TOKUYAMA

2024.4.1 – 2025.3.31

TOKUYAMA TCFD REPORT 2025

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Issued by Carbon Neutral Strategy Div. and Corporate Sustainability Div. Tokuyama Corporation on July 31, 2025

2024.4.1 – 2025.3.31

Tokuyama Group expressed its support for the TCFD recommendations in 2021 and has since been enhancing its climate-related disclosures. In this third release of our TCFD Report for fiscal 2024, we have further strengthened our analysis of climate-related risks and opportunities and disclosed our plans to reduce GHG emissions from in-house power generation facilities. In line with the four governance elements recommended by the IFRS Sustainability Standards Board of Japan (SSBJ), we present our Group's initiatives to address climate change.

Introduction

Under the Tokuyama Vision—our Mission, Vision, and Values, which states, "*To create a bright future in harmony with the environment, in collaboration with its customers, based on chemistry*"—the Tokuyama Group established the "*Tokuyama Group Sustainability Basic Principles*," consisting of eight key items, in April 2023. These principles aim to promote the Group's sustainable growth and enhance corporate value over the medium to long term. Guided by this vision and the basic principles, we are committed to minimizing the environmental impact of our business activities while creating new value in harmony with the environment by providing products that help solve social challenges.

Figure 1: Tokuyama Vision

Slogan: **"For the People of Tomorrow"**

Mission	To create a bright future in harmony with the environment, in collaboration with its customers, based on chemistry
Vision	▶Be a value-creative company that places first priority on R&D and marketing ▶Be a company that never stops challenging new domains while refining and exploiting its unique strengths ▶Be a company with healthy employees who have healthy families and take pride in their work at their company ▶Be a company that fosters bonds with people in communities and societies worldwide
Values	▶Commitment to customer satisfaction as a profit source ▶A broader, loftier perspective ▶Employees who consistently surpass their predecessors ▶Integrity, perseverance, a playful spirit and boldness

Figure 2: Tokuyama Group Sustainability Principles

Tokuyama Group Sustainability Principles

Tokuyama's mission is "To create a bright future in harmony with the environment, in collaboration with its customers, based on chemistry." In order to fulfill this mission, we have established the following principles on the promotion of sustainability.

1. We ensure that all of our business activities help solve social issues and contribute to a sustainable future.
2. We respect human rights, individuality, and diversity, and we strive to deliver job satisfaction for our employees and business partners by implementing human resources development and health management.
3. We practice thorough compliance and conduct transparent business activities in good faith.
4. We always give top priority to safety, and we work hard to prevent accidents and ensure occupational health and safety.
5. We operate in harmony with the global environment by striving to combat global warming and protect biodiversity.
6. We deliver products and services that meet the needs of customers and consumers and provide them with peace of mind.
7. We contribute to local communities by acting as a good corporate citizen in the countries and regions in which we operate.
8. We maintain good communication with all of our diverse stakeholders.

Established April 1, 2023

Governance

Tokuyama Group has identified climate change as one of its most significant management risks. Accordingly, contributing to global warming mitigation is one of the key objectives under its current Medium-Term Management Plan, which began in FY 2021.

Two months after announcing our support for the TCFD recommendations in February 2021, April 2021, we established Carbon Neutral Strategy Dept. directly under the president . With the transition from the concept phase to the implementation phase, Tokuyama has now accelerated its efforts by establishing Carbon Neutral Strategy Div., which has the status of an independent division.

In April 2025, the Corporate Social Responsibility Div. was renamed the Corporate Sustainability Div. to reflect a broader and more comprehensive concept of sustainability. Governance and risk management are handled jointly by the Corporate Planning Dept. and the Sustainability Promotion Dept.; environmental data collection and analysis are managed by the Responsible Care Management Dept.; information disclosure is overseen by the Corporate Communications & Investor Relations Dept.; and legal risk management is the responsibility of the Legal Dept.

Figure 3: Medium-Term Management Plan [FY2021 to FY2025]

1. Transform business portfolio	Increase growth businesses' share of consolidated net sales to over 50%
2. Contribute to mitigation of global warming	Expedite development/commercialization of next-gen energy technologies; reduce GHG* emissions by 30%** by FY2030
3. Practice socially responsible management	Step up high-priority CSR initiatives to lay groundwork for further growth and realize our vision

* GHG: Greenhouse Gas
** Base year FY2019

Figure 4: Organizations in charge of climate change risk management

a. Board's oversight of climate-related risks and opportunities

Sustainability governance

The Board of Directors recognizes that addressing sustainability-related issues is not only a matter of risk reduction but also an important management issue that can lead to new opportunities. From the perspective of enhancing long-term corporate value, the Tokuyama Group has established the "Tokuyama Group Basic Sustainability Principles" and is actively and proactively addressing these issues.

Important policies and plans related to sustainability are either resolved or reported to the Board of Directors, which provides guidance and oversight.

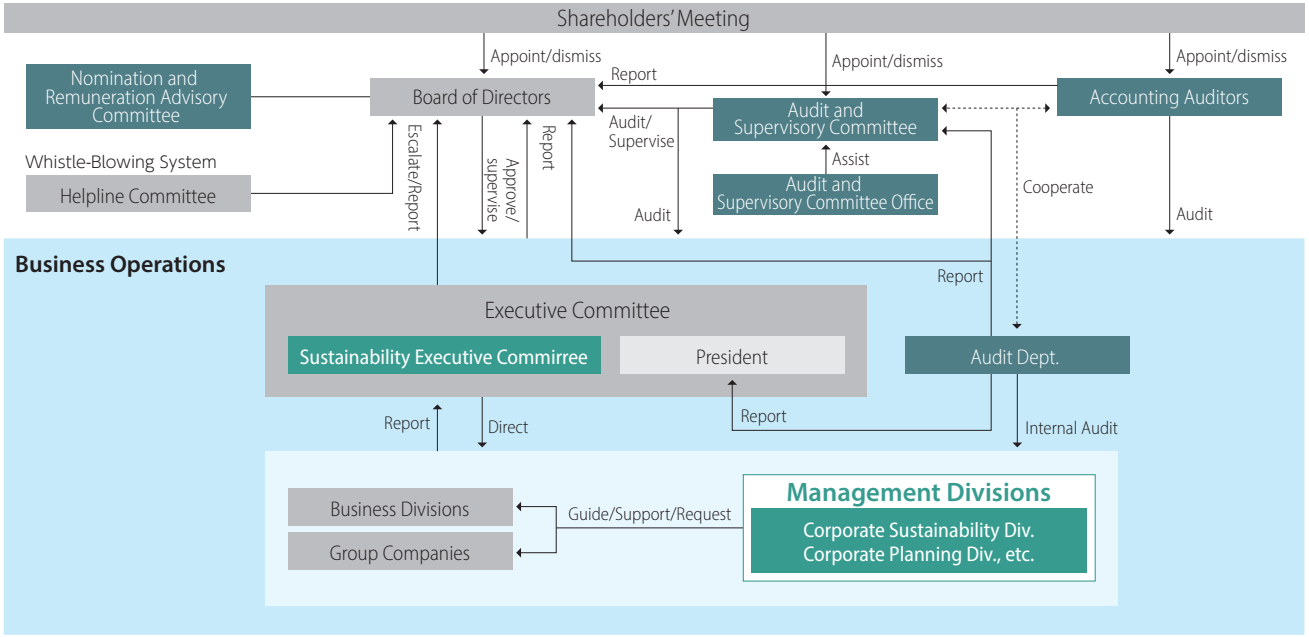
The CSR Promotion Council met in fiscal 2024 to determine sustainability-related policies and goals and to facilitate smooth implementation of activities. The council, held in principle once a year, is chaired by the President and Executive Officer, includes all executive officers as members, and allows attendance by Audit and Supervisory Committee members including outside directors. The council discussed key matters including the promotion of appropriate corporate governance and the risks and opportunities associated with sustainability issues.

Organizational reform from FY2025 onward

Starting in April 2025, to further promote sustainability management and to implement internal controls effectively and efficiently, the company restructured the former CSR Promotion Council into the newly established Sustainability Executive Committee. This committee is chaired by the President and Executive Officer, with all Executive Officers serving as members. Additionally, Audit and Supervisory Committee members including Outside Directors, are permitted to attend.

Figure 5: Corporate governance structure

As of April 1, 2025



Under the policies determined by the Board of Directors, the Sustainability Executive Committee deliberates and makes decisions on company-wide sustainability issues, including the formulation and approval of sustainability plans and the monitoring of their execution. The committee also addresses critical matters related to internal controls and discusses and determines key sustainability-related disclosure items. To address areas of high specialization and importance from the perspectives of sustainability and internal control, the committee has established several Expert Committees. These cover the following domains:

- Compliance
- Financial Reporting
- Fair Trade and Competition
- Security Trade
- Information Security
- Safety and Environment
- Product Safety and Quality Assurance

Each Expert Committee is chaired by the Director responsible for the respective areas (see Figure 9 on page 26: Committees Responsible for Risk Oversight).

To ensure agile decision-making, the Sustainability Executive Committee convenes regularly once a year and additionally as needed. The implementation of sustainability initiatives is subject to scheduled audits conducted by the Audit Dept., with the results reported to the President and the Board of Directors.

Board oversight of climate-related issues

Climate change is recognized as an urgent issue for our company. Positioned as one of the priority issues under our Medium-Term Management Plan 2025, we are actively advancing initiatives under the leadership and responsibility of the President and CEO, with a focus on contributing to the prevention of global warming.

Matters related to climate change are discussed by the Executive Committee, which then adopts resolutions as necessary. Such matters include corporate policies for addressing climate change, the formulation of medium and long-term strategies to achieve those policies, and the selection of investment projects, etc. The resolutions are then reported to the Board of Directors. Additionally, decisions on matters of particularly high importance are taken by the Board of Directors after deliberation by the Executive Committee.

Table 1: Process and frequency for reporting and approval of climate-related matters by directors

Approval Process	FY2024 Results	Notes
Board of Directors	18 *	● Receives reports on and oversees CSR matters, including climate change activities ● Receives reports on and oversees matters that can help achieve key measures under the Medium-Term Management Plan
CSR Promotion Council	1	● The president chairs the council, which reports to the Board of Directors on its meetings and the activities of the council's eight subcommittees
Sustainability Committee	2	● Established in FY2022, the Sustainability Committee permits Group directors to attend its meetings as observers ● Summary reports are provided to the Board of Directors
Environment Committee	1	● This committee oversees onsite environmental audits conducted across the Group, and monitors the energy-saving activities of individual Group sites
Executive briefing of Carbon Neutral Strategy Div.	5	● Reporting progress on key issues

*Regarding the Board of Directors, in addition to the above, there were two written resolutions that were deemed to have been Board of Directors resolutions.

Table 2: Process and frequency for receiving reports, and monitoring mechanism by managements

Reporting Process	Meeting Frequency (Number of meetings in FY2024)	Monitoring Mechanism
Executive Committee	Twice a month in principle (28) *	With "Contribute to mitigation of global warning" set as a priority issue under the Medium-Term Management Plan 2025, the committee deliberates on the strategic planning and capital investment needed to mitigate climate change risks
CSR Promotion Council	Annually (1)**	Chaired by President; Oversees materiality progress and specialized committees (Risk & Compliance, Environment, Safety)
Sustainability Committee	Semiannually (2)	Chaired by the director responsible for CSR, the committee directs the Group's CSR initiatives including climate change
TCFD Task Force	As necessary (2)	Positioned under the Sustainability Committee, the task force assembles its members from across the Group to investigate and promote practical initiatives that meet the TCFD recommendations
Environment Committee	Annually (1)	The committee provides general oversight of the environmental audits conducted at each production facility, receives energy conservation activity reports, and sets environmental targets for the next fiscal year
Top executives' interview with Carbon Neutral Strategy Div.	Monthly (12)	Responsible for investigating and implementing measures

* Regarding the Executive Committee, in addition to the above, there were two written resolutions that was deemed to have been an Executive Committee resolution.
** CSR Promotion Council reorganized into Sustainability Executive Committee from FY2025

b. Management's role in assessing and managing climate-related risks and opportunities

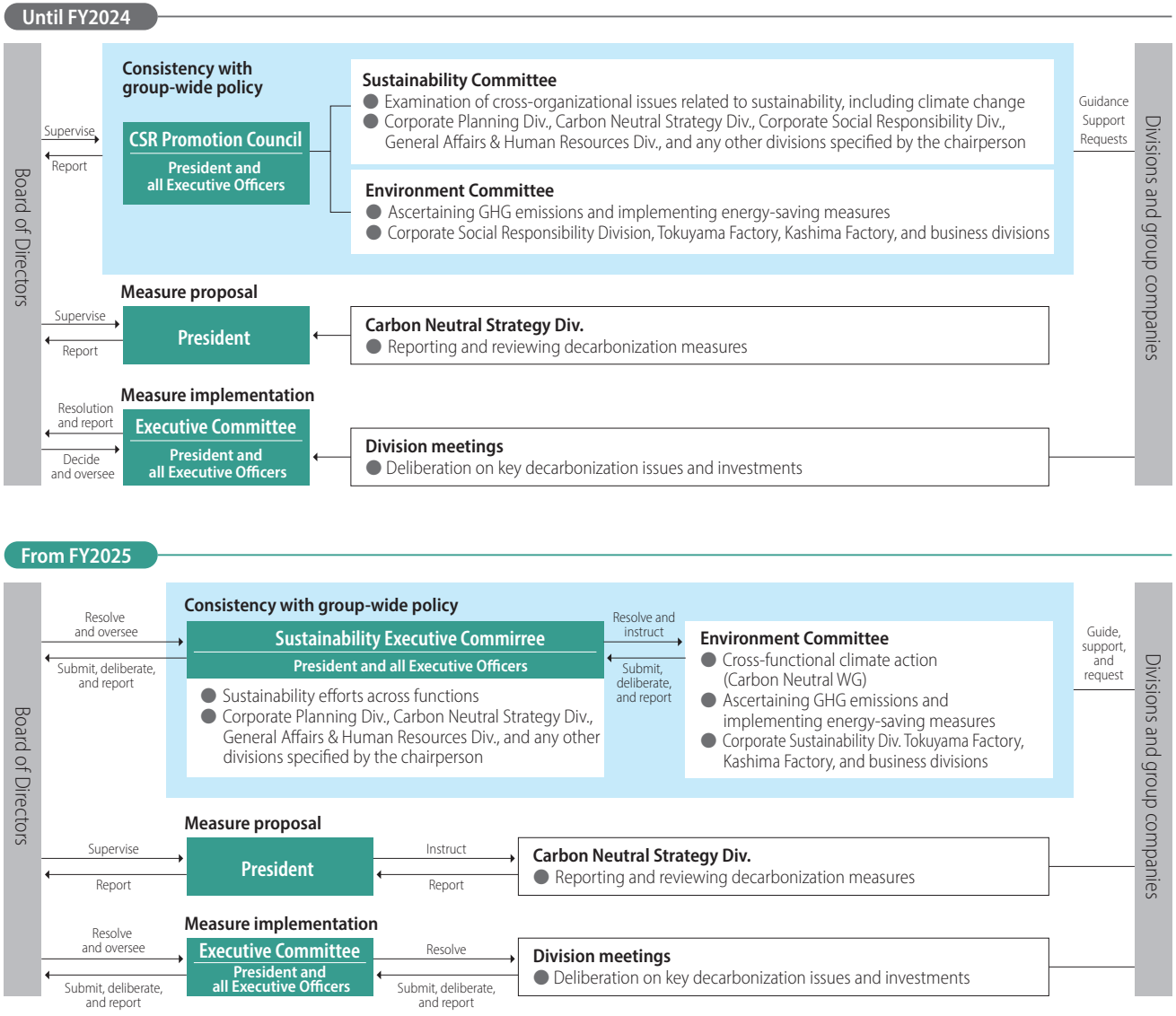
In FY2024, climate-related initiatives were carried out through the CSR Promotion Council and its subordinate bodies: the Sustainability Committee (meets twice annually in principle) and the Environmental Committee (meets once annually in principle). Each committee analyzed climate-related risks and opportunities that may impact on the Group's business operations and implemented appropriate responses.

The reporting process to management and the actual reporting activities in FY2024 are summarized in Table 2 on page 5. In addition to actions taken through the Management Committee and CSR Promotion Council, the company also monitored the latest developments and regulatory changes related to climate change, ensuring readiness for prompt response.

From FY2025 onward, the CSR Promotion Council and Sustainability committee have been reorganized into the Sustainability Executive Committee, which will convene once annually with a primary focus on reporting. Additionally, climate-related matters raised as needed will be addressed within the "Sustainability Section" of the Executive Committee, which meets twice monthly. This structure enables comprehensive oversight and evaluation of risks and opportunities.

Investment-related initiatives will continue to be deliberated and reviewed within the Executive Committee, as in previous years.

Figure 6: System for promoting carbon neutrality achievement



Strategy

In formulating the Medium-Term Management Plan 2025, we considered both climate-related risks—such as increased carbon costs due to the introduction of internal carbon pricing, changes in customer procurement policies, and potential impacts on financing stemming from shifts in financial and investment institutions' policies—and new business opportunities, particularly in the environmental domain. To assess the time horizon, financial impact, and priority level of these factors more concretely, we conducted scenario analyses based on transition risk scenarios such as the IEA's Net Zero Emissions (NZE) scenarios, and physical risk scenarios including the IPCC's RCP8.5 and SSP3-7.0. These analyses were performed along a timeline extending from the present to 2050, focusing on both 1.5°C and 4°C scenarios. Through the strategy of Transform Business Portfolio—from energy-intensive operations to value-creating businesses—we aim to mitigate climate-related risks while capitalizing on promising business opportunities.

a. Climate-related risks and opportunities the company has identified over the short, medium, and long term, taking into consideration different climate-related scenarios, including a 2°C or lower scenario

In FY2021, we began analyzing the risks and opportunities that the Group faces due to climate change. In FY2022, we evaluated the potential financial impacts on the Group of those risks and opportunities, the potential timing of their occurrence, the impact on business, and the priorities for addressing these risks and opportunities. Based on these results, we began examining and implementing specific measures from FY2023. Details of the risks are presented in Table 3.

