Mizuho Sustainability Focus 2025

Pioneering Sustainable Business for 2050: Toward the Grand Design Vision

– Pursuing Sustainable Growth Amidst Changing Times –

MIZUHO

Innovating today. Transforming tomorrow.

Toward resolving social issues while achieving economic growth

Proactively innovating together with our clients for a prosperous and sustainable future

Yasuhiko Ushikubo

Senior Executive Officer / Group Chief Sustainability Officer (Group CSuO)
Mizuho Financial Group, Inc.

Over the past year, we have witnessed rapid changes in the global social and economic environments related to sustainability. In the area of climate change, partial shifts in U.S. policy following the change in administration, along with rising project costs driven by inflation, have affected companies' decarbonization efforts. At the same time, companies have shown greater interest in balancing responses to social issues and economic growth while confronting social and economic realities, as seen in the renewed recognition of the importance of energy security and increasing debate over *adaptation* to climate change. Meanwhile, in Japan, with the formulation of the Green Transformation (GX) 2040 Vision and revisions to the GX Promotion Act, decarbonization initiatives have entered the execution phase, and the government and private sector are working together to advance them.

The goal of achieving carbon neutrality by 2050 remains unchanged. It is essential to maintain core policies and strategies from a medium-to long-term perspective and to stay committed toward the goal, without changing our stance. At the same time, in the short term, we need to respond flexibly to ongoing environmental changes. For example, the expected timeline for the energy transition has shifted due to global environmental changes. As the introduction of hydrogen, which is expected to play a central role in the energy transition, has been slightly delayed, LNG has grown in importance for the time being. To offset CO_2 emissions, we believe that it is necessary to implement CCUS initiatives strategically.

As not only climate change but also social issues, such as resource circulation, nature conservation, and human capital, have become increasingly diverse and complex, it will be important to consider *impact*—an indicator that comprehensively evaluates the outcomes of initiatives. Also, Mizuho will focus on *adaptation* finance, sustainability data utilization, and blue economy-related businesses to respond to a wide range of environmental changes. In particular, we will advance related initiatives across the group to create new blue economy-related businesses which also reflect Mizuho's corporate color.

Mizuho's sustainable business strategy is to envision the ideal state of Japanese industry in 2050, work together with our clients to take on the challenge of decarbonization to achieve this state, and drive the transformation of Japan's industrial structure. To share this strategy with our clients, we reiterate the approaches underlying our "Grand Design" in this report.

Mizuho believes that transforming the industrial structure and enhancing industrial competitiveness will create a pathway to solving social issues, including climate change, while achieving economic growth and helping our clients grow and enhance their corporate value. Achieving this goal is the realization of true sustainability. Mizuho will make efforts, while exerting our strength, to *proactively innovate together with our clients for a prosperous and sustainable future.*

Positioning of the Sustainability Focus Reports

Since 2023, Mizuho has shared its insights on sustainable business. The first report outlined the positioning of sustainability initiatives for enhancing corporate value and analyzed promising business fields. The second report presented Mizuho's sustainable business strategy based on those findings. The third report outlines the positioning of the strategy in light of recent external environments and focuses on cases of specific initiatives that Mizuho made in line with the strategy.

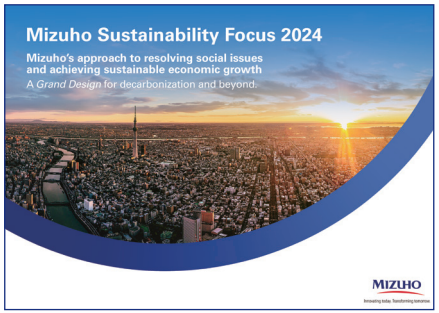
2023

Promising business fields from a sustainability perspective

Sustainability initiatives serve as measures for Japanese companies to **enhance their corporate value.**

2024

Fields that Mizuho focuses on for decarbonization and economic growth



Initiatives related to **hydrogen, carbon credits, the circular economy, and impact** need to be accelerated to realize a sustainable society by 2050.

2025

Specific initiatives toward transforming the industrial structure by 2050

How will Japan's industry look in 2050, combining both economic growth and decarbonization? Mizuho is addressing clients' challenges and taking proactive steps.

