: 215,752, PHEV: 218,040), **increasing the share of electrified vehicles to 18.1% of total deliveries in the reporting 12 months** • **Decided to finance carbon-free technology at new construction plant in Debrecen (Hungary) through application of ICP**

Source: CDP response (2023)

Exchange rate: 1 dollar = 147.50 yen, 1 euro = 159.71 yen (using exchange rates as of the end of January 2024)

Groupe Renault's initiative（Manufacturing, France）

Utilizes ICP for vehicle verification and industrial equipment investment. The company plans to introduce ICP for parts and material supply in the future

Purpose of use	①For reference	②Partially reflected in investment standards	③Internal fee (Budget allocated within the company)
	●		

Scope of application	Target range			Company range			
	Scope 1	Scope 2	Scope 3	Domestic only	Domestic/ Overseas	Head office only	Group/ Subsidiary
	●	●	●	●			

Pricing/Setting Methodology	• Set price：15,971-31,942yen（100-200 euro/tCO2） • ICP Type：Shadow Price • Setting method：Prices in line with short- and medium-term forecasts based on a fluctuation model that integrates external factors such as energy market evolution and regulations. • **Vehicle projects: including in-use emissions regulations, especially CAFE and CO2-related taxes** • **Industrial equipment: considering multiple factors such as expected changes in the energy market and CO2 emission allowances**
Implementation	• Internal Price set to reduce vehicle CO2 emissions. • **Determination of technical components that enable increased efficiency of the vehicle during the use phase, as well as decisions regarding automotive materials and components throughout the value chain** • Carbon Price based on EU-ETS CO2 allowance • **Consider ICP in ROI (return on investment) calculations to promote investments in energy efficiency in manufacturing plants**
Organizational structure, Future initiatives	• As the free allocation of EU-ETS allowances is phased out, we aim to minimize the financial burden of allowances in the medium to long term through efforts to reduce energy consumption at business sites and strict management with an eye to the future
Introduction example	• Carbon Price based on EU-ETS CO2 allowance. • Integrated into the decision-making process for the Pitesti paintshop renovation (implementation of an energy recovery systems), which required 49.51 million yen (310,000 euros). • Internal Price set to reduce vehicle CO2 emissions. • Used as a reference for verification or disposal of BEV, HEV, PHEV, fuel cells, alternative fuels, etc.

Source: CDP response (2023)
Exchange rate: 1 dollar = 147.50 yen, 1 euro = 159.71 yen (using exchange rates as of the end of January 2024)

International Airlines Group（IAG）‘s initiative（Transportation, United Kingdom）

ICP is used in several business areas. Prices are set by combining current prices and future forecasts

Purpose of use	①For reference	②Partially reflected in investment standards	③Internal fee (Budget allocated within the company)
	●	●	

Scope of application	Target range			Company range			
	Scope 1	Scope 2	Scope 3	Domestic only	Domestic/ Overseas	Head office only	Group/ Subsidiary
	●				●		●

Pricing/Setting Methodology	• Price①（**2022-2030 EU-ETS Scheme**）：**10,701-20,761 yen/tCO2**（67-130 euro/tCO2） 　• Set using the 2017 UK Government Aviation Forecast as a reference, combining the actual ETS Allowance Price with the Carbon Price forecast • Price②（**2022-2030 CORSIA Price**）：**1,917-3,194 yen/tCO2**（12-20 euro/tCO2） 　• Set based on model • Price③（**offset**）：**1,597-4,472yen/tCO2**（10-28 euro/tCO2） 　• Regularly reviewed based on secured project price and external forecasts • ICP Type：Shadow Price
Implementation	• **Use ICP for decision-making across multiple business areas** • Used to share operational decisions such as fuel planning and aerial refueling • Used in investment decisions related to fuel efficiency improvement initiatives and SAF projects
Organizational structure, Future initiatives	• Group airlines apply carbon price to financial planning • Fleet planning teams use the latest carbon prices and price forecasts for short- and long-haul fleet purchasing decisions • Sustainability team integrates Carbon Price into business planning to inform scenario analysis of climate-related risks and opportunities
Introduction example	• Even when IAG or operating companies voluntarily choose to invest in carbon avoidance and removal projects, **in collaboration with key partners, conduct due diligence to select credible providers and carefully select projects to meet validated quality standards**

Source: CDP response (2023)
Exchange rate: 1 dollar = 147.50 yen, 1 euro = 159.71 yen (using exchange rates as of the end of January 2024)

Microsoft's initiative（Service, United States）

Collects carbon tax according to each divisions' emission (Scope 1, 2, 3) and use the collected funds for decarbonization projects

Purpose of use	①For reference	②Partially reflected in investment standards	③Internal fee (Budget allocated within the company)
			●

Scope of application	Target range			Company range			
	Scope 1	Scope 2	Scope 3	Domestic only	Domestic/ Overseas	Head office only	Group/ Subsidiary
	●	●	●		●		●

Pricing/Setting Methodology	• Set price：**A unified price is adopted company-wide for business groups operating in over 100 countries around the world.** • All electricity-related emissions: 1,956yen/tCO2 (15 USD/tCO2) • Emissions from business trips: 13,043yen/tCO2 (100 USD/tCO2) • Remaining emissions other than the above: 1,043yen/tCO2 (8 USD/tCO2) • ICP Type：Internal Fee
Implementation	• An entire company (other than LinkedIn) **operates in a system which collects carbon tax based on all Scope 1, 2, and 3 emissions** • **Carbon tax is collected according to the emissions of each division of the business division** • **Collected funds (Carbon Fee Fund) are been used as incentives for decarbonization projects such as climate-related energy and technology innovation**
Organizational structure, Future initiatives	• **Re-evaluate carbon price every year.** • **Work with Company's finance department to manage ICP Price creation and collection funds through Company's Environmental Sustainability Team**
Introduction example	• In FY2021, Carbon Fee Fund was used to support the following investments, etc. • Renewable electricity (7,083,737 MWh) • Carbon removal purchases in 9 countries (removed over 1.4 million mtCO2e) • Innovation projects that are part of the AI for Earth program • Multiple projects related to carbon and environmental justice

Source: Since responses regarding ICP were not published in FY2023, refer to CDP responses from last year (FY2022).
Exchange rate: 1 dollar 130.43 yen, 1 euro 140.75 yen (using exchange rates as of the end of January 2023)

Philip Morris International's initiative（Food, Beverage, Agriculture related, United States）

Collects information on carbon taxes and carbon regulatory risks in each country to set prices, and incorporate ICP into IRR

Purpose of use	①For reference	②Partially reflected in investment standards	③Internal fee (Budget allocated within the company)
		●	

Scope of application	Target range			Company range			
	Scope 1	Scope 2	Scope 3	Domestic only	Domestic/ Overseas	Head office only	Group/ Subsidiary
	●	●			●		

Pricing/Setting Methodology

- Set price：15,488yen/tCO2（105 USD/tCO2 ）
- ICP Type：Shadow Price
- Price setting methodology：Set the uniform price based on the steps below.
  - ① **Calculate the weighted ratio of the total carbon weight of Scope 1 and Scope 2 for that year in each country where manufacturing facilities are located**
  - ② **Assign carbon intensity to each country** by dividing each country's emissions by the total carbon emissions
  - ③ **Classify into categories according to the risk level of carbon taxes and carbon regulations** in each country (e.g., whether carbon regulations are becoming more active or planned to be introduced in the near future)
  - ④ **Multiply each country's carbon intensity by the country-specific risk carbon price assigned to each country's weighted carbon contribution**
  - ⑤ **After finally obtaining the total carbon weighted contribution of all countries, adjust to the nearest integer**

Implementation

- **Incorporating ICP into IRR reduces the impact on the payback period, making it possible to invest in efficiency improvement and emission reduction projects that are not covered by traditional internal investment policies**

Organizational structure, Future initiatives

- Integrate the Shadow Carbon Price (SP) into the preparation and financial evaluation of project proposals for structural reductions in carbon emissions in 2022 and support the approval of 121 carbon emission reduction projects, including four projects in the Zero Carbon Technology (ZCT) program

Introduction example

- Allocated approximately 2.065 billion yens ($14 million) to support project implementation at Manufacturing sites, reducing overall carbon emissions of Manufacturing facilities by at least 7.5% in 2022 versus 2021.
- As part of the ZCT program, the Italian Manufacturing site approved the establishment of a combined solution space, including an electrification plan. A variety of technologies will be operational by 2025, including thermal electrification with heat pumps, electric boilers, and private power generation plants

Source: CDP response (2023)
Exchange rate: 1 dollar = 147.50 yen, 1 euro = 159.71 yen (using exchange rates as of the end of January 2024)

Safran‘s initiative（Manufacturing, France）

Utilizing ICP in supplier determination decisions

Purpose of use	①For reference	②Partially reflected in investment standards	③Internal fee (Budget allocated within the company)
	●		

Scope of application	Target range			Company range			
	Scope 1	Scope 2	Scope 3	Domestic only	Domestic/ Overseas	Head office only	Group/ Subsidiary
	●	●	●	●			

Pricing/Setting Methodology	• Set price：11,978yen/tCO2（75 euro/tCO2） • ICP Type：Shadow Price • Setting method：**Set based on publications and academic literature from the IEA (International Energy Agency), I4CE (Institute for Climate Economics), and the World Bank**
Implementation	• Utilizing ICP in investment decision making • ICP is factored into investment return calculations and is applied to projects such as additions, new construction, and energy efficiency investments • **Utilizing ICP in supplier selection** • **Require information sharing on CO2 emitted to produce goods and services, use ICP when comparing different offers, and incorporate into "total cost of ownership”**
Organizational structure, Future initiatives	N/A
Introduction example	• ICP is connected to projects such as solar panel projects, light bulb replacement, and low-carbon boiler projects. • It has been decided to introduce ICP into purchasing, supplier selection and cargo management processes at the end of 2021