Table 3: Risks posed by climate change (scenario analysis)

Scenario	Risk category	Target of risk assessment	Potential impacts on the Group (financial) (identified risks)	Financial impact	Timing of risk materialization	Impact on business	Priority level	Response measures
1.5°C	Government policy and regulations	1. Carbon pricing and energy procurement costs	● Increase in operating costs due to expanded carbon pricing	Large	Medium to long term	Large	High	● Initiatives to reduce GHG emissions through fuel conversion (biomass and ammonia) ● Promoting GHG emission reduction measures by adopting internal carbon pricing ● Enhancing initiatives to help promote green transformation by participating in the GX League
			● Increase in mitigation measure costs due to tightening of GHG emission regulations	Large	Medium to long term	Large	High	
	Technology	2. Green process adoption measures	● Rising production and procurement costs due to green transition	Large	Medium term	Large	High	● Studying ammonia supply chain establishment at the Shunan industrial complex ● Ensuring stable procurement of certified biomass fuel by building relationships with suppliers ● Development of black pellets ● Calculation of carbon footprints of product (CFP) ● Value proposition of green products
			● Increased costs for green material procurement and green process conversion due to lack of technology and market maturity	Large	Medium to long term	Large	High	
	Evaluation	3. Evaluation by stakeholders	● Decline in market value and increase in financing costs due to a poor evaluation of carbon neutrality initiatives ● Risk of litigation by local residents to shut down or decommission coal-fired power plants owned by Tokuyama ● Sustainability risks for biomass fuel	Large	Medium to long term	Large	High	● Improving information disclosure and steadily working to reduce GHG emissions ● Dialogue with the local community ● Business portfolio transformation ● Certified biomass fuel procurement
	Market	4. Penetration of green procurement by customers	● Rejection of products by the market based on large carbon footprint evaluation ● Decrease in profitability due to the inability to pass on the price fully cover costs for green process adoption	Large	Medium to long term	Large	High	● Steadily reducing GHG emissions through energy conservation and fuel conversion, etc. ● Studying mass balance certification ● Enhancing supply chain cooperation to form a green market ● CFP evaluation system creation
		5. Lost opportunities due to a failure to keep up with green market expansion	● Lost opportunities due to the delay in establishing a green supply chain ● Lost opportunities due to insufficient efforts for entering the circular economy and the carbon recycling field	Large	Medium to long term	Large	High	● Prompt implementation of measures
4°C	Physical risks (acute)	6. More frequent extreme weather events and sea level rise	● Wind and flood damage to production facilities; production plan delay and increased costs due to supply chain disruptions, etc.	Moderate	Long term	Moderate	Moderate	● Enhancing business continuity planning
	Physical risks (chronic)	7. Long-term intensification of extreme weather events and rising sea levels	● Decrease in production capacity due to insufficient factory cooling capacity caused by rising average temperatures ● Production halts due to storm surges caused by rising sea levels	Minimal	Long term	Minimal	Low	● Maintaining capacity through equipment modifications, etc.

Short term: by FY2025; medium term: by FY2030; long term: by FY2050

Government policy and regulations

1. Carbon pricing and energy procurement costs

Impact on Tokuyama Group

Increase in operating costs due to expanded carbon pricing (medium to long term)

Tokuyama uses coal mainly for in-house power plants. We paid approximately 1.8 billion yen in environmental taxes (Japan's petroleum and coal tax, and carbon tax) in FY2024, which is equivalent to approximately 6.0% of operating income.

Under the Japanese government's "Growth-Oriented Carbon Pricing Concept," an emissions trading system is scheduled to be fully implemented from FY2026, and a carbon levy is planned to be introduced from FY2028, with gradual increases thereafter. As the details of these schemes are yet to be finalized, it is currently difficult to estimate the precise financial impact.

However, assuming a hypothetical carbon price of ¥10,000 per ton of CO_2 applied to fuel-derived GHG emissions and given that the company's fuel-derived emissions in FY2024 totaled approximately 3.1 million tons of CO_2, the estimated annual financial burden would be around ¥31 billion. If fossil fuel consumption cannot be significantly reduced, a financial impact in the range of ¥30 billion per year is anticipated.

Increase in mitigation measure costs due to tightening of GHG emission regulations (medium to long term)

In April 2023, Japan implemented the Revised Act on Rationalizing Energy Use. Under this law, in addition to conventional promotion of energy conservation, requirements for conversion to non-fossil energy have been established. Guidelines for quantitative targets to be achieved by FY2030 have also been implemented for industries with substantial emissions.

Tokuyama has set the following targets based on established objectives.

- **Cement production**: Achieve a non-fossil fuel ratio of 50% in co-firing processes
- **Chemical industry (soda industry)**: Reduce coal consumption by 45% compared to FY2019

While there are no penalties for failure to achieve targets, if the performance of an organization is found to be significantly inadequate, recommendations and/or announcements will be made after considering the level of the relevant technology and the situation for non-fossil energy supply.

In FY2024, our performance results included a 22% achievement in cement production and 12% achievement in the soda industry.

We aim to reduce GHG emissions from our in-house power generation by 50% by FY2030 compared to FY2019, through a shift to non-fossil fuels such as biomass and ammonia.

We plan to invest in facility upgrades about 11 billion yen for biomass co-firing, which will reduce GHG emissions by 30%, and 15 billion yen for ammonia co-firing, which will reduce emissions by 20%.

Government policy and regulations

1. Carbon pricing and energy procurement costs

Response measures

Initiatives to reduce GHG emissions through fuel conversion (biomass and ammonia)

The Group needs to steadily reduce its GHG emissions to mitigate the risk of increased manufacturing costs due to carbon pricing.

Tokuyama is aiming to achieve a 50% reduction in GHG emissions from in-house power plants compared to FY2019 by 2030, and it plans to switch to non-fossil fuels (biomass and ammonia) for in-house power plants. Starting in FY2023, we began gradually increasing the co-firing ratio of biomass. In FY2024, we initiated facility modifications to enable co-firing of wood pellets, with full-scale co-firing scheduled to begin in autumn 2025. Regarding ammonia, we commenced feasibility studies in FY2023 with the aim of starting co-firing by FY2030. These studies have been supported by the following government programs:

FY2023: Subsidy from the Agency for Natural Resources and Energy under the "FY2023 Program for Advancing Petroleum Supply Structure (Transition Promotion Project for Stable Supply of Next-Generation Fuels)"

FY2024: Subsidy under the "FY2024 Program for Promoting Introduction of Non-Fossil Energy (Hydrogen Supply Infrastructure Development Project)"

To mitigate the cost burden of GHG emissions reduction, we plan to utilize subsidies and consider passing costs on through product pricing.

Promoting GHG emission reduction measures by adopting internal carbon pricing

In order to promote GHG emission reduction measures, Tokuyama has added internal carbon pricing (ICP) to its evaluation criteria for investment projects (10,000 yen/t-CO_2). This will promote energy conservation activities in the short and medium term, and we are working to reduce coal use by co-firing with biomass or ammonia at power plants. For the ongoing biomass co-firing investment (scheduled to begin in FY2025), we have used investment effectiveness estimates that incorporate internal carbon pricing as a reference.

Enhancing initiatives to help promote green transformation by participating in the GX League

Since FY2023, the company has been a participant in the GX League, and in FY2024, we joined Phase 1 of the emissions trading scheme. In FY2024, we successfully achieved our voluntary targets for both Scope 1 and Scope 2 emissions (see p.34 for details on the GX League).

We remain committed to working proactively on Green Transformation (GX), including transparent disclosure of our progress. We also leverage insights from other participating companies within the GX League to enhance the effectiveness of our emissions reduction strategies. Furthermore, we are actively promoting green value creation through frameworks such as the GX Leadership Declaration.

Technology

2. Green process adoption measures

Impact on Tokuyama Group

Rising production and procurement costs due to green transition (medium term)

Tokuyama has four coal-fired power plants, one of which is a circulating fluidized bed boiler that can also operate on biomass exclusively. In FY2023, we began to increase the biomass co-firing ratio for that plant. In FY 2024, we reduced the amount of coal used for in-house power generation facilitiy by 310,000 tons compared to FY2019. On the other hand, the remaining three boilers are pulverized coal-fired boilers, and capital investment will be required to convert them to biomass or ammonia use. In FY2024, we began facility modifications on one pulverized coal-fired boiler to enable co-firing with wood pellets. The co-firing is scheduled to begin in autumn 2025. We plan to invest in facility upgrades about 11 billion yen for biomass co-firing, which will reduce GHG emissions by 30%, and 15 billion yen for ammonia co-firing, which will reduce emissions by 20%. In addition, we anticipate increased costs associated with the procurement of biomass and ammonia fuels.

Increased costs for green material procurement and green process conversion costs due to the lack of technology and market maturity (medium to long term)

In order to achieve carbon neutrality, not only does energy input need to be green, but also raw materials and production processes. Many of these processes are still being developed, as relevant markets and technologies are yet to be established. Since many green technologies and markets are still immature, there is a risk of increased costs.

Technology

2. Green process adoption measures

Response measures

Investigation of ammonia supply chain establishment at the Shunan industrial complex

Building a large-scale supply chain is essential for reducing the cost of green energy. To procure biomass fuel, the Group installed equipment for handling wood pellets at the Port of Tokuyama. We are making efforts to efficiently unload biomass fuel, which we will need more of going forward.

To obtain ammonia, we are working with relevant companies to build an ammonia supply chain in the Shunan Industrial Complex.

Ensuring stable procurement of certified biomass fuel by building relationships with suppliers / Development of black pellets

Due to the global transition to decarbonization, there will likely be a tight supply situation for internationally certified biomass fuels, going forward. Until now, we have used palm kernel shells (PKS) as fuel in our power plants. Thanks to the good relationships we have built with our suppliers over the years, we have been able to secure certified products from an early date and have increased our biomass fuel usage.

We have been developing semi-carbonized biomass (black pellets) since FY2023. A pilot plant for pellet production is under construction at Tokuyama Factory, with completion scheduled for October 2025. In line with our 2025 Policy on Sustainable Forests, we aim to increase the types of usable biomass fuels and secure cost-effective and stable procurement.

Calculation of carbon footprint of product

We believe that properly calculating GHG emissions per product unit is the first step toward product decarbonization. Since FY2023, we have been calculating carbon footprint of product (CFP) based on a company-specific methodology aligned with relevant standards and guidelines, using a Cradle-to-Gate approach. These calculations are used to respond to customer requests.

Going forward, we will continue to refine our internal rules and consider introducing third-party verification, considering updates to guidelines and evolving customer expectations, to ensure better CFP assessments and disclosures.

*NOTE: Cradle-to-Gate refers to the assessment of environmental impacts of a product's life cycle from raw material extraction to the point of product shipment from the manufacturing facility.

Promoting the value of green products

We are actively working to communicate the value of low-carbon and green products, recognizing their importance in achieving carbon neutrality.

Achieving both carbon neutrality and economic growth requires decarbonization across the entire supply chain. For this to happen, low-carbon products must be properly valued in the market and see growing demand. In alignment with national GX strategies such as the GX Leadership Declaration, we are committed to promoting the value of green products and accelerating initiatives that support the transition to a decarbonized economy.

Evaluation

3. Evaluation by stakeholders

Impact on Tokuyama Group

Decline in market value and increase in financing costs due to a poor evaluation of carbon neutrality initiatives (medium to long term)

Our stock price could suffer if investors see the ownership of coal-fired power plants as a high risk. Moreover, we could be charged higher interest rates on our borrowing if we are evaluated as a high-risk company, and our financing costs would then increase.

Risk of litigation by local residents to shut down or decommission coal-fired power plants owned by Tokuyama (medium to long term)

In Japan, lawsuits have been filed against constructions of coal-fired power plants by local residents, and there have been cases where such construction plans have been cancelled. As Tokuyama owns four coal-fired power plants, we could be sued to shut down or decommission these facilities if our efforts to reduce coal consumption are seen as insufficient.

Sustainability risks of biomass fuels (medium to long term)

The use of palm kernel shells (PKS) as fuel, which our company also utilizes, carries certain risks associated with the expansion of biomass fuel procurement. These include concerns over deforestation and labor issues within the palm oil industry.

Response measures

Improving information disclosure and steadily working to reduce GHG emissions

With the ultimate goal of achieving carbon neutrality by FY2050, Tokuyama Corporation and its consolidated manufacturing subsidiaries are working to reduce Scope 1 and 2 GHG emissions by 30% by the end of FY2030, compared to FY2019. We are also calculating and disclosing these emissions in accordance with the GHG Protocol. For Scope 3 emissions, Tokuyama and its consolidated manufacturing subsidiaries have set a goal of reducing GHG emissions by 10% by FY2030, compared to FY2022.

In addition, we actively disclose climate-related information in line with the Task Force on Climate-related Financial Disclosures (TCFD) / IFRS Sustainability Disclosure Standards framework, ensuring that stakeholders have access to the information they need.

Evaluation

3. Evaluation by stakeholders

Response measures

Dialogue with the local community

In FY2024, the company actively engaged in regional dialogue and supported public outreach efforts, including sponsorship of the symposium titled "Carbon Neutrality for the Future from Shunan." At the RC Yamaguchi East District Regional Dialogue held on November 15, 2024, the theme was "Toward an Environmentally Friendly Society — Addressing Climate Change." Representatives from the prefecture and participating companies presented their initiatives to local residents.

At the Tokuyama Factory Regional Dialogue held on February 27, 2025, the theme was "Turning Household Waste into Cement — Realizing a Circular Society and Tackling Climate Change." Presentations were made by the prefecture, city, Tokuyama Factory, and Yamaguchi Eco-tech Corporation, followed by a factory tour (cement production and Eco-tech facilities) and an exchange of opinions.

The symposium, hosted by the Shunan Industrial Complex Decarbonization Promotion Council and sponsored by the company, featured lectures and a panel discussion involving high school students, aimed at raising awareness of carbon neutrality among Shunan citizens (March 15, 2025).

The Group will continue building good stakeholder relationships by including local residents in its environmental initiatives and by actively participating in community activities.

Business portfolio transformation

As part of the key initiatives under the Medium-Term Management Plan 2025, the company is promoting a strategic transformation of its business portfolio. Major initiatives in FY2024 include:

- Suspension of one cement kiln production line
- Establishment of TOKUYAMA VIETNAM CO., LTD., a manufacturing and sales subsidiary for polycrystalline silicon for semiconductors
- Launch of operations at a new production building for Tokuyama Dental

Procurement of certified biomass fuel

As the Group is increasing its use of biomass co-firing to reduce GHG emissions, it is important that we ensure sustainability by procuring biomass fuel that meets the level of certification required by the Japanese government's renewable energy feed-in tariff system. Starting in FY2024, we have adopted Green Gold Label certified palm kernel shells (PKS) for our internal power production. We are also promoting CSR procurement, which is one of our key CSR issues (materialities), while working to minimize risks by trying to source from regions with low sustainability risks.

Market

4. Penetration of green procurement by customers

Impact on Tokuyama Group

Rejection of products by the market based on large carbon footprint evaluation (medium to long term)

In recent years, the rules for calculating the carbon footprint of product (CFP) over their life cycle continue to be refined. Since Tokuyama emits a large amount of greenhouse gases, customers may require us to disclose our CFP and set reduction targets for each product. If we fail to achieve these targets, sales of our products could be affected. In particular, sales to customers who are actively working to combat global warming could very well decrease.

Deterioration of profits due to an inability to recover green initiative costs by raising prices (medium to long term)

Tokuyama is investigating fuel conversion and green power procurement to reduce GHG emissions from fuels-derived, but we also assume that energy costs will rise going forward. Therefore, we need to assume an appropriate green market energy price that takes into account the rising costs associated with fuel conversion. However, there is a risk of lower profit margins if the costs related to green process adoption cannot be passed on through higher product prices.

Market

4. Penetration of green procurement by customers

Response measures

Steadily reducing GHG emissions through energy conservation and fuel conversion, etc.

To ensure that our products remain the choice of our customers and survive in the marketplace, we must meet our GHG emission reduction targets for FY2030.

First, we will further ramp up energy-saving activities to fully eliminate any energy loss. Tokuyama will steadily reduce GHG emissions from fuels-derived by steadily adopting co-firing with biomass and ammonia.

Over the short term, we have promoted energy conservation activities in each manufacturing department as shown below, and reduced coal consumption by co-firing with biomass and hydrogen at the Group's in-house power plants.

・Polycrystalline Silicon: Lower power consumption via process improvements (see p.44)
・Cement: Reduced coal use, increased waste plastic through facility upgrades

In addition, as a major investment contributing to carbon neutrality, the Company plans to invest approximately ¥28.9 billion over the three-year period from fiscal 2025 to 2027.

Creation of green products based on mass balance approach certification

Since Scope 1 emissions from electricity and steam generation cannot be reduced using carbon offset credits, and since the Tokuyama Factory generates all its own power, we need to ensure that all the electricity produced by the factory is green in order for it to make green products. Therefore, the Company is considering the use of mass balance and similar methods to allocate green electricity and steam—generated from biomass fuel and other renewable sources—to specific products.

Enhancing supply chain cooperation for green market formation

While GHG emissions reduction is the responsibility of the emitting businesses, we believe the associated costs should be broadly shared across society. To support the development of a sound green market throughout the supply chain, we are strengthening collaboration through initiatives such as the GX League and direct engagement with suppliers and customers.