Although stances toward climate change have wavered globally, Mizuho retains the goal of achieving carbon neutrality by 2050 and is advancing initiatives that prioritize realistic transition, aiming to balance this ambition with continued economic activity. In addition, Mizuho has placed emphasis on the importance of the circular economy and on impact business fields, as well as responses to climate change, and has begun implementing a wide range of approaches.

ACT0 Grand Design

> p.7, Appendix

- In Mizuho's sustainable business, we have envisioned the ideal Japanese industrial structure in 2050 that achieves both carbon neutrality and sustainable economic growth as a "Grand Design" and aim to enhance Japan's industrial competitiveness through the transformation of the industrial structure.

ACT1 ～ ACT4

ACT1 Impact business

> p.11

- Visualize a variety of indicators to resolve social issues through integrated approaches, apply them in evaluation and financing, and actively pursue the development of new products.
  - **Mizuho's human capital management impact finance**
  - **Contribution to impact generation through deposits**

Columns

Advanced themes for impact generation

1. Blue economy-related business > p.15
2. Adaptation > p.16
3. Sustainable data (*visualization*) > p.18

ACT2 Circular economy

> p.19

- Aim to develop supply chains that link forward and reverse supply chain flows within regions or new fields from a perspective of resource circulation that is closely tied to decarbonization and security.
  - **Develop a closed loop for aluminum from retired truck bodies.**
  - **Verification projects for food tray recycling**

ACT3 Transition support

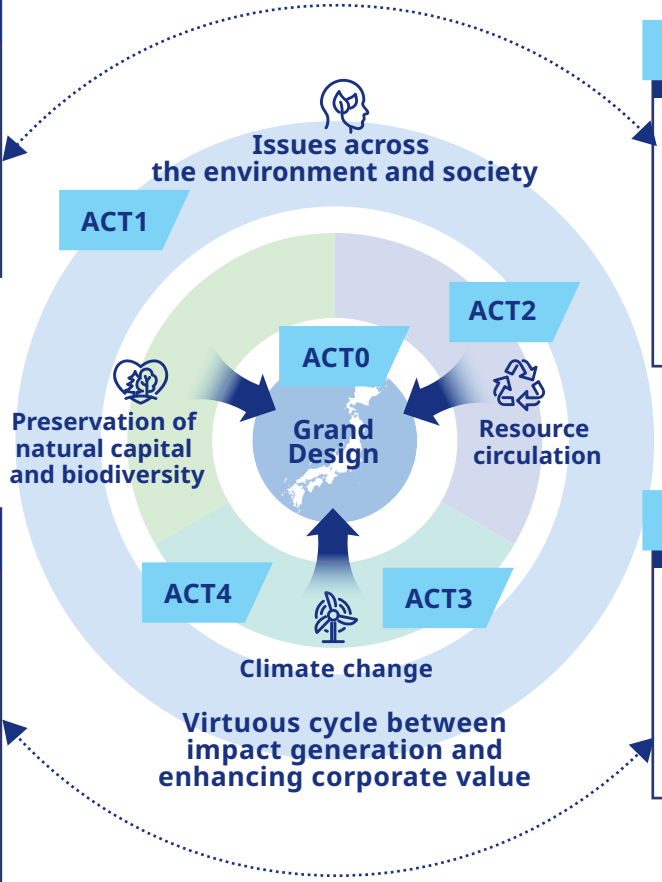
> p.24

- Provide multifaceted support for transition needs to achieve the decarbonization goal by 2030.
  - **Establish financing frameworks for decarbonization at seaports.**
  - **Services of analyzing electricity costs, including renewables**

ACT4 Hydrogen / carbon credits

> p.30

- Provide long-term support for decarbonization in the lead-up to 2050.
- Amid sluggish hydrogen business around the world, view energy transition as a whole and implement a broad range of initiatives.
- Provide support for the creation of compliance credits for the Green Transformation Emissions Trading System (GX-ETS), as well as voluntary credits, and aim to utilize transition credits in Asia.
  - **Initiatives in food and agriculture sectors to expand the utilization of J-credits.**



Source: Compiled by Mizuho Financial Group

Contents

♦: Cases

Mizuho's Approach

A year of wavering stances toward climate change Aiming for a realistic transition that enables economic activity