Source: CDP response (2023)
Exchange rate: 1 dollar = 147.50 yen, 1 euro = 159.71 yen (using exchange rates as of the end of January 2024)

Saint-Gobain's initiative（Material, France）

Setting ICP by application (R&D, energy investment)

Purpose of use	①For reference	②Partially reflected in investment standards	③Internal fee (Budget allocated within the company)
	●		

Scope of application	Target range			Company range			
	Scope 1	Scope 2	Scope 3	Domestic only	Domestic/ Overseas	Head office only	Group/ Subsidiary
	●	●	●		●		●

Pricing/Setting Methodology	• Set price：**Set multiple prices for each purpose** • 15,971 yen/tCO2（100 euro/tCO2）：**Energy investment** • 31,942 yen/tCO2（200 euro/tCO2）：**R&D** • ICP Type：Shadow Price
Implementation	• Used in investment decisions for transition to low-carbon technologies • **Applies to Scope 1,2 for all entities in the 70 countries in which it operates** • **Investing in research and development of breakthrough low-carbon technologies** • Research and development：**ICP covers all CO2 emissions in Scope 1, 2, and 3 for all groups in the 70 countries in which they operate** • Demonstrate value in supporting low-carbon R&D projects, such as developing new technologies to preheat raw materials
Organizational structure, Future initiatives	N/A
Introduction example	• **Used to apply hydrogen in float furnaces and used ICP in supporting low-carbon R&D projects**, including the development of a new technology to preheat raw materials • Adding energy efficiency equipment (heat recovery) to new float lines for manufacturing flat glass in Mexico and India using internal carbon price

Source: CDP response (2023)
Exchange rate: 1 dollar = 147.50 yen, 1 euro = 159.71 yen (using exchange rates as of the end of January 2024)

Société Générale‘s initiative（Service, France）

By taxing emissions using ICP, the group achieved significant reductions

Purpose of use	①For reference	②Partially reflected in investment standards	③Internal fee (Budget allocated within the company)
			●

Scope of application	Target range			Company range			
	Scope 1	Scope 2	Scope 3	Domestic only	Domestic/ Overseas	Head office only	Group/ Subsidiary
	●	●	●		●		●

Pricing/Setting Methodology	• Set price：3,993 yen/tCO2 （25 euro/tCO2 ） • Apply the same price to the entire company regardless of geography, business unit, etc. (uniform price) • Set a fixed price and apply it for more than 10 years (static price setting) • Apply Price to each business and service unit • ICP Type：Internal Fee
Implementation	• Carbon tax will be imposed using ICP based on GHG emissions in Scope 1, 2, and 3. • **Uses a system in which a carbon tax is imposed on group entities annually according to GHG emissions.** • **Tax revenue will be used as a reward for the most outstanding environmental impact reduction initiatives within the group.**
Organizational structure, Future initiatives	• Involving each business unit and service unit, **the pricing has been raised** from 10 euros to 25 euros in 2021
Introduction example	• Introduced an award system for CO2 reduction's initiatives. Since its launch, nearly 950's initiatives have been announced, more than half of which have received awards, resulting in a reduction of over 50,000 tons of CO2

Source: CDP response (2023)
Exchange rate: 1 dollar = 147.50 yen, 1 euro = 159.71 yen (using exchange rates as of the end of January 2024)

Solvay S.A.'s initiative（Service, Belgium）

The price is set by 3 different time frames (short, medium and long). ICP is incorporated into the estimated financial profit

Purpose of use	①For reference	②Partially reflected in investment standards	③Internal fee (Budget allocated within the company)
		●	

Scope of application	Target range			Company range			
	Scope 1	Scope 2	Scope 3	Domestic only	Domestic/ Overseas	Head office only	Group/ Subsidiary
	●	●	●	●			

Pricing/Setting Methodology	• Set price：Set multiple prices depending on time axis (short term/medium term/long term) and Usage for implementation. • Short-term (1 year)：**ETS forward price** • Medium term (10 years)：15,971yen/tCO2 (100 euros/tCO2) ⇒ **Used for capital investment profitability analysis** • Long-term (2050)：15,971yen/tCO2 (100 euros/tCO2) ⇒ **Used as a shadow price for carbon footprint calculation in portfolio evaluation** • ICP Type：Implicit Price, Shadow Price
Implementation	• **ICP is incorporated into estimated financial return calculations** and is utilized in investment decisions. • When used for capital investment profitability analysis, **investments that do not meet Solvay's profitability standards will not be made.** • **If the investment does not have an acceptable return on investment under market conditions, but the return on investment is good when taking ICP (Implicit Price) into account, the investment will be made**
Organizational structure, Future initiatives	• Sustainable Portfolio Management (SPM) is developed in close collaboration with business units and departments in key processes such as strategy, research and innovation, capital expenditures, marketing and sales, and mergers and acquisitions
Introduction example	• Solvay in Italy reduced its CF4 emissions by 560,000 tons of CO2 equivalent and 460,000 tons of CF4 in 2019 through innovative clean technology developed in-house and commissioned in 2019. The implementation of the project has been decided based on the application of ICP

Source: CDP response (2023)
Exchange rate: 1 dollar = 147.50 yen, 1 euro = 159.71 yen (using exchange rates as of the end of January 2024)

Tetra Pak's initiative（Food, Beverage, Agriculture related, Switzerland）

Collects internal fees using ICP while formulating air transportation policies to reduce CO2 emissions

Purpose of use	①For reference	②Partially reflected in investment standards	③Internal fee (Budget allocated within the company)
	●		●

Scope of application	Target range			Company range			
	Scope 1	Scope 2	Scope 3	Domestic only	Domestic/ Overseas	Head office only	Group/ Subsidiary
	●	●	●		●		●

Pricing/Setting Methodology	• Price①：1,597-3,993 yen/tCO2（10-25 euro/tCO2） • Use a unified price throughout the company. Refer to EU CO2 emissions credits to calculate climate change impact. • Even if the actual amount is lower, the minimum amount is set at 1,408 yen/ton (10 euro/ton). • Price②：4,791 yen/tCO2（30 euro/tCO2） • A fixed price is used worldwide. Introducing a carbon price for CO2 emissions from airport cargo transportation • ICP Type：Shadow Price、Internal Fee
Implementation	• **Confirm the impact on climate change and use it to make investment decisions for power generation equipment, etc.** (utilizing Price①) • **A new policy on Air Transportation sets Air Transportation only in business critical situations, and if the recommendations are ignored and air cargo is used, Development and Service Operations (DSO) will collect a fee to invest in renewable energy** (utilizing Price ②)
Organizational structure, Future initiatives	• Air Transportation is recognized as something that should be used with the express approval of the relevant Managing Director and Vice President of Capital Equipment for Development and Service Operations (DSO). • **Prices will be used globally and will be updated twice a year**
Introduction example	• Investment in onsite solar power generation at Tetra Pak's factory in Nairobi (Kenya) in 2022. • Carbon costs improved financial return on investment by 1-2 years • **The use of air cargo was significantly reduced as a result of establishing internal fees when using air cargo**

Source: CDP response (2023)
Exchange rate: 1 dollar = 147.50 yen, 1 euro = 159.71 yen (using exchange rates as of the end of January 2024)

Unilever Plc's initiative（Material, United Kingdom）

Utilizing ICP to reflect on investments decisions and establishing sustainability investment funds

Purpose of use	①For reference	②Partially reflected in investment standards	③Internal fee (Budget allocated within the company)
	●		

Scope of application	Target range			Company range			
	Scope 1	Scope 2	Scope 3	Domestic only	Domestic/ Overseas	Head office only	Group/ Subsidiary
	●	●	●		●		●

Pricing/Setting Methodology	• Set price：9,853 yen/tCO2 （70 euro/tCO2） • ICP Type：Shadow Price • Price setting methodology：Set based on the World Bank Carbon Price Report.
Implementation	• Reflected in investment decision making. 　• **Mandatory presentation of project financial indicators such as NPV, IRR, and return on investment, both with and without ICP, for all projects with capital investments of more than EUR 1 million, covering approximately 80% of total capital investments** 　• **Use of ICP is recommended for all non-capital investments, especially decarbonization and energy efficiency projects** 　• **Integrate internal carbon price setting into standardized project cash flow and business case templates** • Establish a fund 　• Ben & Jerry's and Seventh Generation brands have **established their own sustainability investment funds using ICP**
Organizational structure, Future initiatives	• In setting carbon prices, **follow the recommendations of experts from the World Bank High-Level Committee on Carbon Prices Report**. (The report recommends increasing the carbon price from $40 to $80/t-CO2 by 2030, which is necessary to achieve the goals of the Paris Agreement.) • **Plan to review the effectiveness of carbon price and consistency with targets every year**.
Introduction example	• Ben & Jerry's imposes an internal carbon tax on every 1Mt of GHG emissions from farm to landfill. Worked with farmers to implement strategies to reduce GHG emissions, including manure separators that turn methane into cow bedding • Implemented energy-saving measures such as installing solar panels at an ice cream factory in Vermont and installing electric vehicle charging stations at the facility

Source: CDP response (2023)
Exchange rate: 1 dollar = 147.50 yen, 1 euro = 159.71 yen (using exchange rates as of the end of January 2024)

Volkswagen AG's initiative（Manufacturing, Germany）

Introduced ICP to achieve reduction targets in line with CO2 emissions regulations, collecting penalties for excess amounts