Construction of carbon footprint of product evaluation system

In order to make greener products, GHG emissions data needs to be made available for the entire product life cycle, including the calculation method. We established a system for calculating carbon footprint of product based on accepted and proposed standards and guidelines for determining cradle-to-gate GHG emissions, including the upstream supply chain. Going forward, we will continue to improve the reliability of our data, through measures such as system-based calculation and third-party verification.

Market

5. Lost opportunities due to a failure to keep up with green market expansion

Impact on Tokuyama Group

Lost opportunities due to the delay in establishing a green supply chain (medium to long term)

We are currently working to bolster our competitiveness by creating a large-scale green supply chain that includes ammonia in the Shunan industrial complex. We recognize that any delay in this effort to enter the green market could result in lost business opportunities.

Lost opportunities due to insufficient efforts for entering the circular economy and the carbon recycling field (medium to long term)

Carbon recycling involves the capture of carbon from CO_2 emissions for use as a raw material, while the creation of a circular economy promotes waste recycling to mitigate resource procurement risks. Tokuyama is investigating initiatives for these two efforts, as they are expected to be implemented worldwide. We recognize that any delay in this effort could result in lost business opportunities.

Response measures

Prompt implementation of measures

Tokuyama will ensure that it seizes business opportunities by steadily implementing the response measures outlined on pages 19 to 23. Moreover, in 2023, we joined Japan's Circular Partners initiative. It was established to promote organic collaboration among ambitious and pioneering companies, as well as government agencies and academic institutions. The aim is to build a circular economy that maximizes added value while promoting efficient and circular use of resources. We are promoting collaboration with other companies to help build a circular economy.

Physical risks (acute)

6. More frequent extreme weather events and sea level rise

Impact on Tokuyama Group

Wind and flood damage to production facilities; production plan delay and increased costs due to supply chain disruptions, etc. (long term)

Since the Tokuyama Factory is situated in a coastal industrial complex, if extreme weather events (such as heavy rains, lightning strikes, and major typhoons) increase due to the effects of climate change, production could be interrupted due to facility flooding. In the past, large typhoons have not caused sufficient damage to affect operations, but they have caused water and other damage to some equipment. In 2018, when torrential rains caused landslides that damaged the JR Sanyo Main Line, we were forced to shift some transport from rail to truck, which increased transportation costs by 52 million yen.

Since Tokuyama transports most of its raw materials and products by sea, more frequent storms could significantly reduce profitability whenever marine transport is delayed or halted as a result.

Response measures

Enhanced Business Continuity Plan measures

To mitigate the risk of plant shutdown due to natural disasters, the Tokuyama Factory is strengthening its infrastructure. As a measure to protect against storm surges during typhoons, which are deemed to be the greatest threat in terms of natural disasters, the factory constructed a seawall during the period from FY2000 to 2016. Considering the greatest potential wave height estimates for the next 15 and 30 years, the height of the seawall was raised from C.D.L* 4.7 to 5.5 meters. This cost about 300 million yen in total, including materials, transportation, labor, administrative work, and other expenses.

As part of our climate change adaptation efforts, Tokuyama conducted a sensitivity analysis in FY2022 on typhoon paths and intensity, based on Yamaguchi Prefecture standards, to assess potential flooding from storm surges at the Tokuyama Factory. In FY2023, we identified areas at risk by simulating the combined impact of storm surge (overtopping and backflow) and rainfall-induced flooding. Going forward, we will consider countermeasures to prevent flooding in the identified areas.

* C.D.L: The chart datum level indicates the baseline from which water depths are calculated for each port.

Physical risks (chronic)

7. Long-term intensification of extreme weather events and rising sea levels

Impact on Tokuyama Group

Decrease in production capacity due to insufficient factory cooling capacity caused by rising average temperatures (long term)

Situated in a coastal industrial complex in Shunan City, Yamaguchi Prefecture, the Tokuyama Factory contains many manufacturing facilities and produces a wide variety of products. Recirculating water is used to cool the manufacturing equipment. Once this water has captured heat from the manufacturing process, it is cooled by the effects of evaporation in cooling towers, and then recirculated. If equipment cooling capacity decreases due to an increase in average air or water temperatures, there is a risk of a corresponding decrease in production capacity.

Production halts due to storm surges caused by rising sea levels (long term)

As it is located in a coastal industrial complex, the Tokuyama Factory is susceptible to flooding caused by storm surges. If one manufacturing facility within the Tokuyama Factory were to be shut down for 10 days, the estimated losses would be approximately 300 million yen.

Response measures

Maintaining capacity through equipment modifications, etc.

To maintain cooling capacity, current cooling tower capacity will be increased by expanding the evaporation area, increasing the capacity of circulation pumps, and improving the piping design. This will require an investment of at least several hundred million yen.

Table 4 shows climate-related opportunities.

Table 4: Climate change opportunities (scenario analysis)

Scenario	Opportunity Type	Opportunity Assessment Target	Impact on Tokuyama Group	Impact Level	Term	Priority Level	Response Measures
1.5℃	Market	1. Expanding demand in the environmental market	● Expansion of businesses offering waste disposal, effective utilization of resources, and measures to combat global warming	Large	Medium to long term	High	● Commercialization of renewable resources and energy
		2. Shift to carbon neutrality by regions and industrial complexes	● Enhancing site competitiveness by promoting large-scale green supply chains for energy materials	Large	Medium to long term	High	● Green supply chain construction conducted and promoting green technology development through the Shunan Industrial Complex Decarbonization Promotion Council
	Resource use efficiency	3. Demand for products and services to promote carbon utilization	● Entering new business fields by establishing a carbon recycling system	Large	Medium term	High	● Accelerating research and development, feasibility studies, and demonstration experiments, along with implementation in actual operations

Medium term: by FY2030; long term: by FY 2050

Market

1. Expanding demand in the environmental market

Impact on Tokuyama Group

Expansion of businesses offering waste disposal, effective utilization of resources, and measures to combat global warming

Waste recycling is expected to further expand in response to rising environmental awareness and the need to mitigate resource procurement risks heightened by geopolitical factors. While renewable energy use is growing, there is also demand for carbon-neutral thermal power generation in the manufacturing industry, which requires heat for production.

Response measures

Commercialization of renewable resources and energy

While using co-firing with PKS biomass as a measure to reduce coal consumption, the Group is continuing to study the development and commercialization of alternative biomass fuels in order to ensure stable fuel procurement. In December 2023, we decided to build a pilot plant for the development of black pellets, which has the potential to be a new biomass fuel that eliminates various issues with existing biomass fuels. Construction is currently underway, with completion scheduled for October 2025.

In September 2023, group company Tokuyama Chiyoda Gypsum Co., Ltd. (TCG) opened a new recycling plant in Muroran City, Hokkaido, its third such site in Japan. Established in 2011 as a joint venture between Tokuyama and Chiyoda Ute Co., Ltd., TCG operates a waste gypsum board recycling business. It uses the world's first technology for continuous large recrystallization of waste gypsum, a process developed by Tokuyama. In 2013, TCG began operations at the Mie Headquarters Factory, and in 2016, it started operations at the Kanto Plant in Sodegaura City, Chiba Prefecture. Currently, the two plants recycle approximately 100,000 tons of waste gypsum board in total annually. Gypsum board is widely used as a fireproof material for walls and ceilings in residential construction, but the amount of waste from renovations and demolition is increasing each year. There are also growing needs for recycling due to factors such as a shortage of managed landfill sites and a decrease in waste gypsum raw materials due to decarbonization efforts. This technology enables horizontal recycling into gypsum boards, contributing to a resource-circulating society through the promotion of "Circular Board" made entirely from recycled materials.

The Nanporo Industrial Park is located in Nanporo Town, Sorachi District, Hokkaido. In 2019, the Group built an experimental facility there for the development of catalyst-based technology for recycling photovoltaic cell modules. With the aim of helping to make solar power a mainstay electricity source, this project has been adopted by Japan's New Energy and Industrial Technology Development Organization (NEDO) as a project for "technology development relating to solar cell module separation and material recycling." With this technology development, the Group aims to commercialize solar equipment recycling and be ready for the huge expected increase in solar panel disposal in the 2030s. In March 2024, we supplied glass sheets separated from solar panels using this technology to AGC Inc. The company conducted demonstration testing for the recycling float sheet glass, and this became the first successful demonstration of its kind in Japan. We are currently conducting demonstration tests for horizontal recycling of glass and solar cells, aiming to achieve a resource recovery rate of over 95% for steel components in solar panels. In parallel, we are advancing discussions on implementing a circular economy model in Hokkaido, where our research base is located, by building a collection network for end-of-life panels.

Market

2. Shift to carbon neutrality by regions and industrial complexes

Impact on Tokuyama Group

Enhancing site competitiveness by promoting large-scale green supply chains for energy materials

For the Group, the challenge of achieving carbon neutrality all on its own presents a number of difficult problems, such as the need to procure new energy materials on an individual-company basis.

However, if this is viewed as a regional issue and, for example, the entire industrial complex strives to achieve carbon neutrality, it becomes possible to examine and address energy materials issues on a regional basis. Although it will still require high levels of technology development and innovation, if this can be achieved, the region can gain new added value as a "carbon-neutral industrial complex" and become highly competitive.

Response measures

Green supply chain construction conducted and promoting green technology development through the Shunan Industrial Complex Decarbonization Promotion Council

The Shunan Industrial Complex Decarbonization Promotion Council was established in February 2022 with the aim of achieving carbon neutrality at the site while maintaining and strengthening its industrial competitiveness. The Council comprises companies with operations at the Shunan Complex, the city of Shunan, and the Society of Chemical Engineers, Japan. In May 2023, the Council released a grand design and a roadmap for the complex, with targets established through backcasting.

Currently, various themes are being investigated by subcommittees established under this council. Tokuyama and four other companies in the complex requested consultation with the Japan Fair Trade Commission regarding planned joint activities to promote carbon neutrality at the Shunan Complex. In February 2024, the Commission responded that these activities should pose no issues under Japan's Antimonopoly Act, except in cases where they ended up restricting competition, such as cartel behavior when setting product prices. As a result, the Group will accelerate its efforts to help achieve a carbon-neutral industrial park, including discussions on how to create a carbon-free ammonia fuel hub within the Shunan Complex.

Resource use Efficiency

3. Requests for CCU-related products

Impact on Tokuyama Group

Entering new business fields by establishing a carbon recycling system

While carbon pricing is making CO_2 emissions more costly, it also means increasing the value of carbon, in other words. Carbon is indispensable for human life, and the supply of carbon will become ever more restricted due to limitations imposed on the use of fossil resources. Therefore, in the near future, carbon recycling could become an important technology. In other words, any company that emits a lot of CO_2 will also have a source of carbon. Tokuyama has a long history of using soda ash by-products as a raw-material for cement. Applying the power of chemistry to make efficient use of materials that were once considered useless is a challenge that we, as a chemical company, must take on.

Response measures

Accelerating R&D, demonstration projects, and actual green technology adoption in business operations

As part of efforts to establish a carbon recycling system, the Group is conducting demonstration testing for CO_2 capture, as well as feasibility studies concerning the manufacture of valuable materials using the captured CO_2.

For the demonstration testing, CO_2 capture equipment manufactured by Mitsubishi Heavy Industries Engineering, Ltd. (currently Mitsubishi Heavy Industries, Ltd.) was installed at a Group cement plant from 2022 to 2024. It captured CO_2 from the plant's exhaust gases, and the reliability of long-term continuous operation was evaluated. We also analyzed data obtained concerning impurities in the captured CO_2 gas, and verified the feasible application of optimal CO_2 capture technology in cement plants. As a result, we were able to analyze and evaluate the characteristics and trace components of cement kiln exhaust gas, enabling optimal design and equipment layout for future application in commercial-scale plants.

The Group completed its feasibility studies in FY2024 on the commercial viability of methanol production, utilization, and sale. Methanol is expected to become a useful product for building a carbon-neutral society. By leveraging manufacturing technology developed by Mitsubishi Gas Chemical Company, Inc., we could produce methanol using CO_2 captured from the emissions of the Tokuyama Factory. In this process, hydrogen would first be produced using green electricity generated from biomass at the same factory and then reacted with the captured CO_2 to produce methanol.

In March 2024, Tokuyama and eight other members of the Shunan Industrial Complex Decarbonization Council submitted a proposal to NEDO entitled, "Study for the Implementation of a Carbon Recycling Project through Industrial Collaboration at the Shunan Complex." It was subsequently adopted by NEDO as the "Project for the Development of Carbon Recycling Technologies and the Development and Promotion of Next-Generation Thermal Power Generation Technologies / Project for the Implementation of Carbon Recycling Technologies through Industrial Collaboration." With the aim of helping to build a carbon-neutral society through inter-industry collaboration, the Council continues to conduct a feasibility study on a carbon recycling project to lower CO_2 emissions, while taking into account the characteristics of the industrial complex.

b. Impact of climate-related risks and opportunities on the company's businesses, strategy, and financial planning

Using our analysis of opportunities arising from climate change, and after examining business opportunities in the environmental field, we determined more specific details and evaluated the relevant time scope, financial impacts and priorities.

Table 5: Investigation of business opportunities arising from climate change

	Future Events	Business Opportunities	Products and Technology	Term	Financial Impact	Priority Level
Business opportunities in the 1.5°C scenario	Widespread adoption of low-carbon hydrogen	● Sudden increase in demand for water electrolysis equipment ● Expansion of hydrogen demand and distribution	● Water electrolysis equipment ● Expansion of sodium chloride electrolysis equipment ● Hydrogen carrier (magnesium hydride)	Medium to long term	Moderate	High
	Expansion of electrification of mobility	● Expansion of demand for lithium batteries ● Expansion of demand for thermal management materials	● Ion exchange membranes ● Thermal management materials	Short to long term	Moderate	High
	Rapid digitalization	● Expansion of semiconductor demand	● Polycrystalline silicon ● Photoresist developer ● Silica for CMP ● High-purity IPA ● Thermal management materials, etc.	Short term	Large	High
	Spread of energy-saving housing	● Increase in demand for functional insulation material	● Super-insulated, highly-airtight plastic window sashes ● Plaster sheets	Short term	Minimal	Low
	Formation of a closed-loop society	● Increase in demand for recycling of waste material and industrial waste	● Waste gypsum board recycling technology ● Ion exchange membranes ● Effective use of biomass combustion ash (CCUS) ● Development of carbon negative concrete	Short term	Minimal	Moderate
		● Response to large quantities of waste from photovoltaics panels	● Recycling technology for photovoltaics modules	Medium term	Minimal to moderate	Moderate

Short term: by FY2025; medium term: by FY2030; long term: by FY2050

FY2024 Initiatives and Specific Progress **Business opportunities** See pages P.40, P.41, P.42, P.43, P.45, P.46

c. Resilience of strategy

Figure 7 outlines the breakdown of reductions and our multipronged approaches for FY2030 and FY2050 targets.

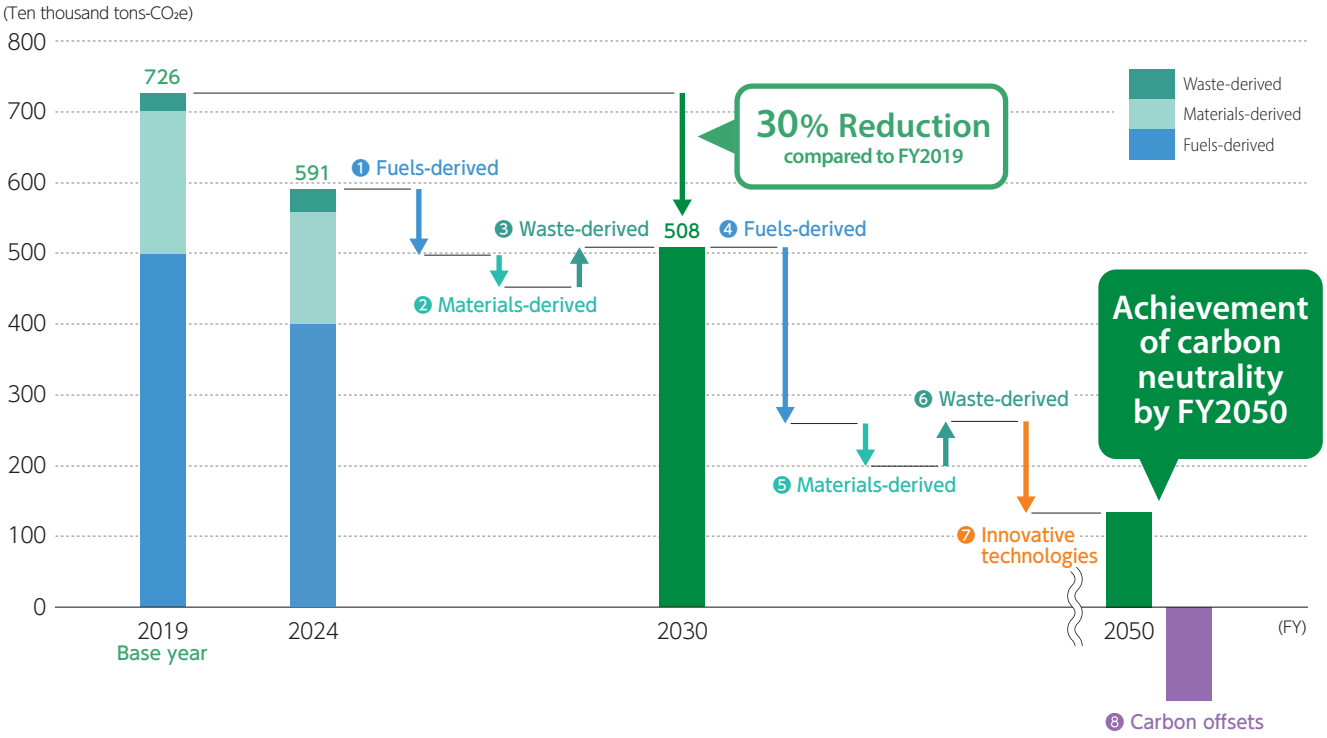
To achieve a 30% reduction in GHG emissions (Scope 1 and 2) by FY2030 from the base year FY2019, we are implementing targeted measures across fuel, raw materials, and waste derived sources. Furthermore, through these measures, we aim to achieve carbon neutrality by FY2050 as our long-term goal. We plan to invest approximately ¥28.9 billion in environmental initiatives over the three years starting in FY2025.