In 2024 and 2025, we observed a major shift in investment trends related to climate change initiatives in the U.S. In Europe as well, the stances toward climate change have been reassessed to better align with the reality. In Asia, the concept of transition has gained broad acceptance, as rapid decarbonization is difficult, and initiatives have been advancing steadily. Today, the importance of the concept has become recognized around the world. Although levels of interest vary by country and concerns are growing, Japan has maintained a largely consistent stance and is continuing and accelerating transition-related efforts across both the public and private sectors. It is obvious that disasters induced by climate change, such as sea-level rises, extreme weather events, and wildfires caused by drought and dryness, have become more severe. In the past, initiatives prioritized measures to reduce greenhouse gas (GHG) emissions—the cause of global warming. However, as the impact of climate change intensifies year after year, emphasis is now being placed on *adaptation* measures that strengthen resilience and enhance capabilities of adapting to situations after disasters.

	Recent changes	Key impact
Global	Prolonged inflation Greater importance of economic security	The completion schedule for investment projects, including hydrogen and offshore wind power, has been delayed. The importance of resource circulation within Japan and among allies has increased.
U.S.	Policy shifts under Trump 2.0	In certain sectors and regions in the U.S., government support for decarbonization investment is being reduced. Meanwhile, impact investment may attract attention as a form of post-ESG investment.
Europe	The European economy, which has led decarbonization, has slowed down.	Europe, which was at the forefront of disclosure and regulation, is now moving toward more realistic rules and transition measures.
Japan	Based on the GX 2040 Vision, the green transformation policy has accelerated. Impact investment and lending themes have been incorporated into the New Form of Capitalism policy.	Japanese companies continue to advance toward decarbonization. Utilization of GX-ETS credits will become important (compared to sluggish utilization of voluntary credits). Impact investment and lending will continue to expand.
Asia	There is growing need to respond to the increasing severity of natural disasters.	***Adaptation*** in countries and regions that are more vulnerable to disasters has drawn attention.

Source: Compiled by Mizuho Financial Group based on various published materials

External environment momentum compared to FY2024

Transition

Hydrogen

The selection of hydrogen-related projects has advanced globally. In Japan, support for price differentials is fully underway.

Carbon credits

Although voluntary credit trading has been on a downward trend, activity in the compliance market is strong.