Purpose of use	①For reference	②Partially reflected in investment standards	③Internal fee (Budget allocated within the company)
	●		●

Scope of application	Target range			Company range			
	Scope 1	Scope 2	Scope 3	Domestic only	Domestic/ Overseas	Head office only	Group/Subsidiary
	●	●	●		●		●

Pricing/Setting Methodology	• Price①（SCOPE1-3）：31,942 yen/tCO2（20 euro/tCO2） • Reviewed annually based on target achievement and adjusted by resolution of the Board of Directors. • Price②（SCOPE3(Downstream)）：75,862 yen/tCO2（475 euro/tCO2） • Fixed Price determined as a penalty for exceeding fleet emission rules. If fleet emission regulations change, the set price is expected to change as well. • ICP Type：Shadow Price, Internal Fee
Implementation	• Newly registered passenger cars within the EU will be subject to ICP pricing • **Targets newly registered passenger cars that meet exhaust gas performance standards** • **If the target is not met, a penalty of 95 euros per vehicle will be imposed for every 1g of CO2 per kilometer exceeded**
Organizational structure, Future initiatives	• ICP is part of an integrated management system that manages group-wide CO2 activities required to comply with EU CO2 emissions regulations
Introduction example	N/A

Source: CDP response (2023)
Exchange rate: 1 dollar = 147.50 yen, 1 euro = 159.71 yen (using exchange rates as of the end of January 2024)

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Appendix

Biotechnology, Healthcare, Pharmaceuticals Sector（1/2）

Company	Sector	ICP Type	Set price (tCO2)	SBT Certified	Detail
Astellas Pharma	Biotechnology, Healthcare, Pharmaceuticals	Implicit Price	**100,000 yen**	Targets Set	• Targets Scope1, 2 • **Applicable to all business divisions of Astellas Pharma, including pharmaceutical technology, drug discovery research, and sales** • The Enterprise Risk Management, EHS team collects a list of investment plans from each facility, including estimated cost, estimated CO2 savings, payback period, and CO2 savings to drive capital investment
Otsuka Holdings		Shadow Price	**5,000yen**	Targets Set	• Targets Scope1, 2 • Introducing ICP to promote low-carbon investments • **Calculates the cost effectiveness of cogeneration systems, etc. and makes investment decisions**
Ono Pharmaceutical		Implicit Price	**8,096yen**	Targets Set	• Targets Scope1, 2 • Introducing ICP to promote low-carbon investments • **Use internal carbon pricing as one of the decision-making factors when purchasing energy-intensive equipment, such as air conditioning equipment, and when planning investments in renewable energy**
Shionogi & Co.		Shadow Price	**10,000-16,523 yen**	Targets Set	• Targets Scope1, 2 • Introducing ICP to change internal behavior, promote energy efficiency, and promote low-carbon investments • **Make investment decisions considering of carbon value when introducing or switching to electricity derived from renewable energy** • **Promote capital investment that takes carbon value into consideration to improve the outcome CO2 reduction. Mainly in facilities and equipment which emits large amount of CO2, such as factories and research laboratories**

Source: CDP responses from each company (2023), Science Based Targets website (as of the end of January 2024)

Biotechnology, Healthcare, Pharmaceuticals Sector（2/2）

Company	Sector	ICP Type	Set price (tCO2)	SBT Certified	Detail
Daiichi Sankyo	Biotechnology, Healthcare, Pharmaceuticals	Shadow Price	**1,000-3,000 yen**	Targets Set	• Targets Scope1, 2 • Introducing ICP to change internal behavior, promote energy efficiency, promote low-carbon investments, identify and utilize low-carbon opportunities, meet stakeholder expectations, and reduce S/C emissions • **Utilize ICP as a reference when making investment decisions for the introduction of high-efficiency lighting equipment in factories.** • **Consider prices based on trends in the domestic emissions trading system** • The price is set between 1,000 and 3,000 yen, with 2,000 yen being the average price
Sumitomo Pharma		Implicit Price	**2,800,000 Yen**	Targets Set	• Targets Scope1, 2 • Introducing ICP to promote energy efficiency, promote low-carbon investments, and identify and utilize low-carbon opportunities • **Utilize ICP for investment decisions by setting an "implicit price" considering the cost of replacing conventional equipment with the CO2 reduction when replacing high-efficiency equipment with planned LED conversion or replacing aging equipment**
Takeda Pharmaceutical		Implicit Price	**1,100yen**	Targets Set	• **Targets Scope1, 2, 3 (upstream)** • Introducing ICP company-wide to guide GHG regulations, address stakeholder expectations, change internal behavior, promote energy efficiency, promote low-carbon investments, and identify and utilize low-carbon opportunities
TSUMURA & CO.		Shadow Price	**11,943-33,175 yen**	Unable to confirm	• Targets Scope1, 2 • ICP is used to make investment decisions, enhancing energy efficiency technologies and equipment, as well as **to select electric power companies**
Terumo		Shadow Price	**10,000 yen**	Targets Set	• Targets Scope1, 2 • **It aims to introduce ICP on trial basis in 2021 and to be implemented into organization-wide system in 2022** • **Apply ICP to self-investment in solar power generation equipment and capital investment in equipment with low return on investment such as LEDs**

Source: CDP responses from each company (2023), Science Based Targets website (as of the end of January 2024)

Food, Beverage, Agriculture related Sector（1/2）

Company	Sector	ICP Type	Set price (tCO2)	SBT Certified	Detail
Asahi Group Holdings	Food, Beverage, Agriculture related	Shadow Price	**11,846-17,111 yen**	Targets Set	• Targets Scope1, 2 • Introducing ICP to promote low-carbon investments • **Refers to the carbon price assumed by IEA NZE**
Ajinomoto		Shadow Price	**1,500-25,000 yen**	Targets Set	• Targets Scope1, 2 • Introducing ICP to change internal behavior, promote energy efficiency, promote low-carbon investments, and meet stakeholder expectations • **ICP used in group-wide transition risk scenario analysis to visualize future carbon tax hikes**
Kikkoman		Implicit Price	**6,500yen**	Committed (within 2 years)	• Targets Scope1, 2 • Introducing ICP to change internal behavior, promote energy efficiency, and promote low-carbon investments • **Pricing is calculated from the average of the actual price of renewable energy for electricity required for future reductions and the price of offset certificates in the heat field**
Kirin Holdings		Shadow Price	**7,000yen**	Targets Set	• Targets Scope1, 2 • **Utilize ICP information as input information when formulating the Kirin Group Environmental Vision 2050, and reflect the results of scenario analysis, including impact assessment, in environmental strategies** • Furthermore, **the ICP was introduced into the investment decision framework for environmental investments with the main purpose of reducing GHG emissions, with the aim of accelerating environmental investments** • **Prices are set based on the IEA's carbon price predictions in the literature for each country**

Source: CDP responses from each company (2023), Science Based Targets website (as of the end of January 2024)

Food, Beverage, Agriculture related Sector（2/2）

Company	Sector	ICP Type	Set price (tCO2)	SBT Certified	Detail
Suntory Holdings	Food, Beverage, Agriculture related	Shadow Price	**8,000yen**	Targets Set	• **Targets Scope1,2,3** • Introducing ICP to change internal behavior, promote low-carbon investments, meet stakeholder expectations, and engage suppliers • **Used for business decisions such as estimating the financial impact of future carbon tax increases, and for determining the profitability of solar panels and energy-saving equipment investments**
Sapporo Holdings		Implicit Price	**6,000yen**	Committed (within 2 years)	• Targets Scope1, 2 • **Incorporated into capital investment payback period evaluation and used for investment decisions including purchasing decisions on renewable energy electricity** • **Used to calculate the amount of impact on transition and used in decision-making for disclosure of transition plans based on TCFD recommendations**
The Nisshin OilliO Group		Shadow Price	**10,000 yen**	Unable to confirm	• Targets Scope1, 2 • Introducing ICP to guide greenhouse gas regulations, change internal behavior, promote energy efficiency, promote low-carbon investments, and identify and utilize low-carbon opportunities • **When calculating the profitability of capital investment, the CO2 reduction benefit (CO2 reduction amount x carbon price) is added to the fuel cost reduction, etc., and evaluated, increasing the benefits of equipment introduction and shortening the equipment payback period**
Nisshin Seifun Group		Shadow Price	**5,000yen**	Unable to confirm	• Targets Scope1, 2 • **Targets capital investment and M&A** • **Reflecting ICP into “long-term CO2 emission reduction plan” by 2050**
FUJI OIL HOLDINGS		Shadow Price	**10,000 yen**	Targets Set	• Targets Scope1, 2 • Used as a reference value for investment decisions such as facility purchases
Meiji Holdings		Shadow Price	**5,000yen**	Targets Set	• Targets Scope1, 2 • **It is mandatory to calculate the CO2 reduction effect and economic effect using an internal carbon price for projects with investment amount over 10 million yen**

Source: CDP responses from each company (2023), Science Based Targets website (as of the end of January 2024)