We will reduce GHG emissions from fuels, which accounts for about 70% of our total emissions, by further promoting energy-saving measures. These include measures that have already been implemented while also switching to carbon-neutral fuels such as biomass and ammonia.

We will reduce GHG emissions from raw materials by adapting to the revised Japanese Industrial Standards (JIS), which allow increased use of minor supplementary components in cement, and by advancing technologies for carbon capture and utilization (CCU).

We will continue to consider reducing GHG emissions from fuels and raw materials, taking into account economic efficiency. It is difficult to reduce GHG emissions to zero currently, so the Group will proceed with the development and introduction of CCUS (CO_2 capture, utilization, and storage) technologies.

Figure 7: Medium- to long-term GHG emission reduction targets (Scope 1 and 2)



❶ Co-firing of biomass or ammonia with coal
Increase energy efficiency, improve processes, upgrade equipment
Use of local energy
Business portfolio transformation

❷ Increase in mixed ingredients & Technological development

❸ Energy recovery

❹ Increase biomass and ammonia co-firing ratio → Monofuels
Further use of local energy
Use non-fossil energy
Increase energy efficiency, improve processes, upgrade equipment
Business portfolio transformation
Collaboration with other companies in Shunan Industrial Complex

❺ Calcium recycling
Low GHG-emission cement
Business portfolio transformation

❻ Energy recovery

❼ Conversion to innovative manufacturing methods

❽ Introduction of negative emission technologies (CCS)
Carbon offset

FY2024 Initiatives and Specific Progress

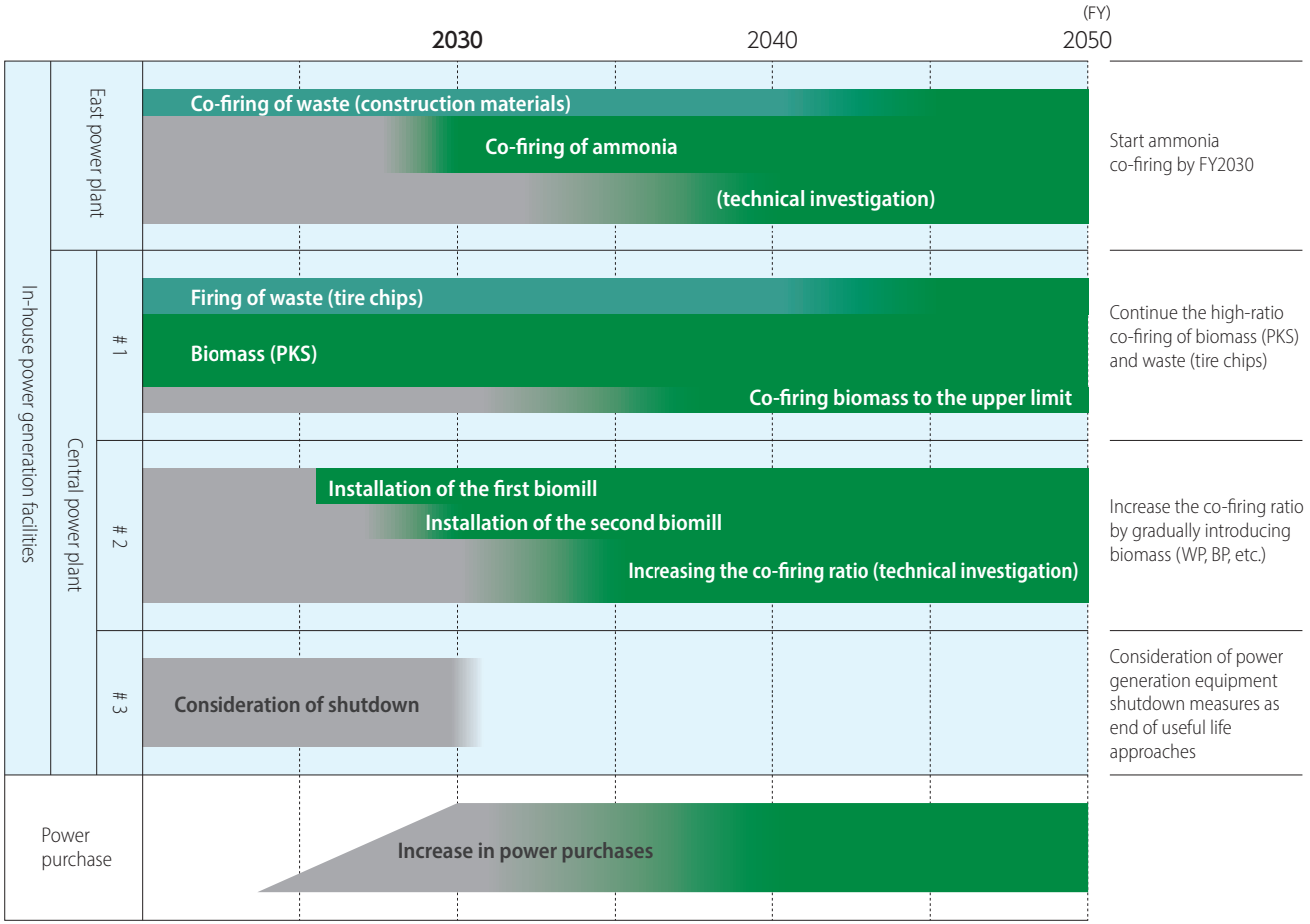
❶❹Reduction of fuels-derived
See pages P.37, P.38, P.44, P.45

❽Carbon offsets
See pages P.37, P.39, P.40, P.41, P.42, P.46

Fuels-derived GHG emissions are highest from in-house power generation facilities at the Tokuyama Factory. We have outlined fuel conversion plans for four power units, as shown in Figure 8. At the East Power Plant, we plan to begin ammonia co-firing by FY2030 in collaboration with other local companies in the industrial complex.

At the Central Power Plant, we are continuing high-ratio co-firing of biomass fuel (PKS) in one unit, while preparing another unit to use biomass fuels such as white pellets, with plans to gradually increase the co-firing ratio starting in FY2025.

Figure 8: Reduction plan for fuels-derived GHG emissions from each power plant



*The above is a plan that is considered reasonable at the present time and does not guarantee the future. *WP: white pellet; BP: black pellet

Risk Management

The Tokuyama Group has established a risk management system to ensure a reliable response to "material risks"—events or factors that may affect the achievement of organizational goals or business continuity, and that could either impair or enhance corporate value. These risks require cross-organizational responses and are managed systematically.

a. Company's processes for identifying and assessing climate-related risks

Company-wide risk management

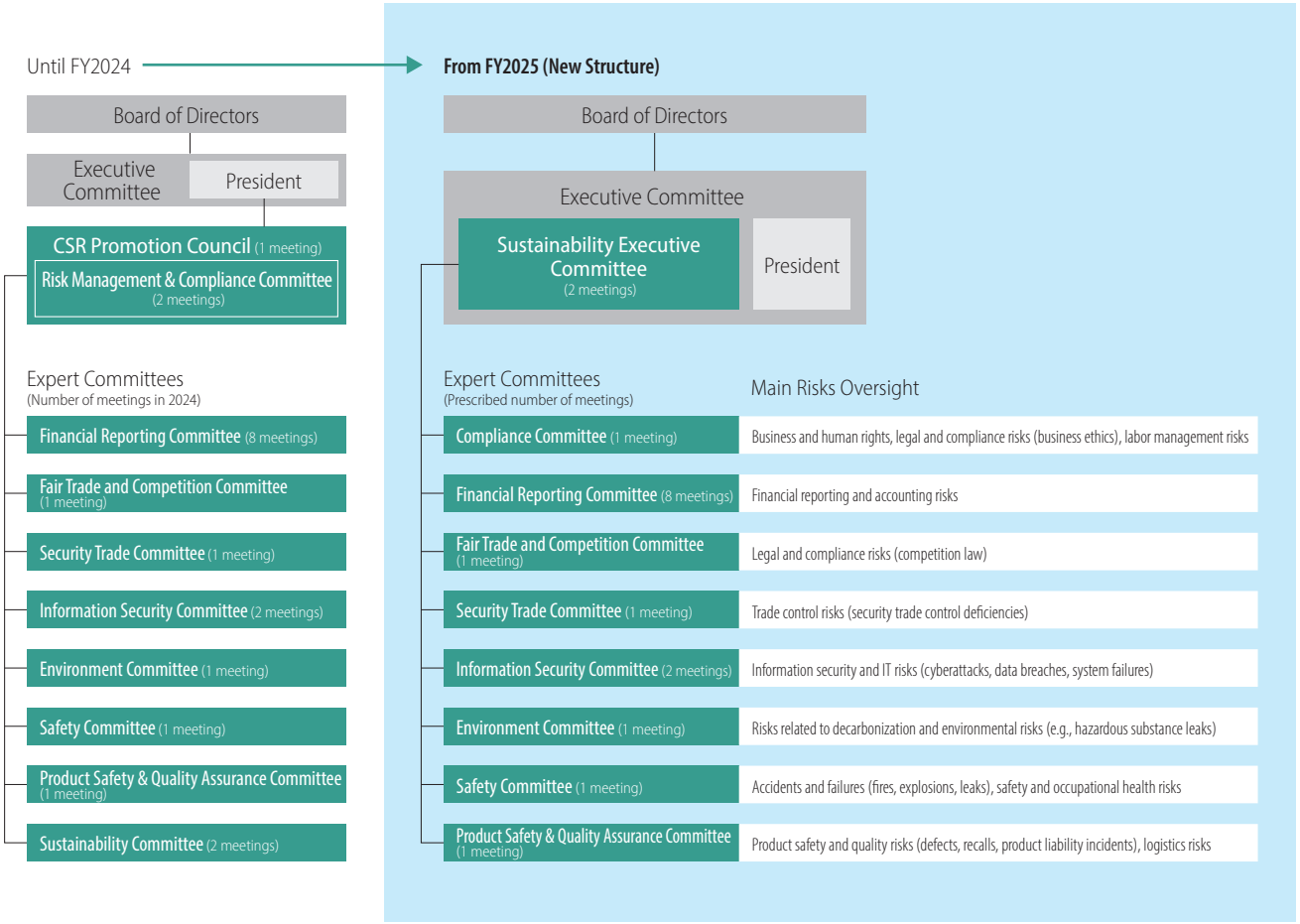
As part of our company-wide risk management framework, which includes sustainability-related risks, we have established the Risk Management and Compliance Committee under the CSR Promotion Council, chaired by the Director in charge of CSR. This committee, which convenes in principle twice a year, serves as a central body for promoting both risk management and compliance—considered the twin pillars of internal control.

In addition, for areas requiring specialized expertise or of high importance, we have established expert committees chaired by the respective responsible directors, separate from the Risk Management and Compliance Committee.

Starting in April 2025, the Risk Management and Compliance Committee was dissolved, and the CSR Promotion Council was reorganized into the Sustainability Executive Committee. This new committee includes all Executive Officers, including the President, and may also be attended by Audit and Supervisory Committee members, including Outside Directors. Sustainability-related risks and opportunities, including those previously discussed by the Risk Management and Compliance Committee, are now deliberated within the Sustainability Executive Committee.

Based on these discussions, instructions or delegation of responsibilities are issued to relevant business divisions and expert committees.

Figure 9: Committees responsible for risk oversight



b. Process for identifying material risks

Figure 11 on page 29 illustrates the process for identifying material risks. The former Risk & Compliance Committee regularly reviewed the positioning of currently recognized material risks based on their likelihood and potential impact, while also discussing the inclusion of new risks. Each material risk was assigned to a relevant expert committee responsible for determining response policies and implementing countermeasures. The CSR Promotion Council oversaw the overall process.

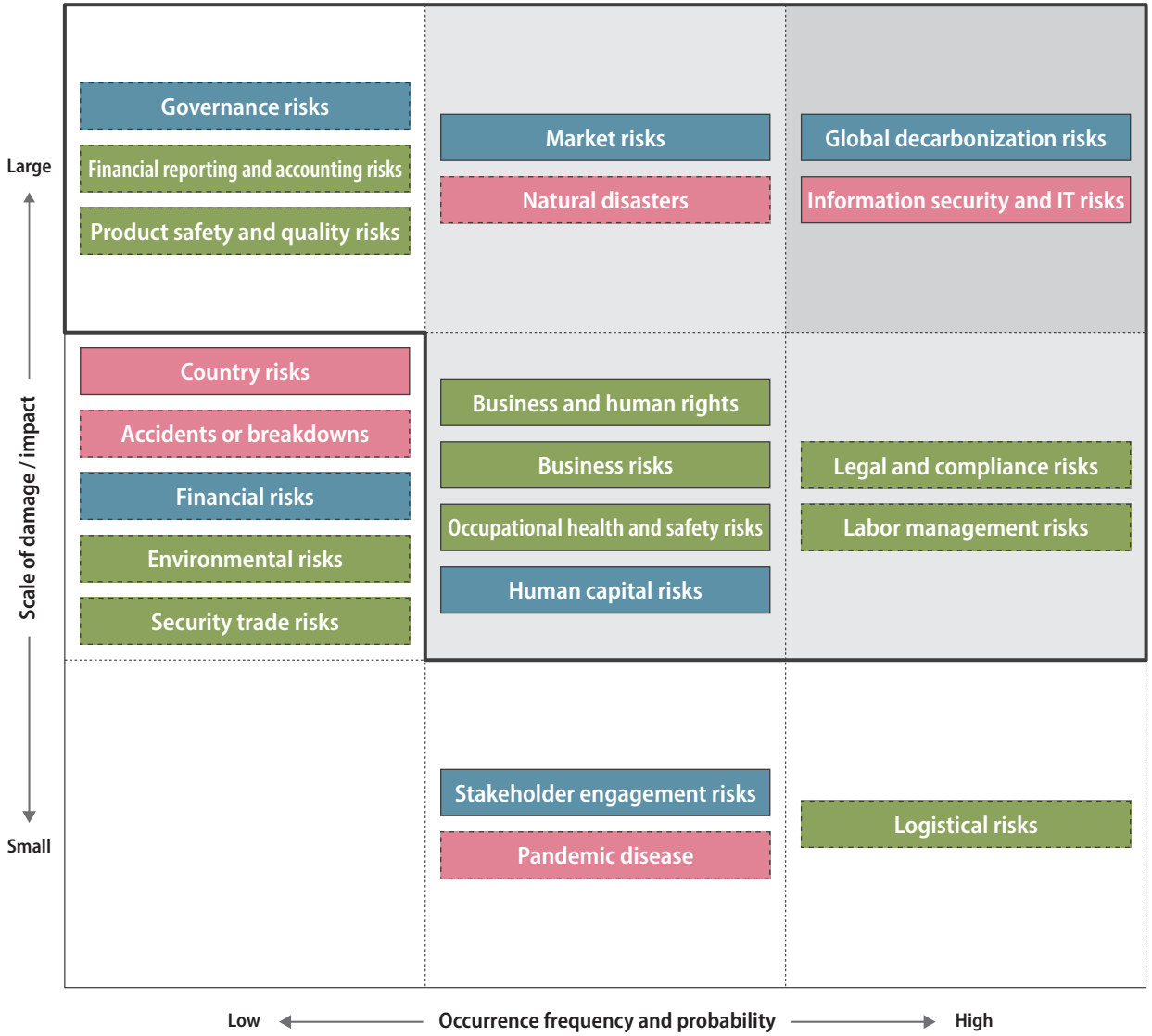
A list of material risks confirmed as of March 2025 is shown in Table 6, and their mapping based on likelihood and impact is presented in Figure 10 on page 28. From April 2025 onward, discussions on material risks are conducted by the newly established Sustainability Executive Committee.