Circular economy

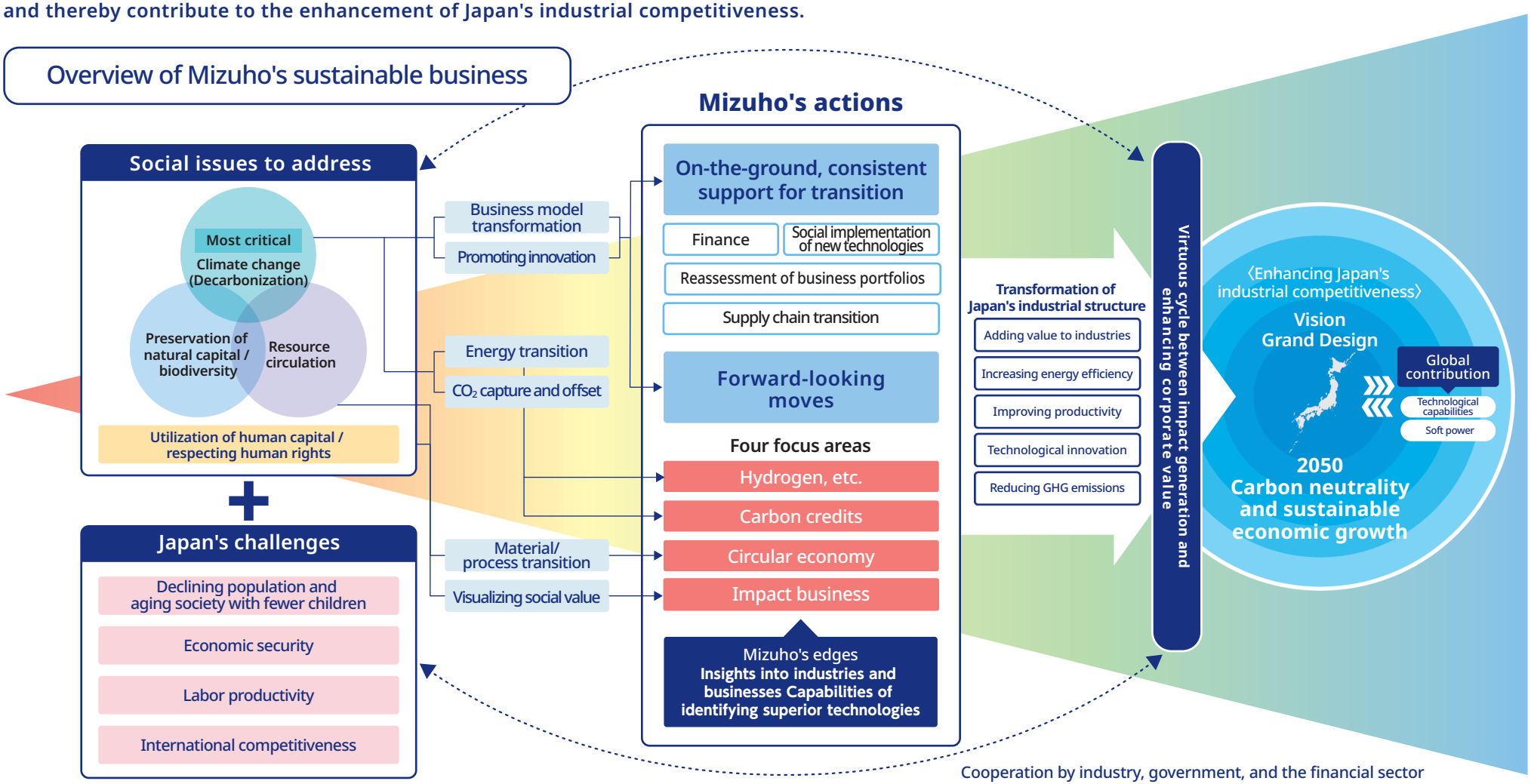
Impact

Despite significant changes in the landscape around responses to climate change, the direction to be pursued has remained unchanged.

To strengthen Japan's industrial competitiveness, Mizuho is promoting the transformation of industrial structure by considering the resolution of social issues from an industrial perspective.

Given Japan's challenges, such as a declining population, we expect that it will be difficult to maintain the competitiveness of Japanese industries under the existing industrial structure. Mizuho has envisioned **the ideal Japanese industrial structure that achieves both carbon neutrality and sustainable economic growth** as a "Grand Design." To realize this vision, we aim to **create a virtuous cycle between impact generation and enhancing corporate value by resolving social issues and thereby contribute to the enhancement of Japan's industrial competitiveness.**

Overview of Mizuho's sustainable business



Source: Compiled by Mizuho Financial Group

Starting point of the "Grand Design": Envision Japan's future industrial structure based on the vision for the manufacturing industry.

Japan's manufacturing sector currently accounts for a relatively high share of GDP compared with other developed countries. However, production volumes are expected to decline by 2050 as demand within Japan weakens due to the population decrease. With the manufacturing industry, which has driven Japan's economic growth, now facing the need to transform its business model, we began formulating the 2050 vision by first inquiring into the preferred state of the manufacturing industry in order to maintain and enhance Japan's industrial competitiveness.

Current state of the manufacturing industry

[Manufacturing share of GDP]

- Japan: Approx. 21%(2023)
- EU: Approx.14%(2023)
- U.S.: Approx.10%(2024)

Source: World Bank Open data

A relatively high manufacturing share compared to other developed countries

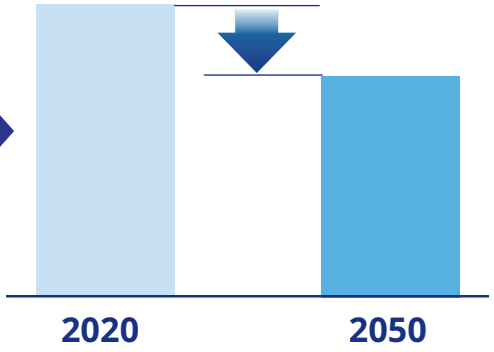
External environment changing for Japan's manufacturing industry toward 2050

- Population decline ▶ Weaker demand in Japan
- Rise of China and India ▶ Decline in exports of general-purpose goods from Japan
- Advancement of local production for local consumption ▶ Shift toward local manufacturing

Limit to systems generating profit through volume production
A shift from quantity to quality is required.