Case studies of companies introducing ICP

Fossil fuel Sector, Infrastructure related Sector（1/3）

Company	Sector	ICP Type	Set price (tCO2)	SBT Certified	Detail
INPEX	Fossil fuel	Shadow Price	**4,004-16,668 yen (27.15-113USD*1)**	Unable to confirm	• Targets Scope1, 2 • Introducing ICP to perform stress test investments • **Applying ICP as part of economic evaluation of existing and potential future projects** • **Prices are reviewed annually in line with IEA WEO carbon prices**
Osaka Gas	Infrastructure related	Shadow Price	**4,000-18,000 yen**	Unable to confirm	• **Targets Scope1, 2, 3** • **Utilizes ICP to understand the financial impact of climate change risks on new or existing investment projects and evaluate countermeasures and their effectiveness**
Kumagai Gumi		Shadow Price	**2,200-23,000 yen**	Targets Set	• Target Scope2 • Introducing ICP to change internal behavior, promote energy efficiency, promote low-carbon investments, identify and utilize low-carbon opportunities, and meet stakeholder expectations • **Established a carbon price specifically designed to promote energy conservation of electrical equipment in the head office building, and applied ICP to evaluate profitability**
Shimizu Corporation		Shadow Price	**10,500-18,200 yen**	Targets Set	• **Targets Scope1, 2, 3 (downstream)** • Introducing ICP to promote energy efficiency, identify and utilize low-carbon opportunities • **Calculate the cost-effectiveness by dividing CO2 emission reduction cost (administrative activity expenses and research and development expenses) by the carbon price**
SEKISUI CHEMICAL		Internal Fee	**30,000 yen*2**	Targets Set	• Targets Scope1, 2 • Introducing ICP to guide GHG regulations, change internal behavior, promote energy efficiency, and promote low-carbon investments • Introduced an "Environment-Contributing Investments Promotion Measures" in which when business divisions make capital investments, the head office bears the cost according to the amount of CO2 emissions reduced • **Verifying life cycle GHG emissions during building operation and cost effectiveness of ZEB technology development investment under Scope 3/Category 11**

Source: CDP responses from each company (2023), Science Based Targets website (as of the end of January 2024)
*1：1 dollar = 147.50yen (using exchange rate as of the end of January 2024)
*2：Since no description equivalent to ICP unit price (yen/tCO2) could be found in the CDP response for FY2023, refer to the amount

Infrastructure related Sector（2/3）

Company	Sector	ICP Type	Set price (tCO2)	SBT Certified	Detail
Sekisui House	Infrastructure related	Shadow Price	**10,000 yen**	Targets Set	• Targets Scope1, 2 • Introducing ICP to change internal behavior • **Applying ICP to increase employees' sense of ownership to climate change measures and utilize them in investment decisions for decarbonization**
Taisei Corporation		Implicit Price	**8,000yen**	Targets Set	• **Targets Scope1,2,3** • Introducing ICP to change internal behavior, promote energy efficiency, promote low-carbon investments, and reduce supply chain emissions • Utilize ICP for the following purposes. **(1) Convert the CO2 emission reduction effect from equipment introduction and reflect it in return calculations when making investment decisions, (2) Calculate the CO2 emission reduction effect expected from practical application of technology and use it as one of the investment performance indicators, (3) Head office/branch/group Convert the CO2 emitted by the company and set environmental management indicators that relate it to CO2 emission costs**
Daiwa House Industry		Shadow Price	**4,000yen (Scope1,2) 20,000yen (Scope3 downstream)**	Targets Set	• **Targets Scope1, 2, 3 (downstream)** • Introducing ICP to change internal behavior, promote energy efficiency, promote low-carbon investments, and meet stakeholder expectations • **Utilizing ICP to consider priorities for energy-saving investments at facilities across the group** • **Established an "Environmental IRR" system that calculates IRR by setting ICP unit prices for real estate development and calculating CO2 reduction value in cash flow**

Source: CDP responses from each company (2023), Science Based Targets website (as of the end of January 2024)

Case studies of companies introducing ICP

Infrastructure related Sector（3/3）, Manufacturing Sector（1/12）

Company	Sector	ICP Type	Set price (tCO2)	SBT Certified	Detail
Toda Corporation	Infrastructure related	Shadow Price	**5,000-15,400 Yen**	Targets Set	• Target Scope1 • Introducing ICP to change internal behavior, guide GHG regulations, and meet stakeholder expectations • **ICP is used to see if the increased costs of adopting low carbon fuels (e.g. BDF) are justified from a carbon price perspective**
Daito Trust Construction		Shadow Price	**10,000 Yen**	Targets Set	• **Targets Scope1, 2, 3 (upstream)** • **ICP is set when evaluating the economic efficiency when considering the introduction of renewable electricity and switching from gasoline-fueled vehicles to low-carbon vehicles**
Sumitomo Mitsui Construction		Shadow Price	**8,567yen**	Targets Set	• **Target Scope2** • **Making investment decisions that consider the profitability of business income and expenses in consideration of ICP and promote investments that contribute to reducing CO2 emissions** • Based on the predicted future CO2 price (USD) in developed countries shown in the 2021 World Energy Outlook by the IEA, set in yen considering exchange rates
Mitsui Fudosan		Shadow Price	**5,000yen**	Targets Set	• **Targets Scope1,2,3** • Introducing ICP to change internal behavior, promote energy efficiency, promote low-carbon investments, identify and utilize low-carbon opportunities, guide GHG regulations, and meet stakeholder expectations • **ICP is used to obtain approval for business plans for new properties in all business types and regions, including office buildings, retail, and logistics. It will also be used to raise employees' awareness of reducing CO2 emissions and to formulate and consider equipment plans that will lead to reductions in CO2 emissions**
JVC KENWOOD	Manufacturing	Shadow Price	**2,500yen**	Unable to confirm	• Targets Scope1, 2 • Introducing ICP to change internal behavior

Source: CDP responses from each company (2023), Science Based Targets website (as of the end of January 2024)

Manufacturing Sector（2/12）

Company	Sector	ICP Type	Set price (tCO2)	SBT Certified	Detail
LIXIL	Manufacturing	Shadow Price	**1,575-13,650 yen**	Targets Set	• Targets Scope1, 2 • Introducing ICP to change internal behavior, promote energy efficiency, promote low-carbon investments, identify and utilize low-carbon opportunities, and reduce supply chain emissions
SUBARU		Shadow Price	**6,000yen**	Unable to confirm	• Targets Scope1, 2 • **When acquiring certain amount of tangible fixed assets, the company report CO2 reduction outcome of introduced equipment as a cost reduction effect and include it in the criteria for making capital investment decisions**
SUMCO		Shadow Price	**2,700yen**	Unable to confirm	• Targets Scope1, 2 • Targeting investments that are thought to have an impact on carbon emissions (equipment renewal, expansion, etc.), **the impact amount based on ICP can be evaluated together with benefit calculations at the time of investment planning and can be used as a reference for investment decisions**
TOTO		Shadow Price	**15,000yen**	Targets Set	• Targets Scope1, 2 • Introducing ICP to change internal behavior, promote energy efficiency, promote low-carbon investments, and meet stakeholder expectations. • **ICP utilized for large-scale capital investments that involve an increase or decrease in CO2 emissions**
Aisin Corporation		Shadow Price	**11,000yen**	Targets Set	• Targets Scope1, 2 • Introducing ICP to change internal behavior, and promote low-carbon investments • **ICP utilized for investment decisions in energy saving and renewable energy equipment investment** • **Review prices as appropriate while monitoring market trends and progress towards climate change targets**

Source: CDP responses from each company (2023), Science Based Targets website (as of the end of January 2024)

Case studies of companies introducing ICP

Manufacturing Sector（3/12）

Company	Sector	ICP Type	Set price (tCO2)	SBT Certified	Detail
Advantest	Manufacturing	Shadow Price	**3,000-8,000yen**	Targets Set	• Targets Scope1, 2 • Introducing ICP to change internal behavior, promote energy efficiency, promote low-carbon investments, and identify and utilize low-carbon opportunities • **Applied to decision-making for introducing renewable energy**
Ibiden		Shadow Price	**4,000yen**	Unable to confirm	• Targets Scope1, 2 • **Decarbonization using ICP is added to a decision-making factor when considering capital investment,** • **Prices are set once a year considering EU emissions futures prices**
Oji Holdings		Shadow Price	**16,900 yen**	Unable to confirm	• Targets Scope1, 2 • Introducing ICP to change internal behavior, promote energy efficiency, promote low-carbon investments, and guide GHG regulations. • **Used to raise awareness among all executives and employees about reducing GHG emissions related to climate change issues**
Omron		Implicit Price	**1,386yen**	Targets Set	• Target Scope2 • Utilizing ICP to select electric power companies • **Prices are set based on the market transaction price of non-fossil certificates**
Kawasaki Heavy Industries		Internal Fee	**2,000yen**	Committed (within 2 years)	• Targets Scope1, 2 • **Plans to promote investment in hydrogen business through ICP operation**

Source: CDP responses from each company (2023), Science Based Targets website (as of the end of January 2024)

Case studies of companies introducing ICP

Manufacturing Sector（4/12）

Company	Sector	ICP Type	Set price (tCO2)	SBT Certified	Detail
Kioxia Holdings	Manufacturing	Internal Fee	**5,000yen**	Unable to confirm	• Targets Scope1, 2 • Introducing ICP to change internal behavior • Use ICP to drive investment in reducing greenhouse gas emissions within your company • **ICP is used as a tool to introduce measures to reduce greenhouse gas emissions when it is difficult to make decisions using the traditional CAPEX method when preparing a budget**
Canon		Shadow Price	**24,000yen**	Committed (within 2 years)	• Targets Scope1, 2 • Introducing ICP to promote energy efficiency. • **ICP is used for investment decisions regarding energy saving related capital investment**
Kyocera		Shadow Price	**1,607-3,278yen**	Targets Set	• Targets Scope1, 2 • **ICP is used to comprehensively judge electricity prices and the amount of environmental impact associated with CO2 emissions and select a power purchaser**
Kokuyo		Internal Fee	**890yen**	Unable to confirm	• Targets Scope1, 2 • Introducing ICP to identify and utilize low-carbon opportunities • Carry out a forest conservation activity called the "**Yuinomori Project**", which covers 4 million yen in thinning costs every year and has absorbed a cumulative total of 67,390 tCO2 over 15 years. This figure is used as a reference when setting ICP prices
Konica Minolta		Implicit Price	**1,000-20,000yen**	Targets Set	• Targets Scope1, 2 • Introducing ICP to promote low-carbon investments and guide GHG regulations • **ICP is used for investment decisions towards decarbonization and renewable energy**