Table 6: List of significant risks (FY2025)

*The chairperson of each committee is a director who is responsible for the relevant risks

Large category	Moderate category	Minimal category	Relevant committee *
Hazard risk (external environment risk) Risks posed by the external environment and potential events	Natural disasters	Earthquake, tsunami, weather-related disaster, abnormal weather event (typhoon, storm surge, heavy rains, etc.)	Sustainability Executive Committee
	Accidents or breakdowns	Fire, explosion, chemical leak, equipment or device damage or failure, utility supply interruption, accident with aircraft, ship or railway	Safety Committee
	Pandemic disease	Widespread outbreak of COVID-19 or another endemic infectious disease	Sustainability Executive Committee
	Country risks	War, conflict, terrorism incident, riot, unlawful political change, or economic crisis	Sustainability Executive Committee
	Information security and IT risks	Cyberattack, virus infection, information leaks, system failure, failure of system facilities/equipment, IT risks	Information Security Committee
Business risk (strategic risk) Risks posed by the quality and accuracy of corporate strategies that affect performance and corporate value	Global decarbonization risks	Carbon pricing and energy costs, green process adoption measures, customer penetration of green procurement, stakeholder assessment, more frequent severe weather in the long term, and lost opportunity of expansion into the green market	Sustainability Executive Committee Environment Committee
	Market risks	Changes in market needs, marketing failures or deficiencies, emergence of new competitors, product development failures or obsolescence, delays in responding to rapid technological innovations, and delays or barriers to overseas expansion, low PBR risks	(Executive Committee)
	Human capital risks	High turnover and difficulty in securing talent, workforce aging, top-heavy human resource pyramid, human resource development and technology transfer, delay in addressing diversity, failure to adopt new work styles, human resource mismatch due to business transitions, inadequacies and delays in disclosing human capital information	(Executive Committee)
	Governance risks	Insufficient succession plans, maintaining governance transparency, inadequacies in reporting line control	(Executive Committee)
	Financial risks	Funding plan or financing failure, paid capital increase, suspension of financial support, interest rate or foreign exchange rate fluctuation risk, and stock price decline	(Executive Committee)
	Stakeholder engagement risks	Media criticism and slander, reputational harm, social media risks, improper information disclosure, corporate value destruction caused by self-serving activists	(Executive Committee)
Operational risk (business process risk) Risks arising from deficiencies in internal processes related to business execution, or from inadequate functions	Occupational health and safety risks	Equipment or machine stoppages or accidents due to operating errors, industrial accidents, and aging equipment or machinery	Safety Committee
	Business risks	Soaring raw material or fuel prices, failed pricing policies, declining price competitiveness, dependence on a small number of suppliers, and dependence on a small number of customers	(Executive Committee)
	Product safety and quality risks	Quality defects, voluntary recalls, product liability incidents due to design defects, manufacturing defects, false labeling, and misrepresentation, violations of domestic and international laws and regulations	Product Safety and Quality Assurance Committee
	Logistical risks	Damage accidents during transportation and storage (including hazardous material spills)	Product Safety and Quality Assurance Committee
	Environmental risks	Release of hazardous pollutants, contamination of soil and groundwater, complaints from local residents regarding noise and odors, illegal dumping and improper disposal of waste, water risks, and biodiversity	Environment Committee
	Security trade risks	Deficiencies in security trade control	Security Trade Committee
	Business and human rights	Human rights violations in supply chains, boycotts, and consumer movements	Compliance Committee
	Financial reporting and accounting risks	Window dressing settlements, inappropriate accounting practices, tax compliance, non-performing loans/bad debts	Financial Reporting Committee
	Legal and compliance risks	Intellectual property rights infringement and violation, invention compensation disputes, antimonopoly law violation, Unfair Competition Prevention Act violation (bribery), improper contract signing, insider trading, inadequate management of licenses and permits, misconduct involving executives or employees, ties to antisocial forces, and intimidation	Fair Trade and Competition Committee Compliance Committee
	Labor management risks	Death from overwork, extended working hours, unlawful overtime, labor conflicts and strikes, human rights violations and discrimination, harassments, mental health concerns, and the safety of expatriates and business travelers	Compliance Committee

Figure 10: Mapping of significant enterprise risks (FY2025)



Definitions of major risk categories

- **Hazard risk (External environment risk)**
  Risks posed by the external environment and potential events
- **Business risk (Strategic risk)**
  Risks posed by the quality and accuracy of corporate strategies that affect performance and corporate value
- **Operational risk (Business process risk)**
  Risks arising from deficiencies in internal processes related to business execution, or from inadequate functions

Definition of scale of damage and impact

Large ↑	Damage that threatens the survival of the company, as well as substantial damage such as loss of assets
Moderate	Significant decrease of profits, or minor loss of assets
Small ↓	Little impact on corporate profits and assets

Definition of occurrence frequency and probability

High →	Occurs more than once a year Will almost certainly occur in the near future
Moderate	Occurs several times a decade
Low ←	Occurs once every decade or more

Definition of vulnerability

High	Mitigation measures have not been implemented or are completely inadequate
Moderate	Some measures have been implemented, but they are still insufficient
Low	Effective measures have been implemented and a management cycle is in place

As shown in Figure 9 (p.26), each expert committee chaired by the responsible director evaluates and determines the appropriate response policy for material risks under its jurisdiction—such as mitigation, avoidance, transfer, or retention. Based on the selected policy, the committee formulates and implements countermeasures and conducts regular reviews, ensuring execution management aligned with the company's risk management system.

Climate change response

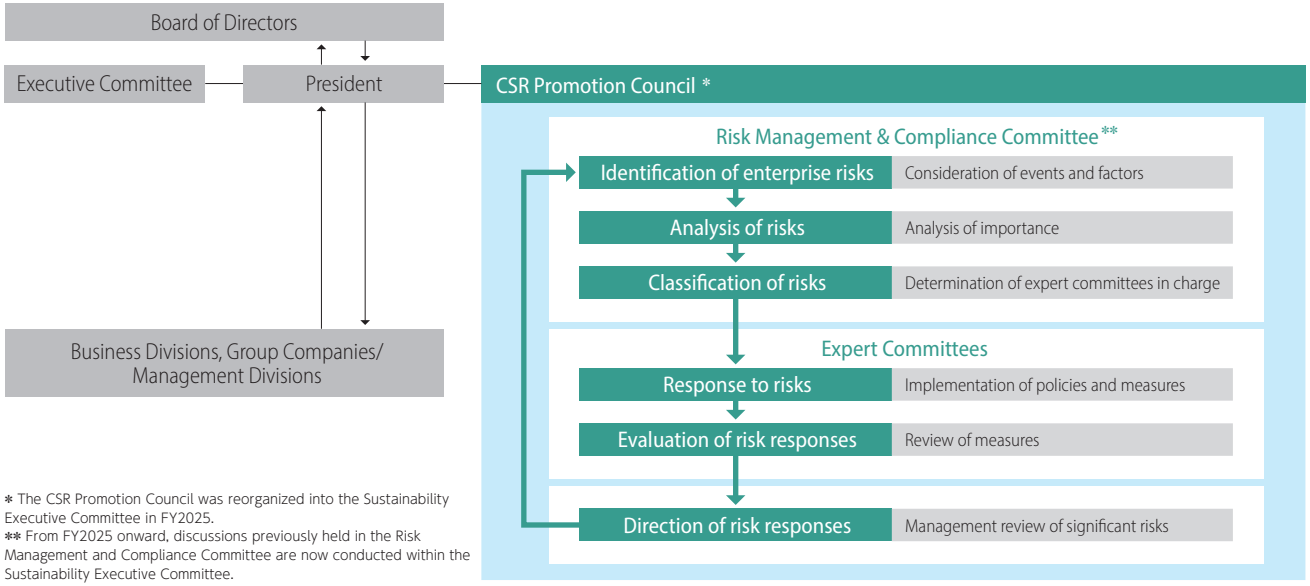
Climate change risks are addressed by two key committees: the Environment Committee and the Sustainability Committee. The Environment Committee oversees the identification and monitoring of Scope 1, 2, and 3 GHG emissions across the Tokuyama Group. Under the environmental management system, it sets energy-saving targets and leads related initiatives. The committee also ensures compliance with climate-related regulations.

The Sustainability Committee focuses on soft law responses, including initiatives and external disclosures related to climate change. For example, the committee actively engages with sustainability challenges and discloses relevant actions. It has also worked to enhance the content of the TCFD report and considered participation in the GX League.

c. How processes for identifying, assessing, and managing climate-related risks are integrated into the company's overall risk management

Material risks were regularly reviewed and updated by the former Risk Management and Compliance Committee, which also identified emerging risks. These were reported to the CSR Promotion Council and the Board of Directors.

Figure 11: Process for identifying material risks



* The CSR Promotion Council was reorganized into the Sustainability Executive Committee in FY2025.
** From FY2025 onward, discussions previously held in the Risk Management and Compliance Committee are now conducted within the Sustainability Executive Committee.

In April 2025, the Risk Management and Compliance Committee were dissolved, and the CSR Promotion Council was reorganized into the Sustainability Executive Committee. This new committee includes all executive officers, including the President, and may also be attended by Audit and Supervisory Committee members, including outside directors. Sustainability-related risks and opportunities, including those previously discussed by the Risk & Compliance Committee, are now deliberated within the Sustainability Executive Committee. Based on these discussions, instructions or delegation of responsibilities are issued to relevant business divisions and subordinate committees.

Identification and evaluation of climate-related risks

Tokuyama's competitive advantage lies in the integrated, high-efficiency production processes at its flagship Tokuyama Factory, which has historically relied on coal-fired power generation facility and energy-intensive operations. However, with the accelerating shift toward decarbonization, rising environmental awareness, and tightening regulations, the business environment is undergoing significant transformation.

In response, the Medium-Term Management Plan 2025 (see Figure 3) identifies business portfolio transformation and contributions to climate change mitigation as priority issues.

Accordingly, the former Risk Management and Compliance Committee designated "risk related to transition to a decarbonized society" as the most critical climate-related risk. Multiple expert committees were assigned to address this issue collaboratively:

The Environment Committee manages regulatory compliance. The Sustainability Committee manages initiatives and soft law disclosures related to climate change.

Metrics and Targets

For the purpose of setting management indicators and targets, Tokuyama Group considers the period up through FY2025 (the final fiscal year for the Medium-Term Management Plan 2025) as the short term, with the medium term extending through FY2030, and the long term through FY2050.

a. Metrics used by the company to assess climate-related risks and opportunities in line with its strategy and risk management process

Reduction targets for Scope 1 and 2 emissions

In the past, the Group has measured CO_2 emissions, CO_2 intensity, and energy intensity. Under the new Medium-Term Management Plan 2025, however, we aim to help mitigate global warming by measuring total group-wide GHG emissions and achieving certain management targets. These are a 30% reduction in GHG emissions (Scope 1 and 2) compared to FY2019 by FY2030, and the attainment of carbon neutrality by FY2050.

Moreover, when calculating compensation for all executive officers, we look at performance with respect to relevant material issues determined by the Group as indicators and evaluate each officer accordingly. As a result, specific roles and responsibilities are taken into account as relevant factors.

Reduction targets for Scope 3 emissions

Tokuyama has set a Scope 3 emissions reduction target with FY2022 as the base year, and aims to achieve carbon neutrality throughout its entire supply chain.

Figure 12: GHG emissions (Scope 1 and 2) reduction targets

*The fuel-derived GHG include emissions from coal as a thermal energy source

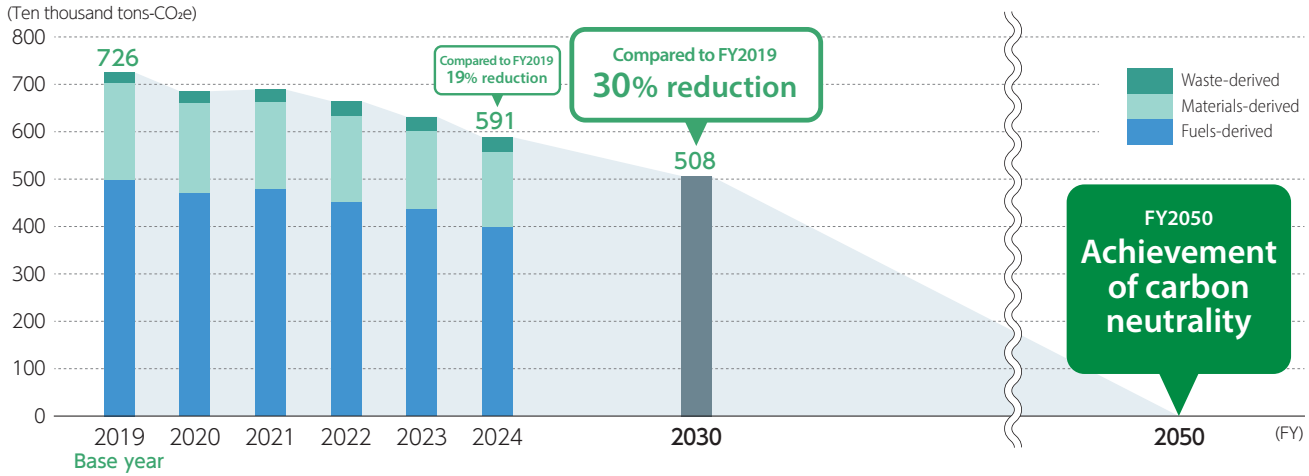
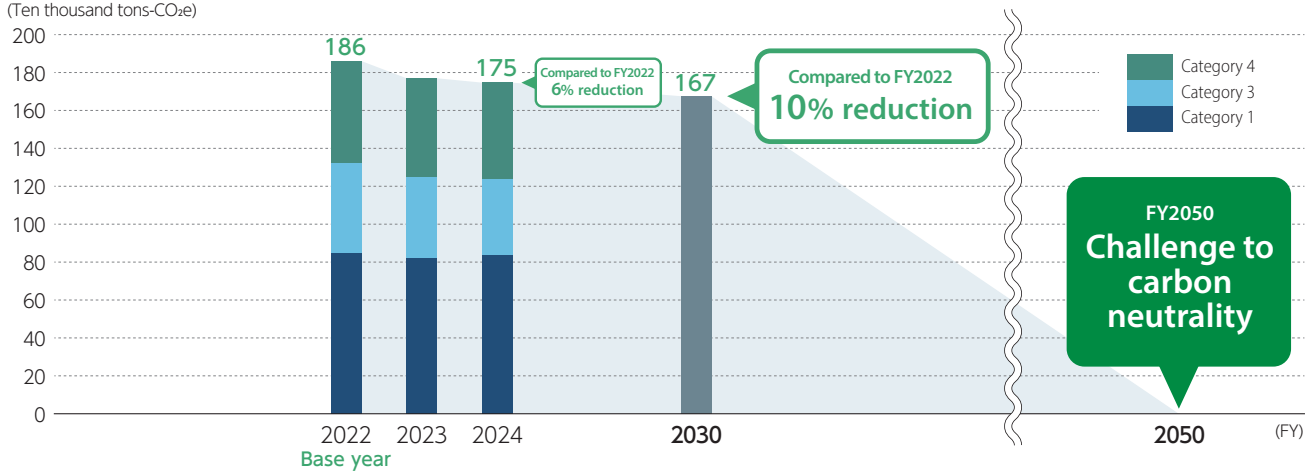


Figure 13: Supply chain emissions (Scope 3) medium- to long-term reduction targets (Categories 1, 3 and 4)



As Categories 1, 3 and 4 account for more than 90% of Tokuyama Group's total Scope 3 emissions, we aim to reduce total emissions for these three categories by 10% before the end of FY2030 (compared to FY2022).

To achieve this goal, we will further enhance our supply chain engagement activities.

Other important metrics and targets related to climate change are listed here.

SBTs: Start investigation for SBT certification

In March 2023, Tokuyama submitted a commitment letter to the SBTi (Science Based Target initiative). While monitoring updates the criteria and recommendations of SBTi, we continue to assess the feasibility for setting the targets of obtaining certification from multiple perspectives.

Water use metrics and targets

During the analysis of the Group's climate-related risks and opportunities, it became clear that climate change and water use issues are also highly relevant.

To manage the industrial water the Group uses for facility cooling and processes, we check the dam reservoir level every day, and adjust water conservation rate according to the reservoir accumulation rate.

Along with recirculating cooling water, we use condensation water from steam generated at our power plants as effectively as possible to conserve water. For our recirculated cooling water, we use just 100,000 cubic meters of industrial water or less per day, compared to our total required water usage of 1.5 million cubic meters per day.

With our condensation water, we effectively utilize approximately 25,000 cubic meters per day.

With respect to water consumption, we are committed to conserving water, and our goal is to keep water withdrawal no higher than the FY2019 level. Water withdrawal excluding seawater in FY2024 was 88% compared to FY2019.

Energy consumption targets

Tokuyama Group is aiming to achieve a 50% reduction in GHG emissions from fuels-derived compared to FY2019 by FY2030, and it plans to switch to non-fossil fuels (biomass and ammonia) for in-house power plants. Starting in FY2023, Tokuyama began gradually increasing the biomass co-firing ratio. In FY2024, the Company launched facility upgrades to enable co-firing with wood pellets, with operations scheduled to begin in autumn 2025. For ammonia, feasibility studies began in FY2023 with the aim of starting co-firing by FY2030.

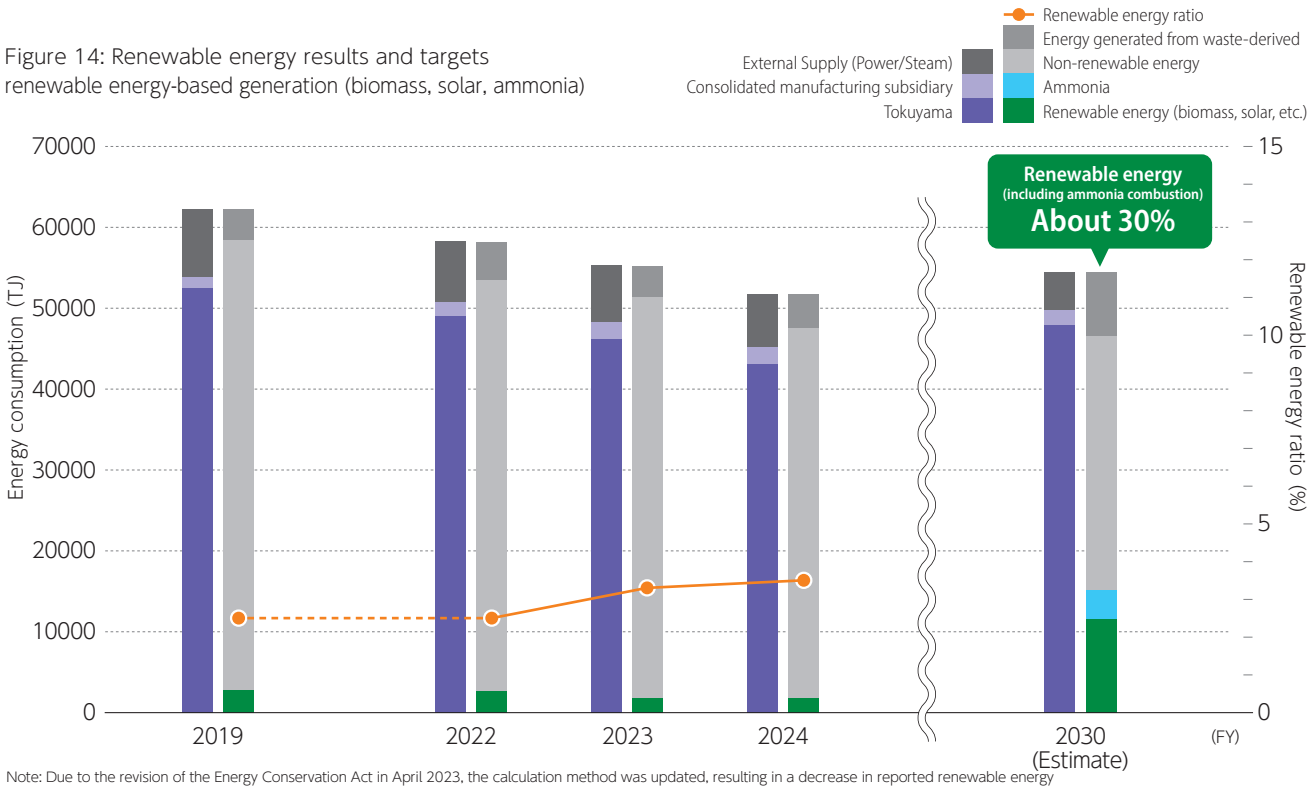
Through this initiative, the Group aims to achieve a renewable energy ratio of 30% by FY2030.