Manufacturing in 2050

[Changes in manufacturing output] (outline)



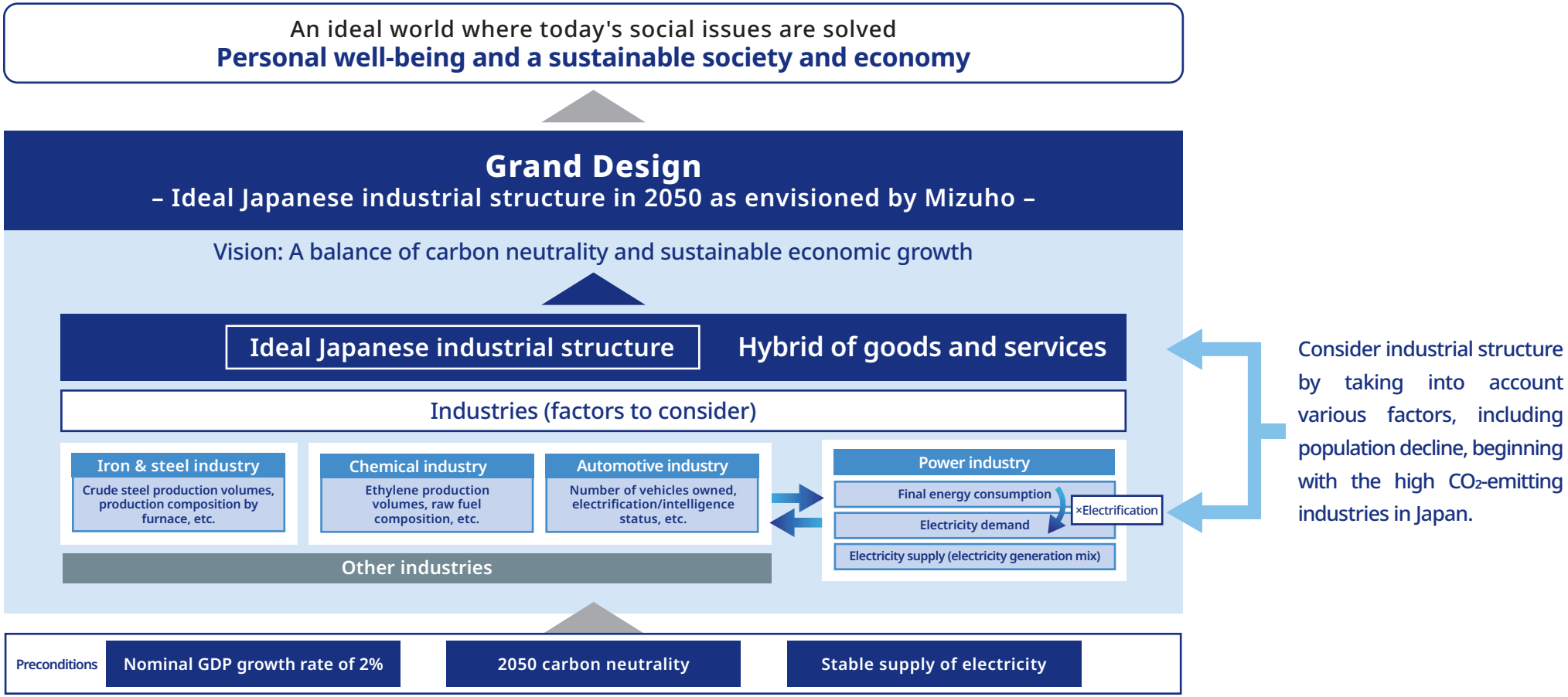
A reduction in output volume is expected by 2050.

What is the preferred state of Japan's industrial structure toward 2050?

Source: Compiled by Mizuho Financial Group

Taking on challenges together with our clients to pursue the ideal Japanese industrial structure in 2050

The difficulty of achieving decarbonization varies depending on which energy source—thermal or electric power—each industry requires and the amount of decarbonized power sources—such as renewable energy—that are available. In Japan, where a large share of CO_2 emissions originates from thermal sources, decarbonization requires more than just electrification and power-source decarbonization. It requires a transformation in industrial structure. Decarbonization is expected to create a considerable burden. If this hinders economic growth, then the personal well-being and sustainable society and economy in Mizuho's ideal world cannot be realized. The Grand Design presents a view of an ideal world in the remote future of 2050, and this is naturally highly uncertain. We will update it to reflect changes in the internal and external environments as well as through discussions with our clients.