Source: CDP responses from each company (2023), Science Based Targets website (as of the end of January 2024)

Manufacturing Sector（5/12）

Company	Sector	ICP Type	Set price (tCO2)	SBT Certified	Detail
GS Yuasa	Manufacturing	Shadow Price	**8,600yen**	Unable to confirm	• Targets Scope1, 2 • Introducing ICP to change internal behavior and promote low-carbon investment. • **Presenting the results of a comparative study that takes ICP into account regarding over a million-yen scale capital investment during deliberation** • **Used in investment decisions for installing solar power generation equipment** • Considering changing prices depending on social conditions
Sumitomo Rubber Industries		Shadow Price	**10,000yen**	Committed (within 2 years)	• **Targets Scope1,2,3** • **ICP is used as criteria for investment decisions aimed at reducing CO2 emissions**
Seiko Epson		Implicit Price	**1,500-10,000yen**	Targets Set	• Target Scope2 • Introducing ICP to change internal behavior, guide GHG regulations, and meet stakeholder expectations • **ICP is used as a standard when deciding to invest in environmental measures, such as the appropriate installation of solar power generation equipment at business sites**
Sony Group		Shadow Price	**5,774yen**	Targets Set	• Target Scope2 • Introducing ICP to promote low-carbon investment and formulate carbon offset budget. • **ICP is used as a basis for deciding whether to introduce renewable energy at business sites**

Source: CDP responses from each company (2023), Science Based Targets website (as of the end of January 2024)

Manufacturing Sector（6/12）

Company	Sector	ICP Type	Set price (tCO2)	SBT Certified	Detail
Daikin Industries	Manufacturing	Shadow Price	**10,000yen**	Unable to confirm	• Target Scope1 • Introducing ICP to change internal behavior, promote energy efficiency, promote low-carbon investments, and meet stakeholder expectations. • **When constructing or renewing factory equipment, low-carbon investments are decided by considering the CO2 emission reduction effect compared to ICP**
Taiyo Yuden		Shadow Price	**10,000yen**	Unable to confirm	• Targets Scope1, 2 • Introducing ICP to promote energy efficiency • **ICP is used in investment decisions for energy-saving measures aimed at achieving absolute greenhouse gas emissions reduction targets**
DISCO		Internal Fee	**1,870yen**	Unable to confirm	• Targets Scope1,2,3 • Introducing ICP to change internal behavior, promote energy efficiency, promote low-carbon investments, meet stakeholder expectations, and reduce supply chain emissions. • **Reduction targets are set for each department, and corporate currency called "Will" is given to employees as an incentive depending on the degree of achievement, which is partially reflected in actual bonuses**
Denso		Internal Fee	**5,000yen**	Targets Set	• **Targets Scope1, 2, 3 (upstream)** • **The net present value (NPV) and internal rate of return (IRR) of capital investment are calculated by adding the amount of CO2 reduction and the value calculated from ICP, with the energy saving effect as a positive factor and the investment amount as a negative factor**

Source: CDP responses from each company (2023), Science Based Targets website (as of the end of January 2024)

Manufacturing Sector（7/12）

Company	Sector	ICP Type	Set price (tCO2)	SBT Certified	Detail
Tokai Rika	Manufacturing	Shadow Price	**16,000yen**	Unable to confirm	• Targets Scope1, 2 • **When calculating the payback year for CO2 reduction investments at domestic bases, 16,000 yen per 1t-CO2 investment effect is deducted**
Tokyo Electron		Shadow Price	**28,221yen**	Targets Set	• Targets Scope1, 2 • Introducing ICP to promote energy efficiency, promote low-carbon investments, and identify and utilize low-carbon opportunities • **ICP is referred to as a KPI when discussing and determining return on investment at internal capital investment councils, budget councils, and board meetings**
Toyota Motor		Implicit Price	**50,000yen**	Targets Set	• **Targets Scope3** • Introducing ICP to change internal behavior and identify and utilize low-carbon opportunities • **Introducing ICP to help reduce CO2 emissions from new cars in situations where compliance with regulations is required**
Toyota Industries		Internal Fee	**18,400yen**[*1]	Committed (within 2 years)	• Target Scope2 • Introducing ICP to change internal behavior, promote energy efficiency, promote low-carbon investments, identify and utilize low-carbon opportunities, and guide GHG regulations • **Consider ICP in capital investment and operating electricity costs due to the introduction of renewable energy such as solar power generation equipment**

Source: CDP responses from each company (2023), Science Based Targets website (as of the end of January 2024)
*1：Since no description equivalent to ICP unit price (yen/tCO2) could be found in the CDP response for FY2023, refer to the amount

Manufacturing Sector（8/12）

Company	Sector	ICP Type	Set price (tCO2)	SBT Certified	Detail
Nabtesco	Manufacturing	Shadow Price	**29,039yen**	Targets Set	• Targets Scope1, 2 • Introducing ICP to promote energy efficiency and promote low-carbon investments • **ICP is used to examine the CO2 reduction effect of introducing solar power generation equipment to domestic factories**
NSK		Shadow Price	**15,000yen**	Unable to confirm	• Targets Scope1, 2 • Introducing ICP to change internal behavior, promote energy efficiency, and promote low-carbon investments • To promote company-wide environmental investment that takes profitability into consideration, investment decisions are made based on the adjusted investment return amount, **converting the CO2 reduction effect into monetary value and visualizing the degree of contribution to profits** (Does not apply to decisions regarding procurement of available energy) • Price is provisionally set based on the carbon tax predicted by the IEA
Niterra		Internal Fee	**10,000yen**	Unable to confirm	• Targets Scope1, 2 • **A fee is collected based on the amount of CO2 emitted from each business office in Japan, and the collected amount is used to invest in renewable energy equipment and CO2 reduction equipment through an internal environmental fund**
Noritz		Shadow Price	**7,000yen**	Unable to confirm	• Target Scope2 • **Introduced to promote investment in low-carbon and energy-saving equipment to reduce CO2** • Prices are set by referring to IEA WEO2020 prices

Source: CDP responses from each company (2023), Science Based Targets website (as of the end of January 2024)

Manufacturing Sector（9/12）

Company	Sector	ICP Type	Set price (tCO2)	SBT Certified	Detail
Panasonic Holdings	Manufacturing	Shadow Price	**6,000yen**	Targets Set	• Targets Scope1, 2 • **ICP is introduced to encourage operating companies to introduce renewable energy equipment such as energy-saving equipment and solar panels while maintaining economic rationality into the future**
Hitachi Construction Machinery		Shadow Price	**14,000yen**	Targets Set	• Targets Scope1, 2 • Introducing ICP to change internal behavior, promote energy efficiency, and promote low-carbon investments • **ICP is used in investment decisions to promote capital investment that contributes to CO2 reduction**
Hitachi		Shadow Price	**5,000-14,000yen**	Targets Set	• Targets Scope1, 2 • **Introducing ICP as a strategy to promote low-carbon investments in factories and offices** • **Prices are set taking into account the 2030 carbon tax and carbon trading price**
Hitachi High-Tech		Shadow Price	**14,000yen**	Unable to confirm	• Targets Scope1, 2 • **The amount of energy saved in electricity, gas, fuel, etc. due to capital investment is defined as the amount of CO2 emission reduction, multiplied by a hypothetical carbon price, and converted into a monetary amount. Used to add the CO2 emission reduction effect to the original investment effect and raise the priority when selecting equipment**
Fujikura		Shadow Price	**6,500yen**	Targets Set	• Targets Scope1, 2 • Introducing ICP to promote low-carbon investments. • **Using ICP to measure the cost-effectiveness of renewable energy implementation to implement transition plans**
Fuji Seal		Shadow Price, Implicit Price	**14,300yen**	Committed (within 2 years)	• Targets Scope1, 2 • Introducing ICP to change internal behavior, promote energy efficiency, promote low-carbon investments, identify and utilize low-carbon opportunities, and guide GHG regulations

Source: CDP responses from each company (2023), Science Based Targets website (as of the end of January 2024)

Manufacturing Sector（10/12）

Company	Sector	ICP Type	Set price (tCO2)	SBT Certified	Detail
Fuji Electric	Manufacturing	Internal Fee	**3,000-15,000yen**	Targets Set	• Targets Scope1, 2 • Introducing ICP to promote energy efficiency and promote low-carbon investments
FUJIFILM Holdings		Shadow Price	**11,000-12,000yen**	Targets Set	• Targets Scope1, 2 • Introducing ICP to change internal behavior, promote energy efficiency, promote low-carbon investments, and guide GHG regulations • **ICP is used to identify risks related to increases in CO2 emissions and make investment decisions in sectors**
Furukawa Electric		Shadow Price	**10,000yen**	Targets Set	• Targets Scope1, 2 • Introducing ICP to change internal behavior and promote low-carbon investments • **Visualize the effects of each department's efforts to achieve greenhouse gas reduction targets and the difference between greenhouse gas reduction targets and actual results as a carbon price**
Bridgestone		Shadow Price	**13,200yen**	Committed (within 2 years)	• **Targets Scope1,2,3** • **Introducing ICP to promote energy efficiency and promote low-carbon investments** • **Calculate the return on investment, including CO2 emission costs due to carbon pricing, and use it as a basis for determining investment profitability** • **The carbon price for CO2 emission costs is set as appropriate, taking into account the business characteristics and regional circumstances of each business division, and the common default value that serves as a reference is updated once a year**
Mabuchi Motor		Implicit Price	**8,000-10,000yen**	Unable to confirm	• Target Scope2 • Introducing ICP to change internal behavior, promote low-carbon investments, identify and utilize low-carbon opportunities, guide GHG regulations, and develop carbon offset budgets