The ratio of renewable energy use for the entire Group in FY2024 was about 3.5%.

Metrics (initiatives) related to internal carbon pricing

In FY2019, Tokuyama adopted internal carbon pricing (ICP) as a criterion for evaluating investment projects to promote GHG emissions reduction. Initially, the price of carbon was set at 3,700 yen per ton of CO_2, based on the European Union Emissions Trading System (EU-ETS) price. In order to further enhance our efforts to reduce GHG emissions, in FY2022 we raised our internal price of carbon to 10,000 yen per ton of CO_2. Using ICP, we will promote activities aimed at decarbonization over the short and medium term.

Figure 14: Renewable energy results and targets
renewable energy-based generation (biomass, solar, ammonia)



Note: Due to the revision of the Energy Conservation Act in April 2023, the calculation method was updated, resulting in a decrease in reported renewable energy from FY2023 onward. However, the renewable energy ratio in Figure 14 is calculated using the same conversion factors after the law revision, so that comparisons can be made on the same basis.
Note: Energy generated from waste includes energy from hydrogen produced during the manufacturing process.

b. Scope 1, Scope 2, and, Scope 3 greenhouse gas (GHG) emissions, and the related risks

Table 7 shows the changes in GHG emissions (Scope 1, 2 and 3). In FY2024, we were able to reduce GHG emissions (Scope 1 and 2) by 19% from the base year of FY2019 by carrying out co-firing with biomass and vigorously pursuing energy-saving activities.

Table 7: Scope 1, 2 and 3 GHG emissions *GHG Protocol third-party assurance (limited assurance)

(Ten thousand tons-CO_2e)

			FY2019	FY2020	FY2021	FY2022	FY2023	FY2024
Scope 1	Tokuyama	GHG emissions from fuels-derived	487.6	460.5	467.7	438.5*	419.2*	**382.4***
		GHG emissions from raw materials-derived	203.2	188.6	185.7	180.2*	166.6*	**159.5***
		Waste-derived	25.3	26.5	27.0	32.1*	29.6*	**31.2***
	Consolidated manufacturing subsidiaries in Japan		0.4	0.4	0.5	0.5*	0.7*	**0.6***
	Consolidated manufacturing subsidiaries outside Japan		0.0	0.0	0.0	0.2*	0.7*	**0.6***
Scope 2	Tokuyama		3.1	3.7	1.5	3.9*	3.7*	**6.1***
	Consolidated manufacturing subsidiaries in Japan		1.4	0.9	1.0	1.0*	0.7*	**0.8***
	Consolidated manufacturing subsidiaries outside Japan		5.3	5.9	6.8	8.3*	10.7*	**9.6***
Scope 3	Tokuyama (categories 1-7 and 9)		178.7	173.7*	176.8*	176.0	166.2	**163.3**
	Tokuyama (categories 1, 3, 4)		169.7	166.7	168.5	167.8*	157.5*	**153.8***
	Consolidated manufacturing subsidiaries in Japan (categories 1, 3, 4)		—	—	—	3.3	3.1*	**3.6***
	Consolidated manufacturing subsidiaries outside Japan (categories 1, 3, 4)		—	—	—	15.1	16.3*	**17.2***

* GHG emissions from biomass combustion in FY2024 results were 250,000 tons-CO_2e

Table 8 shows the breakdown in GHG emissions (Scope 3). In FY2024, we were able to reduce GHG emissions (Scope 3) by 6% from the base year of FY2022.

Table 8: Scope 3 GHG emissions by category (Ten thousand tons-CO_2e)

		FY2022	FY2023	FY2024
Category 1	Tokuyama	71.2*	68.8*	**68.5***
	Consolidated manufacturing subsidiaries in Japan	1.6	1.3*	**1.9***
	Consolidated manufacturing subsidiaries outside Japan	11.7	12.0*	**13.5***
	Total	84.4	82.2*	**83.9***
Category 3	Tokuyama	45.0*	39.0*	**36.7***
	Consolidated manufacturing subsidiaries in Japan	0.4	0.4*	**0.4***
	Consolidated manufacturing subsidiaries outside Japan	2.1	2.9*	**2.9***
	Total	47.5	42.4*	**40.0***
Category 4	Tokuyama	51.6*	49.7*	**48.6***
	Consolidated manufacturing subsidiaries in Japan	1.3	1.4*	**1.2***
	Consolidated manufacturing subsidiaries outside Japan	1.3	1.3*	**0.8***
	Total	54.2	52.4*	**50.6***
Total (categories 1, 3, 4)	Tokuyama	167.8*	157.5*	**153.8***
	Consolidated manufacturing subsidiaries in Japan	3.3	3.1*	**3.6***
	Consolidated manufacturing subsidiaries outside Japan	15.1	16.3*	**17.2***
	Total	186.1	176.9*	**174.5***

*Third-party assurance (limited assurance)
* Due to rounding, the total value may not always be accurate

Methodology explanation

Scope 1, 2

- Greenhouse Gas Emissions Calculation and Reporting Manual (Ver. 6.0) March 2025, Ministry of Environment and Ministry of Economy, Trade and Industry
- The list of emission factors for electric power operator (for calculating greenhouse gas emissions of specified emitters) FY2023 Results – Released March 18, 2025 by the Ministry of the Environment and the Ministry of Economy Trade and Industry

Scope 3

- Basic Guidelines on Accounting for Greenhouse Emissions throughout the Supply Chain (Ver. 2.7) March 2025, Ministry of the Environment and Ministry of Economy Trade and Industry
- Emission Intensity Database for Calculating Greenhouse Gas Emissions of Organizations Across Supply Chains (Ver. 3.5), March 2025, Ministry of the Environment and Ministry of Economy, Trade and Industry
- LCI Database IDEAv2 (for supply chain greenhouse gas emissions calculation), Sustainable Management Promotion Organization (SuMPO), December 2019

GX League

In FY2022, we endorsed the GX League Basic Concept announced by Japan's Ministry of Economy, Trade and Industry, and then joined the League when it began full-scale activities in FY2023.

As a member of the GX League, Tokuyama has established emission reduction targets based on the requirement set by this coalition. Specifically, we have set targets for Tokuyama and consolidated manufacturing subsidiaries' Scope 1 and 2 emissions in Japan, along with GHG emission reduction targets based on the GHG Protocol.

Even though the emissions data and base years submitted to the GX League are different from those calculated based on the GHG Protocol, because of different calculation protocols, the original emissions data is the same and the reduction targets are consistent.

In FY2024, combined Scope 1 and 2 emissions were reduced by 17% compared to the base year average for FY2019 – FY2021.

Figure 15: GX League emission reduction targets (Scope 1)

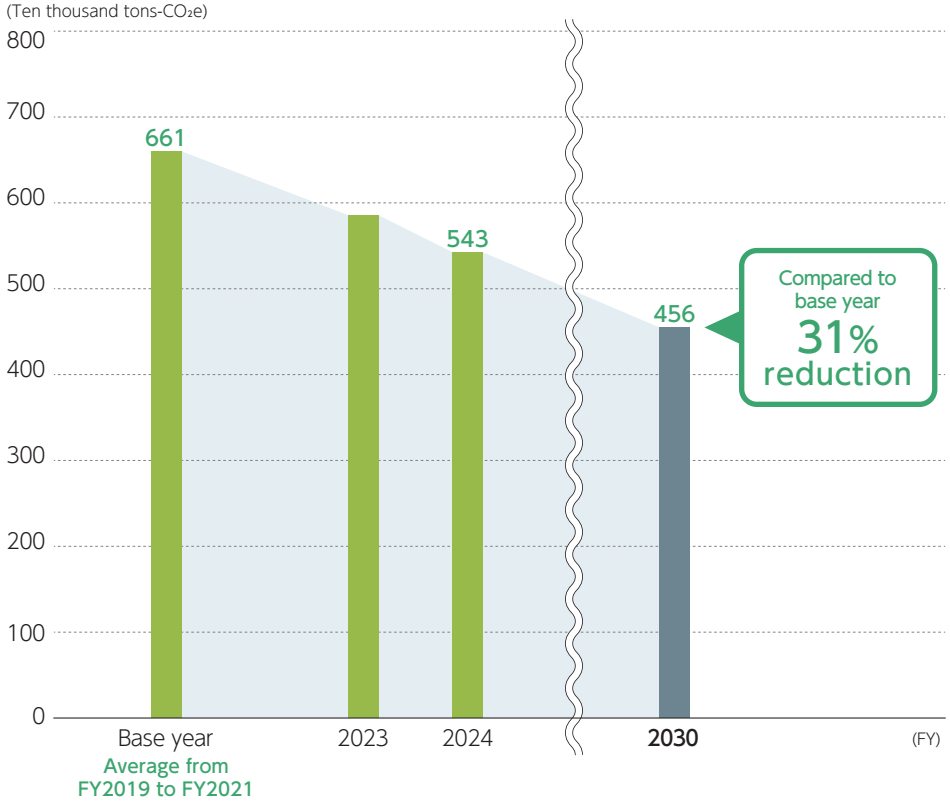


Table 9: Tokuyama Group GHG emissions (GX League)

*Re-registered due to boundary change
*Third-party assurance (reasonable). FY2023 figures reflect the shift from limited to reasonable assurance

(Ten thousand tons-CO₂e)

		Base year	FY2023	FY2024
Scope 1	Tokuyama (non-consolidated)	660.0 *	585.9 *	**542.1** *
	Materials-derived (Deduction)	(-26.3) *	(-29.4) *	**(-31.0)** *
	Consolidated manufacturing subsidiaries in Japan	0.5 *	0.7 *	**0.7** *
	Total Scope 1	660.5 *	586.7 *	**542.7** *
Scope 2	Tokuyama (non-consolidated)	2.8 *	3.5 *	**6.1** *
	Consolidated manufacturing subsidiaries in Japan	1.1 *	0.7 *	**0.8** *
	Total Scope 2	3.9 *	4.3 *	**6.9** *
Total Scope 1, 2		664.4 *	591.0 *	**549.7** *

* Average from FY2019 to FY2021
* Totals may not match due to rounding

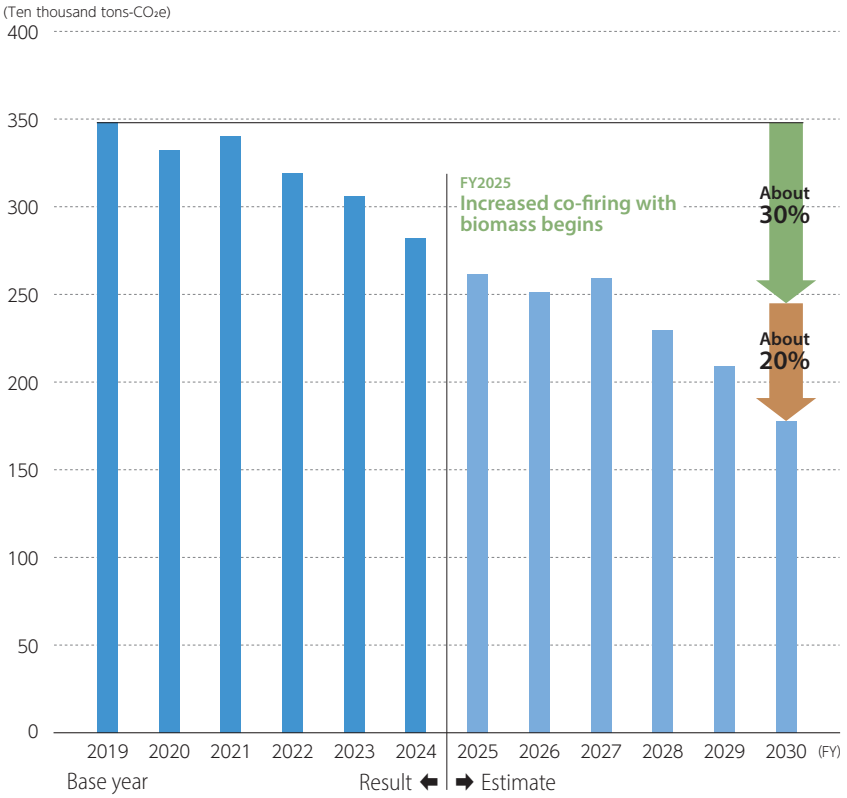
c. Targets used by the company to manage climate-related risks and opportunities and performance against targets

The major sources of the Group's GHG emissions are in-house coal-fired power plants (GHG emissions from fuels-derived) and cement production (raw material-derived and waste-derived GHG emissions).

Reduction of fuel-derived GHG emissions from in-house power plants

The Group is aiming for a 50% reduction in fuel-derived GHG emissions (not related to cement) compared to FY2019 by FY2030, and we are currently drafting and implementing plans to achieve this goal. For co-firing with biomass, we will still use palm kernel shells, construction waste and wood chips as fuel. However, we are planning to procure biomass fuel and invest in co-firing equipment in order to further increase the level of co-firing starting in FY2025. The Group estimates that the total investment required to reduce GHG emissions by 30% through co-firing with biomass will be 11 billion yen by FY2030. With regard to co-firing with ammonia, we are currently investigating the installation of relevant equipment. The Group estimates that the total investment required to reduce GHG emissions by 20% using ammonia co-firing will be 15 billion yen by FY2030. As both biomass and ammonia co-firing require large amounts of investment, we plan to make steady progress while assessing economic feasibility and seeking government support.

Figure 16: Reduction plan for fuel-derived GHG emissions from in-house power plants



Estimated biomass-related investment: 11 billion yen
We will increase the level of co-firing using biomass by making further investment to increase co-firing capacity starting in FY2025

Estimated ammonia-related investment: 15 billion yen
Equipment for co-firing with ammonia will be installed, conmenced by FY2030

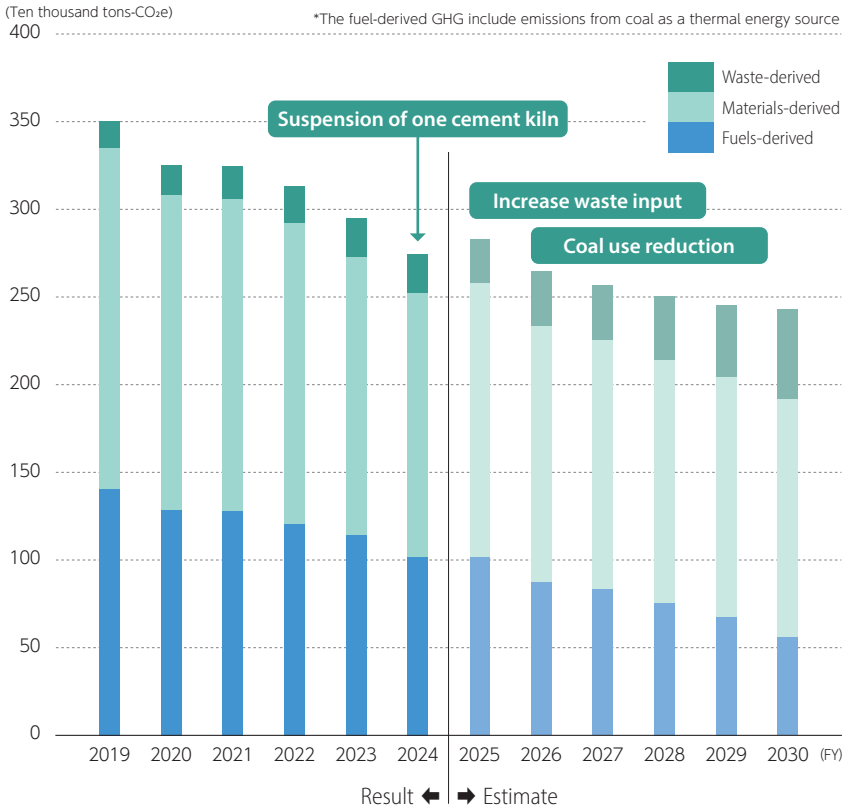
Through these measures, we will gradually replace coal with non-fossil fuels and reduce GHG emissions from in-house power plants.

Reduction of raw materials-derived, waste-derived, and fuels-derived GHG emissions (cement production)

Over the short and medium terms, we plan to increase the use of waste, especially waste plastic. Using waste plastic as alternative thermal energy increases waste-derived GHG emissions. Nevertheless, the Group intends to increase its waste use because there are currently no alternative energy sources that are economically viable, and it wants to reduce its coal use as a priority. Over the long term, the aim is to use hydrogen and ammonia as heat sources, and the necessary studies are now being carried out. The Group's raw materials-derived GHG emissions arise mostly from limestone (calcium carbonate) use. Cement production requires large amounts of calcium. However, since there are currently no raw material candidates to replace limestone, dramatic reduction measures are difficult. The Group is now investigating ways to reduce these emissions per unit of production by increasing the use other materials while reducing the amount of clinker (a mix of limestone and minerals) per unit of cement.