Source: CDP responses from each company (2023), Science Based Targets website (as of the end of January 2024)

Manufacturing Sector（11/12）

Company	Sector	ICP Type	Set price (tCO2)	SBT Certified	Detail
Mitsubishi Electric	Manufacturing	Internal Fee	**51,938 yen**[*1]	Targets Set	• Targets Scope1, 2 • Introducing ICP to promote low-carbon investments • **The goal is to invest 0.15% of factory shipments as environmental investment at each production site (all domestic factories and major overseas factories). At the head office, we compile the total investment and CO2 emission reduction results (theoretical values before implementation, actual values after implementation), and provide support to ensure that each production base is committed to environmental investment and CO2 emission reduction**
Murata Manufacturing		Shadow Price	**7,000yen**	Targets Set	• Targets Scope1, 2 • Introducing ICP to change internal behavior, promote energy efficiency, and promote low-carbon investments • **Used in decision-making for energy savings and renewable energy investments**
Meidensha		Implicit Price	**15,000 yen**	Targets Set	• Targets Scope1, 2 • Introducing ICP to change internal behavior, promote energy efficiency, promote low-carbon investments, and meet stakeholder expectations • **Promote the introduction of energy-efficient equipment by considering GHG emissions over the life cycle in ICP evaluations during capital investment with the goal of reducing GHG emissions by 30% in 2030 (compared to FY2019)** • **Internal prices are set taking into account the Ministry of the Environment and IEA's 1.5℃ scenario, "benchmarks from other companies," etc**
Yamaha		Shadow Price	**14,000 yen**	Targets Set	• Targets Scope1, 2 • Introducing ICP to promote low-carbon investments • Utilize ICP in all capital investment decisions
Yamaha Motor		Shadow Price	**9,000yen**	Unable to confirm	• Targets Scope1, 2 • **ICP is used as one of the evaluation criteria for energy-related capital investment. Consider CO2 reduction when deciding on capital investment priorities**

Source: CDP responses from each company (2023), Science Based Targets website (as of the end of January 2024)
*1：Since no description equivalent to ICP unit price (yen/tCO2) could be found in the CDP response for FY2023, refer to the amount

Manufacturing Sector（12/12）, Material Sector（1/6）

Company	Sector	ICP Type	Set price（tCO2）	SBT Certified	Detail
Yokogawa Electric	Manufacturing	Implicit Price	**1,000yen**	Targets Set	• Target Scope2 • **When considering capital investment and clean energy introduction plans, convert the expected increase or decrease in GHG emissions into monetary amounts and reflect it in financial decision-making**
Ricoh	Manufacturing	Shadow Price	**4,200yen**	Targets Set	• Targets Scope1, 2 • Introducing ICP to promote low-carbon investment and introduce electricity derived from renewable energy • **Used as a criterion for making capital investments and purchasing renewable energy certificates**
AGC	Material	Shadow Price	**6,500-10,000yen**	Targets Set	• Targets Scope1, 2 • The ICP is used to encourage investment in capital investment to reduce greenhouse gas emissions and investment in technology development to reduce greenhouse gas emissions
DIC	Material	Shadow Price	**8,000yen**	Targets Set	• Targets Scope1, 2 • Introducing ICP to change internal behavior, promote energy efficiency, promote low-carbon investments, and meet stakeholder expectations • **Contributing to promoting the introduction of renewable energy equipment such as solar power generation**
Aica Kogyo	Material	Shadow Price	**8,750-16,250yen**	Unable to confirm	• Targets Scope1, 2 • **Introduced an ICP system for in-house capital investment to promote the introduction of equipment that contributes to CO2 reduction.** • **Prices are set using IEA's carbon price forecast for the 1.5°C target scenario for developed countries**
Asahi Kasei	Material	Shadow Price	**15,000yen**	Unable to confirm	• Targets Scope1, 2 • **Introducing ICP to change internal behavior, promote energy efficiency, promote low-carbon investments, and identify and utilize low-carbon opportunities**

Source: CDP responses from each company (2023), Science Based Targets website (as of the end of January 2024)

Material Sector（2/6）

Company	Sector	ICP Type	Set price (tCO2)	SBT Certified	Detail
Ube Corporation	Material	Shadow Price	**10,000yen**	Targets Set	• Targets Scope1, 2 • Introducing ICP to change internal behavior, promote energy efficiency, and promote low-carbon investments • **Investment evaluation taking carbon pricing into account for capital investment projects with an annual increase or decrease of 1,000 tCO2 or more**
Kao		Shadow Price	**21,000yen**	Targets Set	• Target Scope1 • Introducing ICP to change internal behavior, promote energy efficiency, promote low-carbon investments, identify and utilize low-carbon opportunities, guide GHG regulations, meet stakeholder expectations, and reduce supply chain emissions • **Used for investment decisions such as energy saving equipment, low CO2 equipment, renewable energy procurement, etc.** • **Set CO2 reduction targets for Scope 1 and 2 and raised ICP to 168 USD**
Kuraray		Shadow Price	**10,000yen**	Unable to confirm	• Targets Scope1, 2 • Introducing ICP to change internal behavior, promote energy efficiency, promote low-carbon investments, and meet stakeholder expectations • **ICP is applied to the expected increase/decrease in GHG emissions for each capital investment project and converted into cost, which is used as one of the investment decision criteria**
Resonac Holdings		Shadow Price	**10,000yen**	Unable to confirm	• Targets Scope1, 2 • Introducing ICP to change internal behavior and promote low-carbon investments • We have set a goal to reduce Scope 1 and 2 emissions by 30% in 2030 (compared to 2013) and **use this goal to make investment decisions such as the introduction of energy-saving equipment at each business' factory**

Source: CDP responses from each company (2023), Science Based Targets website (as of the end of January 2024)

Material Sector（3/6）

Company	Sector	ICP Type	Set price (tCO2)	SBT Certified	Detail
Sumitomo Osaka Cement	Material	Shadow Price	**5,000yen**	Unable to confirm	• Targets Scope1, 2 • Introducing ICP to change internal behavior, promote low-carbon investments • **Use as a reference for investment decisions in capital investment plans that involve increases and decreases in CO2 emissions**
Sumitomo Chemical		Shadow Price	**10,000yen**	Targets Set	• Targets Scope1, 2 • Introducing ICP to change internal behavior, promote energy efficiency, and promote low-carbon investments • **Promoting GHG emission reduction investment and energy saving investment towards achieving SBT, ICP has been established to be considered as an economic asset when making all new capital investments, promoting energy saving investment and fuel conversion**
Sumitomo Metal Mining		Shadow Price	**20,000yen**	Unable to confirm	• Targets Scope1, 2 • Introducing ICP to change internal behavior and promote energy efficiency. • **Considers ICP pricing when making capital investments related to energy saving and CO2 emission reduction**
Taiheiyo Cement		Shadow Price	**5,000yen**	Unable to confirm	• Targets Scope1, 2 • Introducing ICP to promote low-carbon investments • **ICP is used to quantitatively understand the economic effects of CO2 reduction and promote effective capital investment in efforts to achieve carbon neutrality**
Nippon Sanso Holdings		Shadow Price	**4,500yen**	Unable to confirm	• Targets Scope1, 2 • **The introduction of ICP has also led to improved environmental awareness in each business division and group company, and we are promoting updates to highly efficient equipment**

Source: CDP responses from each company (2023), Science Based Targets website (as of the end of January 2024)

Material Sector（4/6）

Company	Sector	ICP Type	Set price (tCO2)	SBT Certified	Detail
Teijin	Material	Shadow Price	**14,000yen**	Targets Set	• **Targets Scope1, 2, 3 (upstream)** • Introducing ICP to change internal behavior and promote low-carbon. • We have set a goal of achieving Net-Zero across all our business sites by FY2050 and a 30% reduction compared to FY2018 by FY2030 • **ICP is utilized to support capital investment plans that incorporate the risk of future carbon price increases and contribute to reducing CO2 emissions from your company**
Denka		Internal Fee	**2,000yen**	Unable to confirm	• Targets Scope1, 2 • Introducing ICP to change internal behavior, promote energy efficiency, promote low-carbon investments • **Introduced ICP in 2008 to raise environmental awareness and CO2 pricing within the company** • **Setting ICP prices with reference to the European Emissions Trading System and utilizing them in investment decisions**
Tokyo Steel Manufacturing		Shadow price	**9,293yen (63USD*1)**	Committed (within 2 years)	• Targets Scope1, 2 • Introducing ICP to change internal behavior, promote energy efficiency, promote low-carbon investments, and identify and utilize low-carbon opportunities • **Applied in 4 of the factories in Japan. Expected reduction in greenhouse gas emissions associated with the capital investment is multiplied by ICP to convert it into a monetary amount and calculate the effect. It is used as an indicator for making decisions regarding capital investment**
Tosoh		Shadow Price	**6,000yen**	Unable to confirm	• Targets Scope1, 2 • Introducing ICP to change internal behavior and promote low-carbon investments • **When evaluating the economic efficiency (payback period) of energy-saving equipment investment, the amount calculated by multiplying ICP by the amount of reduction will be considered as investment recovery funds**

Source: CDP responses from each company (2023), Science Based Targets website (as of the end of January 2024)
*1：1 dollar = 147.50yen (using exchange rate as of the end of January 2024)

Material Sector（5/6）

Company	Sector	ICP Type	Set price (tCO2)	SBT Certified	Detail
Toray Industries		Shadow Price	**4,000yen**	Unable to confirm	• Targets Scope1, 2 • Introducing ICP to promote energy efficiency and promote low-carbon investments • **ICP is applied to promote energy saving and low carbon activities in all Toray Group business areas**
Tokuyama	Material	Internal Fee	**10,000yen**	Committed (within 2 years)	• Target Scope1 • Introducing ICP to promote low-carbon investments • **ICP is used to promote energy conservation and determine investment in non-fossil fuels for private power generation equipment.** • **To increase effectiveness of ICP, current level was increased from 3,700 yen/ton-CO2 to 10,000 yen/ton-CO2 in FY22**
Nitto Denko		Shadow Price	**10,000yen**	Unable to confirm	• Target Scope1 • Introducing ICP to promote low-carbon investments • **An incentive of 10,000 yen/tCO2 will be given when calculating the return on investment**
Nissan Chemical		Shadow Price	**6,000yen**	Unable to confirm	• Targets Scope1, 2 • Introducing ICP to change internal behavior, promote energy efficiency, promote low-carbon investments, guide GHG regulations, and meet stakeholder expectations • **ICP is used to calculate operating income for each business division, taking into consideration criteria for capital investment and GHG emission costs**
Nippon Sheet Glass		Shadow Price	**14,400yen**	Targets Set	• **Targets Scope1,2,3** • Introducing ICP to change internal behavior, promote energy efficiency, promote low-carbon investments, identify and utilize low-carbon opportunities, guide GHG regulations, and meet stakeholder expectations • **ICP will be reviewed twice in 2022 and validated based on the latest carbon price forecasts by external analysts**
Mitsui Chemicals		Implicit Price	**15,000yen**	Unable to confirm	• Targets Scope1, 2 • Introducing ICP to promote energy efficiency, promote low-carbon investments, and identify and utilize low-carbon opportunities • **ICP is used for performance evaluation and investment decision criteria**

Source: CDP responses from each company (2023), Science Based Targets website (as of the end of January 2024)

Case studies of companies introducing ICP

Material Sector（6/6）, Power generation Sector（1/2）

Company	Sector	ICP Type	Set price (tCO2)	SBT Certified	Detail
Mtsubishi Gas Chemical	Material	Shadow Price	**10,000yen**	Unable to confirm	• Targets Scope1, 2 • Introducing ICP to change internal behavior, promote energy efficiency, promote low-carbon investments, identify and utilize low-carbon opportunities, and guide GHG regulations • **Considers annual carbon price and utilizes for equipment investment decisions**
Mitsubishi Paper Mills		Implicit Price	**記載なし**	Unable to confirm	• Targets Scope1, 2 • Introducing ICP to change internal behavior, promote energy efficiency, promote low-carbon investments, and identify and utilize low-carbon opportunities • **Uses ICP as reference information when comparing investment decisions to promote low carbon**
Lion		Implicit Price	**6,100yen**	Targets Set	• Targets Scope1, 2 • Introducing ICP to change internal behavior, promote energy efficiency, and promote low-carbon investments • **Considers ICP when investing in equipment, technology development, and introducing renewable energy**
Kansai Electric Power	Power generation	Shadow Price	**1,381yen**	Unable to confirm	• **Targets Scope1, 3 (upstream)** • Introducing ICP to guide GHG regulations, meet stakeholder expectations, change internal behavior, promote energy efficiency, promote low-carbon investments, stress test investments, and identify and utilize low-carbon opportunities • **ICP is mainly used to evaluate power generation equipment investment**
Kyushu Electric Power		Shadow Price	**1,400-2,900yen**	Targets Set	• **Targets Scope1, 3 (upstream)** • **Established ICP as part of internal investment standards to further promote renewable energy business that contributes to improving the group's corporate value**

Source: CDP responses from each company (2023), Science Based Targets website (as of the end of January 2024)

Power generation Sector（2/2）

Company	Sector	ICP Type	Set price (tCO2)	SBT Certified	Detail
Chugoku Electric Power	Power generation	Shadow Price	**435yen**	Unable to confirm	• Target Scope1 • Introducing ICP to promote energy efficiency. • **ICP is applied when bidding for thermal power generation. Regarding bidding, price evaluations will be conducted based on the "Guidelines for Bidding for New Thermal Power Generation", considering the cost of CO2 countermeasures**
Chubu Electric Power		Shadow Price	**5,000-16,000yen**	Unable to confirm	• **Targets Scope1, 3 (upstream)** • Introducing ICP to conduct stress-test investments • **Amount set based on WEO STEPS scenario and APS scenario**
Electric Power Development (J-POWER)		Shadow Price	**4,800-10,800yen**	Unable to confirm	• Target Scope1 • Introducing ICP to change internal behavior and promote low-carbon investments • **ICP is used for investment in new power generation projects, re-evaluating economic efficiency, and considering target costs when developing low-carbon technologies**
Tokyo Electric Power		Shadow Price	**300-25,000yen**	Unable to confirm	• **Targets Scope1,2,3** • Introducing ICP to promote low-carbon investments and identify and utilize low-carbon opportunities • **Utilize ICP in business decisions such as investment and procurement**
Tohoku Electric Power		Shadow Price	**1,333-2,888yen**	Unable to confirm	• Target Scope1 • Introducing ICP to promote energy efficiency, promote low-carbon investments • **Considering the CO2 emission factor and ICP of a power plant in assessing the risks and opportunities associated with an investment in the power plant**

Source: CDP responses from each company (2023), Science Based Targets website (as of the end of January 2024)

Case studies of companies introducing ICP

Retail Sector, Service Sector（1/5）

Company	Sector	ICP Type	Set price (tCO2)	SBT Certified	Detail
Sojitz	Retail	Shadow Price	**1,836-34,000yen**	Unable to confirm	• **Targets Scope1, 3** • Introducing ICP to conduct stress-test investments and meet stakeholder expectations • **Scenario analysis based on the IPCC's 1.5°C scenario incorporates costs that assume a rise in carbon prices and examines future business plans and strategies**
Toyota Tsusho		Internal Fee	**30,000yen**	Committed (within 2 years)	• Targets Scope1, 2 • Introducing ICP to change internal behavior, promote energy efficiency, promote low-carbon investments, and identify and utilize low-carbon opportunities
Marui Group		Implicit Price	**29,525yen**	Targets Set	• Target Scope2 • Introducing ICP to change internal behavior, promote low-carbon investments, and identify and utilize low-carbon opportunities • **When selecting electric power company to supply electricity in stores and facilities with high GHG emission composition, ICP is used to consider not only costs but also GHG reductions, including renewable energy procurement**
Mitsubishi Corporation		Shadow Price	**62.2-435yen**	Unable to confirm	• Targets Scope1, 2 • Introducing ICP to change internal behavior, promote energy efficiency, promote low-carbon investments, identify and utilize low-carbon opportunities, guide GHG regulations, meet stakeholder expectations, and conduct stress-test investments
MS&AD Insurance Group Holdings	Service	Implicit Price	**10,000yen**	Removed[*1]	• Target Scope2 • **ICP is used as a basis for decision-making when confirming and comparing additional costs associated with renewable energy contracts, investments in energy-saving equipment such as high-efficiency appliances and LED lighting, and purchasing hybrid, electric, and hydrogen vehicles**
NTT DATA		Shadow Price	**6,500yen**	Targets Set	• Target Scope2 • Introducing ICP to change internal behavior, promote energy efficiency, promote low-carbon investments, identify and utilize low-carbon opportunities, and meet stakeholder expectations • **ICP will be introduced in stages, first considering operation when updating data center air conditioning equipment**

Source: CDP responses from each company (2023), Science Based Targets website (as of the end of January 2024)
*1：If a goal is not submitted within 24 months of commitment, the goal will be classified as "deleted" on the dashboard.