While it is our responsibility as a company to steadily reduce GHG emissions, we also recognize that reducing GHG emissions through the use of our products in society is also an important role. In the future, we will contribute to the achievement of carbon neutrality in the world by expanding our environmentally friendly products and further developing innovative technologies.

Figure 17: Reduction of raw materials-derived, waste-derived, and fuels-derived GHG emissions



The following details the progress of specific measures regarding the Group's initiatives in FY2024.

● Improvement of energy efficiency at the industrial complex and adoption of negative emission technology (CCUS)

14 Reduction of fuels-derived
8 Carbon offsets

Participating in Shunan Industrial Complex Decarbonization Promotion Council

The Shunan Industrial Complex Decarbonization Promotion Council was established by Shunan City, the Society for Chemical Engineers Japan, and companies belonging to the Shunan Industrial Complex (Idemitsu Kosan Co., Ltd., NIPPON STEEL CORPORATION (formerly Nippon Steel Stainless Corporation), Zeon Corporation, Tosoh Corporation, and Tokuyama). In order to help achieve carbon neutrality, the council's aim is to lay out a vision for decarbonization, and to promote efforts to enable its adoption by society, including relevant technology development, evaluation, and demonstration, as well as making policy recommendations. The members of the council all face the new challenge of balancing decarbonization with the need to maintain and enhance the competitiveness of the Shunan Industrial Complex. Several months after discussions began in February 2022, the council was able to announce at the end of May 2023 a grand design for the Shunan Industrial Complex to achieve by 2050. In FY2023, we set up subcommittees to address each theme and conducted more detailed studies.

● Utilization of locally sourced energy

14 Reduction of fuels-derived

Concluding a partnership agreement for the utilization of woody biomass materials

Tokuyama employees planted fast-growing trees in March 2024, following a similar tree-planting session in December 2022. This activity is based on an agreement for forest maintenance and the utilization of woody biomass material signed with Shunan City, Idemitsu Kosan Co., Ltd., Tosoh Corporation, and Marubeni Corporation. By building a sustainable forest management model through reforestation using fast-growing trees, Tokuyama and its partners will promote the utilization of local forest resources and aim for local production of woody biomass for local consumption.

Attempts to promote the utilization of biomass materials within the Shunan Industrial Complex

1. Demonstration of fast-growing tree planting by Shunan City

A pilot project is underway to utilize land owned by Shunan City to plant fast-growing trees for fuel.

Fast-growing trees: Species that grow faster than Japanese cedar and cypress

2. Shunan City, Idemitsu Kosan, Tosoh, Marubeni, and Tokuyama signed a partnership agreement for forest maintenance and the utilization of woody biomass material

Cooperation areas
1. Utilization of locally grown woody biomass and for local consumption
2. Forest maintenance and its effective use, etc.

Organizational structure

Member organizations

- Society for Chemical Engineers, Japan
- Shunan City
- Five companies of the Shunan Industrial Complex
  - Idemitsu Kosan Co., Ltd.
  - NIPPON STEEL CORPORATION
  - Tokuyama Corporation
  - Tosoh Corporation
  - Zeon Corporation

Observers

- Ministry of Economy, Trade and Industry
- Ministry of the Environment
- Yamaguchi University
- Ministry of Land, Infrastructure, Transport and Tourism
- Yamaguchi Prefecture

● Co-firing with biomass and ammonia

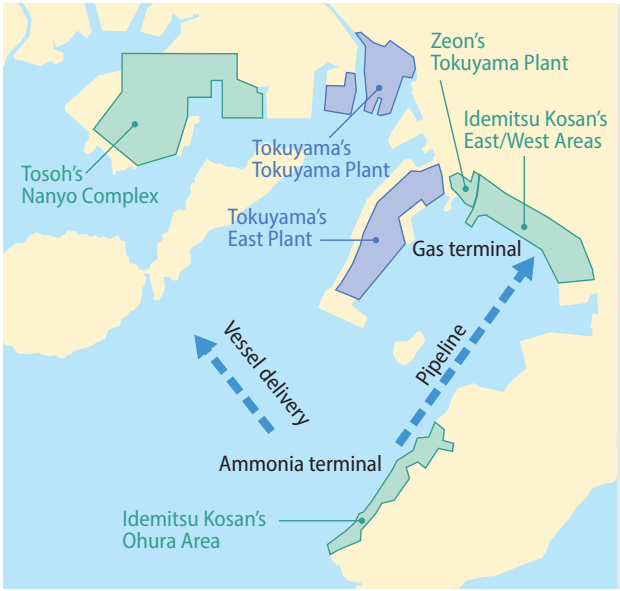
14 Reduction of fuels-derived

The transition promotion project based on a stable supply of next-generation fuels

Idemitsu Kosan Co., Ltd., Tosoh Corporation, Tokuyama Corporation, and Zeon Corporation jointly applied for and were granted the "FY2023 Oil Supply Structure Advancement Project Cost Subsidy: Project to Promote Transition to a Stable Supply of Next-Generation Fuels)" offered by Japan's Ministry of Economy, Trade and Industry and the Agency for Natural Resources and Energy. This project aims to investigate the establishment of a zero-carbon system to supply more than one million tons of ammonia per year at the Shunan Industrial Complex by 2030. The investigation covers use of the storage facility at the Tokuyama Factory of Idemitsu Kosan for development as a shared ammonia supply site for the Shunan Industrial Complex, and the construction of an ammonia supply infrastructure for each company in the complex (demand side). Moreover, based on this project, the four participating companies propose constructing in the Shunan region Japan's first ammonia supply chain and are taking various initiatives such as demonstrating ammonia combustion using actual equipment.

In the area of biomass use, construction work to convert one of the Group's coal-fired power plants to enable co-firing with biomass will begin in FY2024. We plan to operate the plant with a co-firing rate of approximately 25% by calorific value starting around autumn FY2025.

Overview of the support project for turning an industrial complex into a supply site for hydrogen, ammonia, or similar fuels — Joint proposal by Idemitsu Kosan, Tosoh, Zeon, and Tokuyama



Overview of the investigation project

- Investigation into the development of an ammonia terminal using existing infrastructure
- Investigation into the development of a large-scale terminal utilizing existing infrastructure
- Investigation into the development of ammonia supply infrastructure for industrial complex companies
- Aiming to build a district ammonia supply system that can handle more than one million tons

Source: Advisory Committee for Natural Resources and Energy, 5th Meeting; joint meeting of the Hydrogen Policy Subcommittee of the Energy Conservation and New Energy Sectional Committee together with the Ammonia and Other Decarbonized Fuel Policy Subcommittee of the Resources and Fuels Sectional Committee

● Carbon offsets

8 Carbon offsets

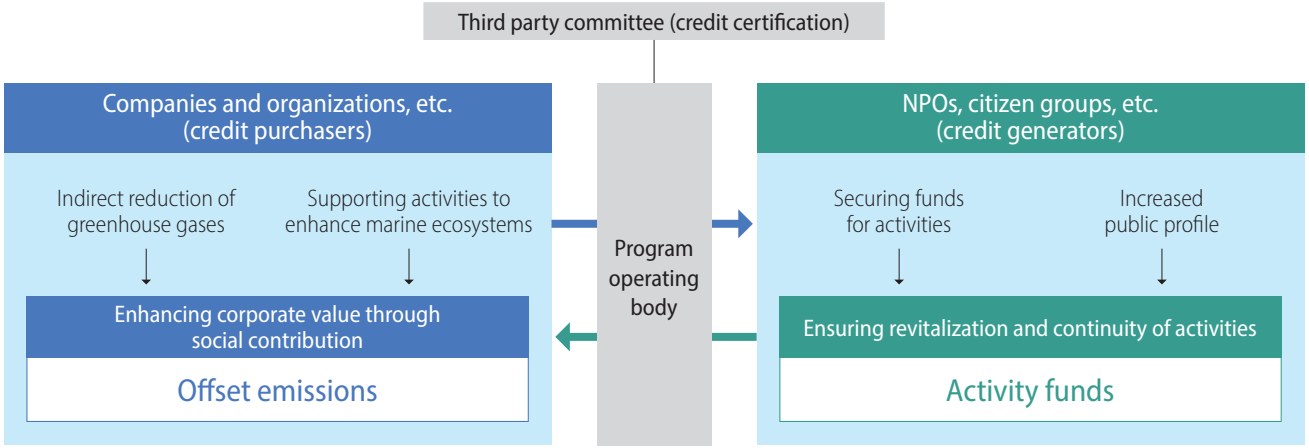
Blue carbon offset

Tokuyama is participating in the Tokuyama Kudamatsu Port and Oshima Tidal Flat Blue Carbon Offset Program, which utilizes "J Blue Credits" issued by the Japan Blue Economy Association (approved by the Minister of Land, Infrastructure, Transport and Tourism).

"Blue carbon" describes the type of carbon that is sequestered when carbon dioxide in the atmosphere is absorbed by marine organisms such as seaweed. It is now attracting attention as a new option for CO_2 capture.

Under the Tokuyama Kudamatsu Port and Oshima Tidal Flat Blue Carbon Offset Program, the amount of CO_2 captured as a result of activities to conserve the seaweed beds near the Oshima tidal flat is certified as J-Blue Credits. Through purchase and utilization of these credits, the Group can offset GHG emissions from its production activities. In FY2024, we purchased credits equivalent to 3.1 tons of CO_2.

By supporting activities to conserve marine ecosystems through this Blue Carbon Offset Program, the Group is helping to build a sustainable world based on beautiful, thriving natural environments from the mountains to the sea.



Blue carbon:
A type of carbon capture where carbon dioxide in the atmosphere is absorbed and sequestered by marine organisms such as seaweed. It is attracting attention as a new option for CO_2 capture.

● Adoption of negative emission technology (CCUS)

8 Carbon offsets

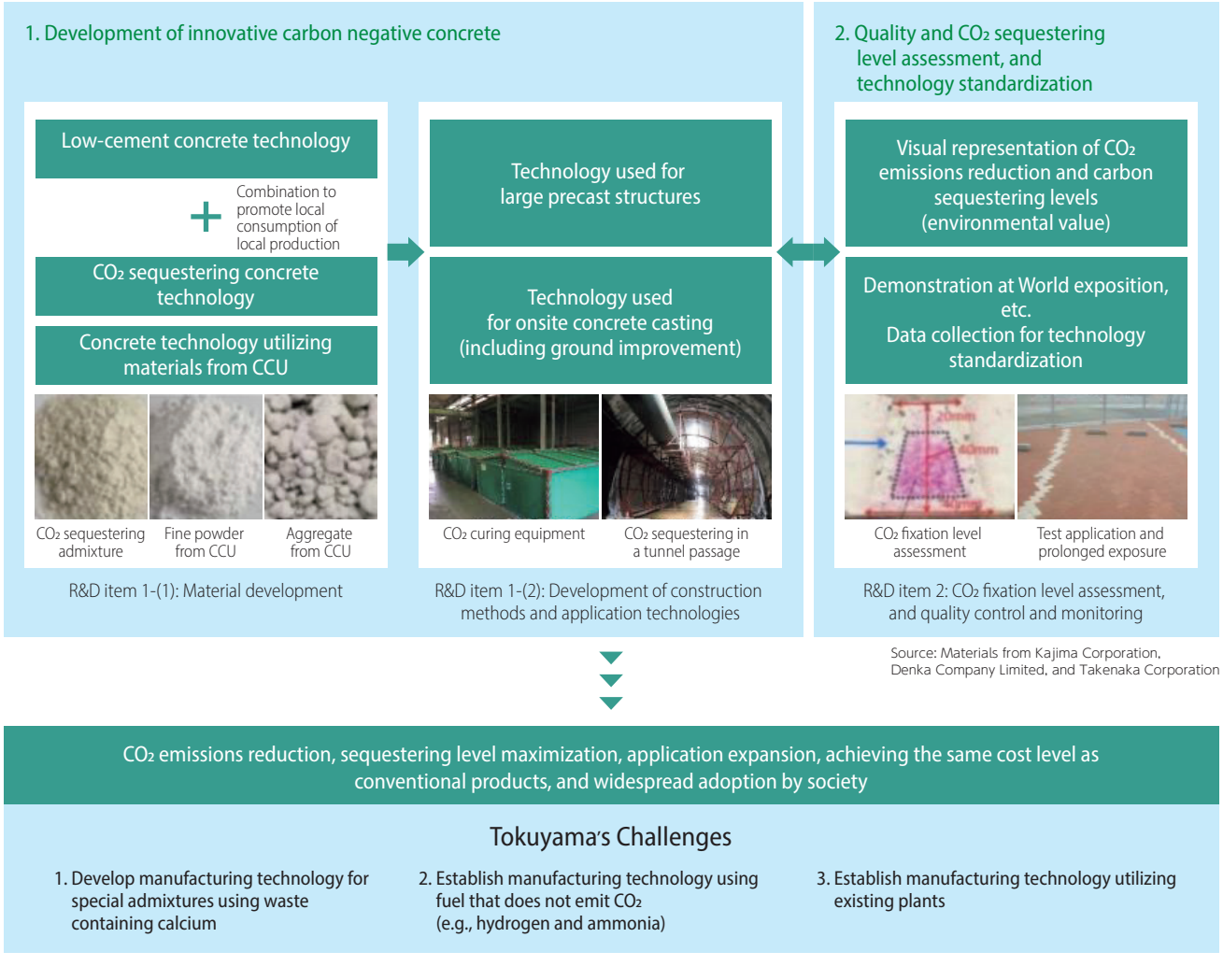
Business opportunities

Development of carbon negative concrete

Carbon-negative concrete is a type of concrete that reduces the net amount of CO_2 generated through concrete production by combining technologies to reduce and capture CO_2 emissions. Tokuyama is working with Denka Company Limited to develop CO_2 fixing admixtures to be used in CO_2-absorbing concrete. This is part of a project for the "Development of Materials, Construction Technology, and Quality Evaluation Technology for Innovative Carbon-Negative (CN) Concrete" under the Green Innovation Fund created by the New Energy and Industrial Technology Development Organization (NEDO).

Tokuyama is mainly responsible for developing the CO_2-fixing admixture produced by utilizing calcium-containing industrial waste as a raw material. We are investigating how various components in the waste can affect the mineral composition of the admixture. By taking these effects into consideration in the material design, we have confirmed that the quality of the admixture is good enough, even when waste comprises about 50% of the component raw materials.

The Group will continue to develop technologies for effective waste utilization and for manufacturing carbon-negative concrete products to help decarbonize society.



Source: Materials from Kajima Corporation, Denka Company Limited, and Takenaka Corporation

*Green Innovation Fund Project (GI Fund):
Toward the goal of achieving carbon neutrality by 2050, the Japanese government has established a Green Innovation Fund of two trillion yen to be administered by the New Energy and Industrial Technology Development Organization (NEDO). The fund provides continuous support to companies and other organizations that are committed to taking on, as management issues, the challenge of achieving specific ambitious targets shared by the public and private sectors, from R&D through to demonstration to social implementation over the next 10 years.

Project format:
A consortium of over 40 companies, 10 universities, and 1 research institute

● Adoption of negative emission technology (CCUS)

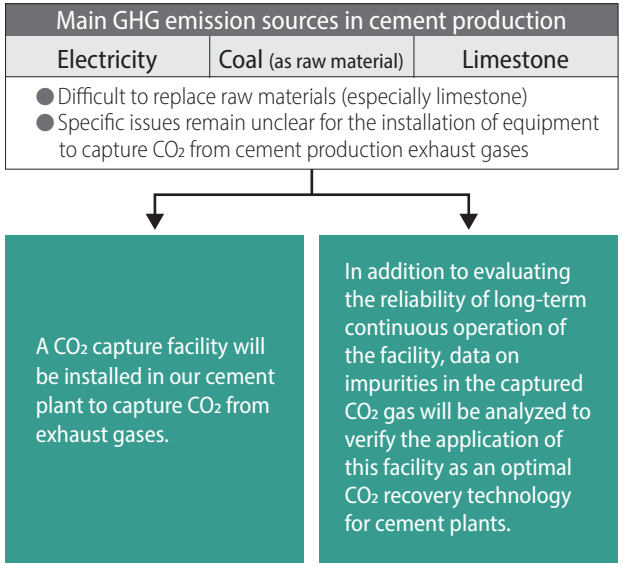
8 Carbon offsets

Conducting a verification test for CO_2 capture from cement production

Using a CO_2 capture test facility at Mitsubishi Heavy Industries, Ltd., we conducted a verification test of CO_2 capture from cement production exhaust gas.

The demonstration test was completed at the end of June 2024. Through analysis and evaluation of the characteristics of cement kiln exhaust gas and the impact of trace components contained therein, we were able to examine optimal design and equipment layout for future application in commercial-scale plants.

Based on the knowledge gained through this initiative, we will calculate the necessary investment, identify issues and take appropriate measures, and then proceed with demonstration and implementation of this technology.



Development of alkaline water electrolyzers

Business opportunities

Leveraging decades of expertise in salt electrolysis from our salt electrolysis business, we have developed a low-pressure alkaline water electrolyzer that generates hydrogen gas through water electrolysis. In March 2025, we delivered a complete alkaline water electrolysis system—including transformers, rectifiers, hydrogen compression units, and hydrogen purification units—to the Fukushima Renewable Energy Institute of the National Institute of Advanced Industrial Science and Technology (AIST). The integrated electrolyzer boasts world-class electrolysis performance and will be used as part of research and development facilities aimed at adapting water electrolysis systems to fluctuating renewable energy sources.