Service Sector（2/5）

Company	Sector	ICP Type	Set price (tCO2)	SBT Certified	Detail
Sompo Holdings	Service	Internal Fee	**1,100yen**	Committed (within 2 years)	• Targets Scope1, 2 • **Utilizing ICP for investment decisions in LED and CO2 reduction equipment** • Prices are set based on external prices from the Tokyo Cap-and-Trade Scheme
Askul		Implicit Price	**8,500yen**	Targets Set	• **Targets Scope1, 2, 3 (upstream)** • **When making environmental investments such as energy-saving equipment in logistics centers such as lighting and air conditioning, the price calculated by multiplying the expected CO2 reduction by the installation of equipment by ICP is presented as a reference value, promoting environmental investment in equipment**
ORIX Corporation		Shadow Price	**15,000yen**	Unable to confirm	• Targets Scope1, 2 • **Estimating the impact of ICP on each risk and opportunity in the 1.5℃ scenario**
ORIX JREIT		Internal Fee	**13,650yen**	Unable to confirm	• **Targets Scope1, 2, 3 (downstream)** • **Used to calculate future carbon tax burden in scenario analysis**
Secom		Shadow Price	**10,000yen**	Targets Set	• Targets Scope1, 2 • Introducing ICP to promote energy efficiency, promote low-carbon investments, and identify and utilize low-carbon opportunities • **The difference between the expected future carbon tax amount based on the group's overall GHG emissions and the cost required for future carbon-zero measures is used as one of the criteria for implementation decisions**

Source: CDP responses from each company (2023), Science Based Targets website (as of the end of January 2024)

Case studies of companies introducing ICP

Service Sector（3/5）

Company	Sector	ICP Type	Set price (tCO2)	SBT Certified	Detail
Softbank	Service	Shadow Price	**12,000-20,000yen**	Targets Set	• Targets Scope1, 2 • **Introducing ICP to visualize potential costs of carbon tax and promote decarbonization plans**
Dai-ichi Life Holdings		Other	**3,000yen**	Unable to confirm	• Targets Scope1, 2 • **Analyze the impact of carbon taxes on investee companies and reflect the results in internal investment and loan rankings to make investment decisions**
Dai Nippon Printing		Shadow Price	**3,000yen**	Targets Set	• Targets Scope1, 2 • **Introducing ICP with the aim of encouraging investment in equipment with high energy-saving performance and CO2 reduction effects**
Daiwa Securities Group		Shadow Price	**3,278yen**	Unable to confirm	• Target Scope2 • **Use ICP to determine the appropriateness of additional costs for introducing renewable energy**
Daiwa House REIT Investment		Shadow Price	**10,000yen**	Targets Set	• **Targets Scope1, 2, 3 (downstream)** • **As an incentive for low-carbon promotion construction, if it is possible to calculate the GHG emissions that are expected to be reduced by implementing construction such as switching to LED lighting or updating air conditioning, the conversion amount using ICP will be taken into consideration when making construction decisions** • **As a guideline for investment decision-making, income and expenses are calculated based on the converted amount by applying ICP to the GHG emissions of the target property and are used as a reference for investment decisions** • **By selecting suppliers with low emissions, they aim to reduce the risk of increased procurement costs when a carbon tax is introduced in the future**

Source: CDP responses from each company (2023), Science Based Targets website (as of the end of January 2024)

Service Sector（4/5）

Company	Sector	ICP Type	Set price (tCO2)	SBT Certified	Detail
Tokyu Land Corporation	Service	Shadow Price	**5,000yen**	Targets Set	• **Targets Scope1, 2, 3 (downstream)** • Introducing ICP to change internal behavior, promote low-carbon investments, identify and utilize low-carbon opportunities, guide GHG regulations, meet stakeholder expectations, and reduce supply chain emissions • **ICP is used to improve internal environmental awareness, implementing specific reduction measures, and identify high-carbon businesses during business selection**
Tokio Marine Holdings		Shadow Price	**1,500-3,000yen**	Removed*1	• Targets Scope1, 2 • Introducing ICP to change internal behavior, promote energy efficiency, guide GHG regulations, and meet stakeholder expectations • **Utilizing ICP in the management decision-making process to comply with the Tokyo Cap-and-Trade Program and promote energy conservation and emissions reduction activities**
TOPPAN Holdings		Shadow Price	**17,358yen**	Targets Set	• Targets Scope1, 2 • Introducing ICP to change internal behavior, promote energy efficiency, and promote low-carbon investments • **Applicable to investment in energy-saving equipment and renewable energy equipment to reduce energy consumption**
NEC		Shadow Price	**3,000yen**	Targets Set	• Targets Scope1, 2 • Introducing ICP to promote energy efficiency and promote low-carbon investments • **Integrating ICP into spend evaluations for facility upgrades including energy efficient solutions**
Nomura Research Institute		Internal Fee	**4,000yen**	Targets Set	• Target Scope2 • Introducing ICP to change internal behavior and identify and utilize low-carbon opportunities • **To allocate to carbon regulations in the data center business and secure funds for future renewable energy expansion, business headquarters that utilize data centers will be charged a fee equivalent to the difference between carbon energy and renewable energy**

Source: CDP responses from each company (2023), Science Based Targets website (as of the end of January 2024)
*1 : If a goal is not submitted within 24 months of commitment, the goal will be classified as "deleted" on the dashboard.

Case studies of companies introducing ICP

Service Sector（5/5）

Company	Sector	ICP Type	Set price (tCO2)	SBT Certified	Detail
Nomura Holdings	Service	Shadow Price	**6,000-8,000yen**	Unable to confirm	• Target Scope2 • Introducing ICP to change internal behavior and promote energy efficiency • **Utilizing ICP for decision-making in switching electricity consumption to renewable energy**
Fujitsu		Internal Fee	**4,000yen**	Targets Set	• Targets Scope1, 2 • **ICP is used to promote decision-making processes for lower carbonization in capital investment and operations**
Mitsubishi UFJ Financial Group		Shadow Price	**4,400yen**	Unable to confirm	• **Targets Scope3 (downstream)** • **ICP is used when making sustainable investments at banks**
LINE Yahoo		Shadow Price	**289-10,125yen**	Unable to confirm	• Targets Scope1, 2 • **ICP is used to estimate the financial impact of dealing with transition risks such as introducing a carbon tax based on CO2 emissions and stricter regulations and penalties**
Resona Holdings		Implicit Price	**10,000-16,000yen**	Unable to confirm	• Target Scope2 • **Utilizing ICP to compare the cost increase associated with the introduction of renewable energy into the electricity used**

Source: CDP responses from each company (2023), Science Based Targets website (as of the end of January 2024)

Transportation Service Sector（1/2）

Company	Sector	ICP Type	Set price (tCO2)	SBT Certified	Detail
ANA Holdings	Transportation Service	Shadow Price	**5,200-13,000yen**	Targets Set	• Target Scope1 • **Investing in SAF is one of the main measures to achieve emission reductions, and the price of CO2 credits is referenced in making investment decisions** • **Prices are set in the range of 40-100 euros based on EU-ETS prices**
Kawasaki Kisen Kaisha		Shadow Price	**7,000yen**	Targets Set	• Target Scope1 • **Refer to the ICP when evaluating investment proposals for energy saving and environmental conservation of ships and make investment decisions considering expected reduction in CO2 emissions and the profitability of the project**
Mitsui O.S.K. Lines		Implicit Price	**7,150-19,250yen**	Unable to confirm	• Targets Scope1, 2 • Introducing ICP to change internal behavior, promote energy efficiency, promote low-carbon investments, identify and utilize low-carbon opportunities, guide GHG regulations, and meet stakeholder expectations • **The IEA published carbon price assumption is used as the ICP price. In accordance with the IEA time axis, approximately $65/ton-CO2 is adopted from 2025 to 2039, and approximately $175/ton-CO2 from 2040 onwards**
West Japan Railway		Internal Fee	**5,000yen**	Unable to confirm	• Targets Scope1, 2 • **Consider ICP in economic calculations when making decisions on capital investments that have CO2 emission reduction as the main purpose or main side effect, such as energy-saving capital investment**
Nippon Yusen		Shadow Price	**9,600-11,200yen**	Targets Set	• Target Scope1 • **Anticipating future introduction of fuel charges and emissions trading for international shipping, the impact of GHG emissions will be used as an investment indicator to promote investment toward decarbonization**

Source: CDP responses from each company (2023), Science Based Targets website (as of the end of January 2024)

Transportation Service Sector（2/2）

Company	Sector	ICP Type	Set price (tCO2)	SBT Certified	Detail
Japan Airlines	Transportation Service	Shadow Price	**15,000yen**	Committed (within 2 years)	• Targets Scope1, 2 • Introducing ICP to promote low-carbon investments and identify and utilize low-carbon opportunities • **In response to ICAO CORSIA, CO2 price estimates are applied to investment decisions on SAF (alternative aviation fuel) and utilized for investment decisions**
East Japan Railway		Shadow Price	**200-1,100yen**	Committed (within 2 years)	• Targets Scope1, 2 • **Determining investment plan considering cost-effectiveness of CO2 reduction based on the credit price of Tokyo's cap-and-trade system (ETS)**

Source: CDP responses from each company (2023), Science Based Targets website (as of the end of January 2024)

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Main Part

Appendix

This chapter includes a summary of the Nature Disclosure Practice Project and materials on the results reported by the recipient companies at the results debriefing session.

Outline

- The following pages provide an overview of the FY2024 Nature-related Financial Information Disclosure Support Model Project (commonly referred to as the Nature Disclosure Practice Project) conducted by the Ministry of the Environment of Japan, and the results of the companies supported by the project.

Purpose and Background of the Project

- Since the publication of the TNFD Disclosure Proposal in September 2023, the number of companies supporting the proposal has been steadily increasing, and the number of companies that actually disclose information has been increasing. On the other hand, many companies still face challenges in disclosing information on nature, as it is necessary to incorporate unique perspectives such as “dependence,” “impact,” and “impact assessment based on regional characteristics” into the analysis.
- In light of this situation, this project aims to improve the quality and expand the quantity of TNFD disclosure in Japan by providing support for “scenario analysis” and “goal setting” in corporate disclosure of information on nature, and by widely disclosing the results.

Objectives of the Project

- This project aims to improve the quality and expand the quantity of disclosures made by the Task Force on Nature-related Financial Disclosures (TNFD) and other organizations in Japan by providing support for “scenario analysis” and “goal setting” in corporate disclosure of nature-related information, and by making the results widely available to the public.

Details of Implementation

Among the information disclosures in line with the TNFD disclosure recommendations, we provided support for (1) scenario analysis and (2) target setting, especially for nature-related issues faced by Japanese companies. (*For details, see 3-4. TNFD Scenario Analysis and 3-5.)

Support period

June 2024 - January 2025

Companies to be supported

(1) Scenario analysis: Takenaka Corporation, KDDI Corporation
(2) Goal setting: TOPPAN Holdings Inc.

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