In addition, under the framework of the "Collaborative Industry-Academia-Government R&D Program for Solving Common Challenges Toward the Expansion of Fuel Cell Applications," Tokuyama Corporation and Nippon Shokubai Co., Ltd. are jointly conducting a NEDO-commissioned project titled "Development of Technologies for Multi-Purpose Applications of Fuel Cells." This project focuses on developing large-scale alkaline water electrolysis equipment and separators suitable for high-pressure systems.

Through the development and demonstration of high-pressure water electrolysis systems that enable cost reduction, we are committed to promoting the widespread adoption of hydrogen as a next-generation energy source and contributing to the realization of a hydrogen-based society.

Initiative at the Center for Commercialization of Advanced Technology

Business opportunities

With the global drive toward carbon neutrality, Tokuyama has decided to enter the electrolyzer business, leveraging the electrolysis technology and hydrogen handling know-how developed by the Group over the last 70 years. The Center for Commercialization of Advanced Technology in Yanai City (Yamaguchi Prefecture) has become our base of operations for this initiative.

At this site, we will begin manufacturing large sodium chloride electrolyzers that can achieve the world's highest level of energy-saving performance. We will also establish a system to manufacture alkaline water electrolyzers using the same production line.

By incorporating Tokuyama's zero-gap salt electrolysis technology, we have developed a sodium chloride electrolyzer that can achieve the world's highest level of energy-saving performance. Our aim is to make high-efficiency sodium chloride electrolyzers widely available for caustic soda production, enabling energy savings in those operations.

Through this project, Tokuyama seeks to help build a hydrogen supply chain that enables efficient energy use, from hydrogen production to utilization. This will help build a hydrogen-powered society through renewable energy adoption worldwide and local consumption of local energy production.

Carbon offsets

Business opportunities

Efficiently utilize biomass combustion ash and CCS

Since combustion ash (fly ash) discharged by biomass power plants contains potassium and other elements, its use in cement production is limited. Therefore, technology needs to be developed for effective utilization of this material.

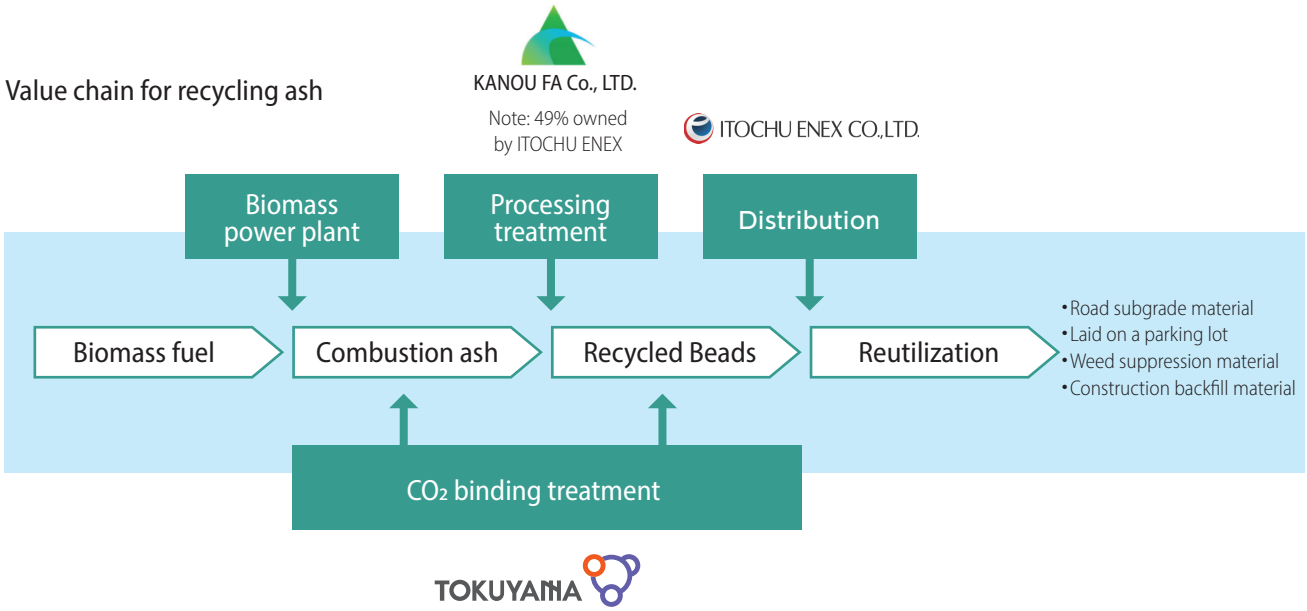
For this joint research with ITOCHU ENEX Co., Ltd., using Tokuyama technology still under development, we aim to utilize biomass fly ash that has adsorbed CO_2 to make a construction material product (trademark: Recycled Beads). The goal is to create a method for CO_2 capture and storage that can be widely adopted.

In FY2023, the Group developed a process technology whereby CO_2 captured from exhaust gases emitted by Tokuyama's cement plant is fixed to biomass fly ash generated by its power plant. The treated ash was then used as a raw material to manufacture CO_2-fixing Recycled Beads™ by an affiliate of ITOCHU ENEX Co., Ltd. The resulting product was finally utilized at the Tokuyama Factory. We confirmed that the CO_2 emissions attributable to the raw materials and energy used in all the processes required to manufacture the CO_2-fixing Recycled Beads amounted to 34.2 kilograms of CO_2 per ton of recycled beads, while the amount of CO_2 fixed was 61.0 kilograms per ton. Thus, the trial manufacture achieved a net carbon sequestration of 26.8 kilograms of CO_2 per ton of beads.

Through this initiative, both companies aim to help realize a decarbonized, recycling-oriented society.

* CCS (Carbon dioxide Capture and Storage)
* Recycled Beads is a roadbed material and weed control product produced by KANOU FA Co., Ltd., a company in which ITOCHU ENEX Co., Ltd. has a 49% stake.

Value chain for recycling ash



Presented by ITOCHU ENEX

Mass production begins for magnesium hydride, a next-generation hydrogen carrier

Business opportunities

In collaboration with Biocoke Lab Co., Ltd. we have installed a hydrogenation reactor to produce magnesium hydride (MgH_2) at the Tokuyama Factory and have begun mass production with the goal of producing 30 tons per year.

Hydrogen is considered a key energy source for building a decarbonized society. However, since it is a gas with a low density, it generally needs to be transported at low temperature and high pressure. Therefore, the added costs for storage and transportation pose an issue for hydrogen compared to conventional fuels.

Magnesium hydride is a solid material capable of storing hydrogen at high density, and it maintains chemical stability at room temperature and at regular atmospheric pressure. This makes it a substance with the potential to be a next-generation carrier for safely storing and transporting hydrogen.

When Tokuyama manufactures caustic soda, hydrogen is obtained as a byproduct. This is reacted with magnesium to produce magnesium hydride, which is then sold by Biocoke Lab.

The two companies are aiming to develop a market for convenient hydrogen products as part of efforts to build a hydrogen-powered society.

Starting in September 2024, TOKUYAMA KAIRIKU UNSO K.K. conducted fuel efficiency testing by adding "ECOMAX," a petroleum fuel additive containing hydrogenated magnesium, to ship fuel used for domestic transport of our products. Over a six-month testing period ending in February 2025, the results showed a 5.9% reduction in fuel consumption compared to historical data on the same route.

ECOMAX was jointly improved by Tokuyama Corporation and Being Co., Ltd., and has been commercially available through Tokuyama Soda Trading Co., Ltd. since November 2024.

Magnesium hydride

Features of Magnesium hydride

A. Enables safe and inexpensive hydrogen transport, as is stable at room temperature and normal atmospheric pressure

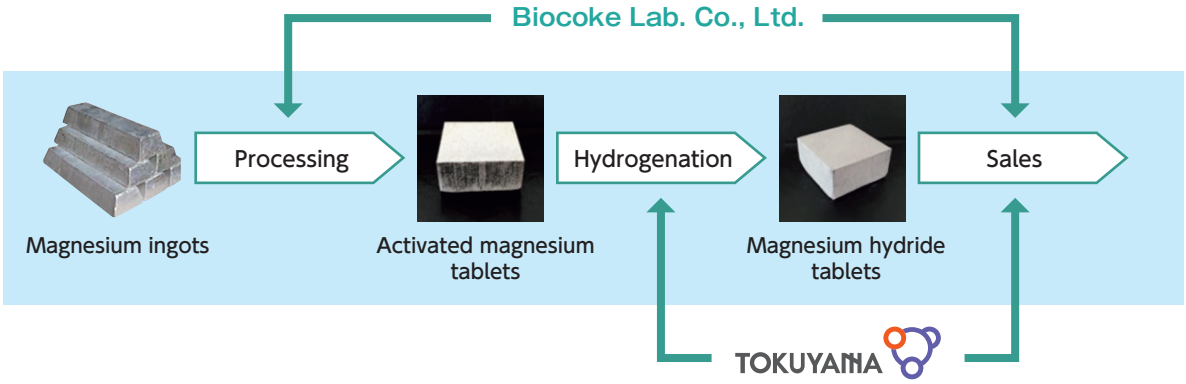
Since it is very lightweight (specific gravity of approx. 1), it can be stored safely and transported inexpensively.

B. Enables high-density hydrogen storage, exceeding that of ammonia (NH_3) *Per unit volume

C. Easy extraction of hydrogen gas

Can generate twice the amount of hydrogen per carrier unit compared to hydrolysis.
Magnesium hydride generates hydrogen at twice the yield per carrier unit through hydrolysis process.
$MgH_2 + 2H_2O \Rightarrow 2H_2 + Mg(OH)_2$

Magnesium hydride manufacturing and sales process



❶❹Reduction of fuels-derived

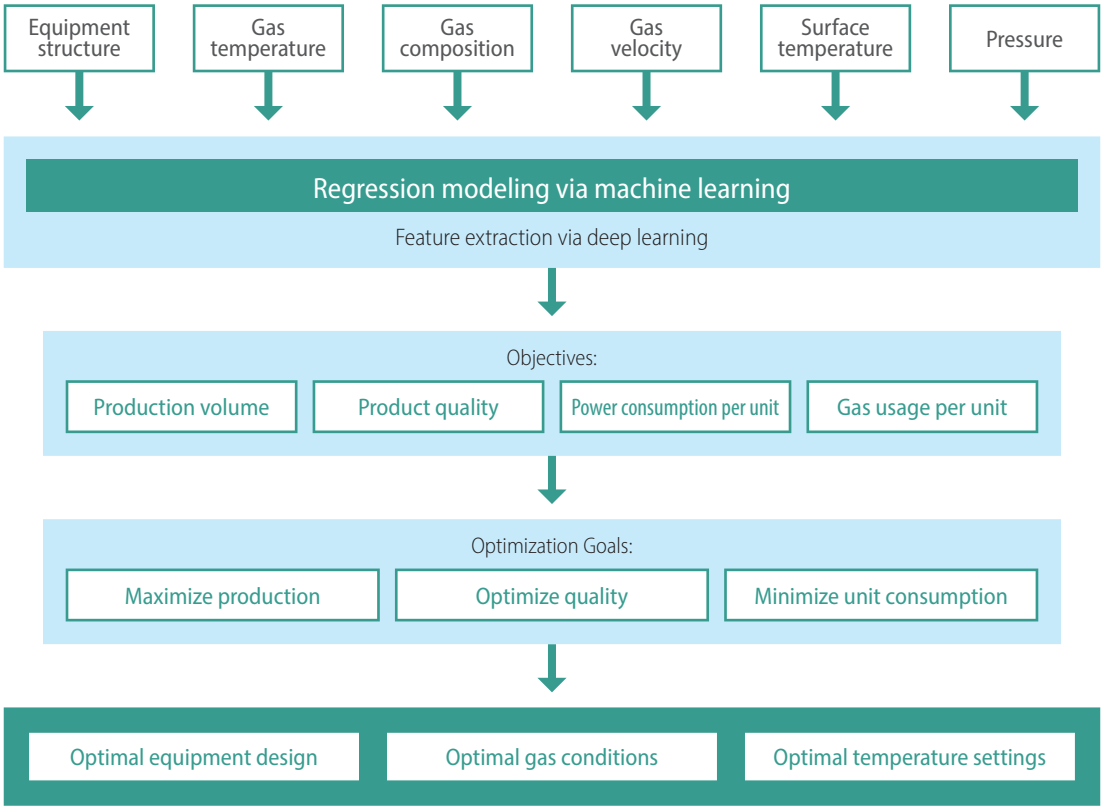
Productivity improvement and CO_2 reduction using AI × CFD digital twinning

For critical production equipment that directly affects manufacturing cost and product quality, we build precise digital twin models that replicate structural and physical properties. These models are analyzed using Computational Fluid Dynamics (CFD) to visualize internal temperature distribution, flow velocity, and chemical reactions. This enables virtual optimization based on quantitative indicators.

Recently, we have integrated AI with CFD. In cases where historical operational data is unavailable, regression models are generated through machine learning using CFD simulation results, allowing rapid identification of optimal operating conditions.

This approach has been applied to polycrystalline silicon reactors for semiconductors. By optimizing equipment structure, gas conditions, and temperature settings, and validating them in real environments, we achieved a reduction of 6,500 t-CO_2/year in FY2024 through improved productivity and lower power consumption.

Polycrystalline silicon reactor optimization



Fuel conversion for sodium silicate cullet production

①④Reduction of fuels-derived

At the Tokuyama Factory, we have initiated a plan to convert fuel sources for sodium silicate cullet production—from heavy oil (Type C) and kerosene to city gas. A major equipment renewal is scheduled by FY2027 to address aging infrastructure.

The plan includes process improvements such as switching from heavy oil used in melting furnaces and kerosene used in drying processes to city gas. Additionally, combustion in the melting furnace will be changed from air-based to oxygen-based, improving combustion efficiency. These changes are expected to reduce gas consumption, enhance energy efficiency, eliminate sulfur oxides from exhaust gases, and significantly lower nitrogen oxide emissions. Overall, the initiative aims to reduce CO_2 emissions from this process by 40%.

Tokuyama is Japan's largest manufacturer of sodium silicate cullet, with an annual production capacity of 180,000 tons. We remain committed to building a sustainable production system to ensure a stable supply to domestic customers.

*Sodium silicate cullet is a glassy solid commonly referred to as anhydrous sodium silicate. It is used as a raw material for water glass (sodium silicate solution), which finds applications in civil engineering (soil stabilization and water leakage prevention) and chemical industries (e.g., precipitated silica, silica gel)

Decarbonization of soda ash production process

①④Reduction of fuels-derived

We are advancing the development of a low-carbon soda ash production process by improving CO_2 absorption efficiency and optimizing energy use.

Soda ash is a fundamental chemical used in everyday products such as glass and detergents. Tokuyama has been producing soda ash at the Tokuyama Factory since its founding in 1918 and is currently the only domestic supplier, with an annual production capacity of 200,000 tons.

In the conventional process, limestone is calcined in a lime kiln to extract CO_2, which is then reacted with raw salt in a carbonation tower. In our new process, we aim to improve CO_2 absorption efficiency by 17% and reduce power consumption for carbonation by 24% using a redesigned carbonation tower.

A pilot plant featuring the improved tower began operation at the Tokuyama Factory in February 2024 and is currently undergoing trial runs. Based on the data obtained, we plan to design a more efficient tower and consider its deployment of commercial-scale facilities. This initiative is expected to contribute to direct CO_2 emission reductions from soda ash production.

Soda ash is a promising material for a decarbonized society, as it utilizes CO_2 as a raw material. Tokuyama is actively promoting the development of a high-environmental-value soda ash business to help mitigate global warming.

Hydrogen utilization model verification at Tokuyama Factory

Business opportunities

Tokuyama has signed a memorandum of understanding with Ebara Corporation and its group company, Ebara Refrigeration Equipment & Systems Co., Ltd., to jointly conduct a demonstration test of a new hydrogen utilization model. The test employs the RHDH-type hydrogen-fired absorption chiller/heater, developed by the Ebara Group.

The Ebara Group is a leading industrial machinery manufacturer specializing in fluid and thermal control technologies across a wide range of sectors. This demonstration aims to establish a model for direct hydrogen use. The RHDH unit has been installed at the Tokuyama Cultural and Sports Center, where it utilizes hydrogen supplied by Tokuyama to provide heating and cooling.

Through this initiative, the companies are evaluating the long-term reliability and practical performance of the system under actual load conditions, contributing to the advancement of hydrogen-based energy solutions.

Test start date: August 1, 2024
Location: Tokuyama Cultural and Sports Center

Joint development of Biochar Interlocking Blocks to support a carbon-neutral society

Carbon offsets

Business opportunities

Tokuyama and Fujita Corporation, a member of the Daiwa House Group, have jointly developed an environmentally friendly paving material for sidewalks—Biochar* Interlocking Blocks—designed to achieve net-zero greenhouse gas emissions from raw materials such as cement.

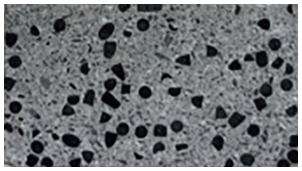
In the construction industry, efforts to reduce CO_2 emissions from concrete products include the use of blended cement, which partially replaces cement with industrial by-products such as ground granulated blast furnace slag and fly ash. However, achieving full carbon neutrality using blended cement alone remains challenging.

This newly developed product meets the required flexural strength of 3.0 N/mm² for sidewalk paving materials while achieving carbon neutrality by storing carbon within the block. This is accomplished by incorporating biochar, a by-product of woody biomass gasification power generation, which both fixes CO_2 and utilizes industrial by-products effectively.

Manufacturing the biochar interlocking blocks has been confirmed at TOKUYAMA ART BLOCK LABO Co., Ltd. We will continue working to expand the application of these blocks by enhancing performance in areas such as flexural strength and water retention—and establishing a stable supply system.

*Biochar is a carbon-rich by-product of biomass gasification

Biochar Interlocking Block



Cross-section [With Biochar]

Cross-section [Without Biochar]

Installation example