For details of the Grand Design, refer to the Appendix.▶

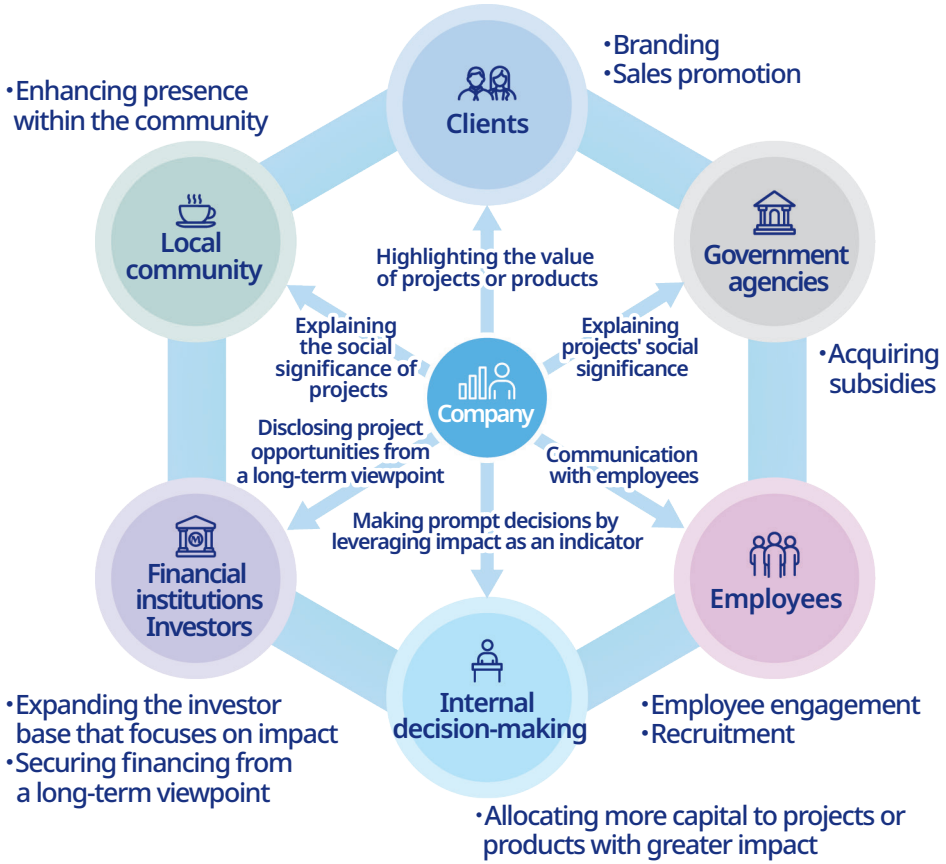
Source: Compiled by Mizuho Financial Group

Integrated Approach to Social Issues

To enhance corporate value through impact generation

Impact refers to the social and environmental changes and effects generated by projects and activities. Visualizing the social value created through project activities, in addition to their economic value, and sharing this with stakeholders enhances the value of the projects and companies.
We believe that it is important to recognize impact and incorporate it into management decision-making when addressing risks or capturing opportunities in order to respond to diverse social issues.

Capturing opportunities through impact generation



Source: Compiled by Mizuho Financial Group based on various published materials

Mizuho's initiatives

❶Mizuho Natural Capital Impact Finance

Point **Evaluate clients' initiatives related to natural capital, such as nature-positive management and readiness for compliance with the Taskforce on Nature-related Financial Disclosures (TNFD).**

- Promote impact generation related to natural capital that forms the foundation of social and economic activities.
- As there is no standardized measurement method or clarified common goal for natural capital, this product was developed based on advice from United Nations Development Programme (UNDP) experts regarding approaches for impact generation by incorporating global perspectives.

❷Single-parent family housing support fund

Point **Collaborate with investors to achieve both social contribution and financial returns.**
Promote social impact generation by supporting housing for single-parent families and facilitating their advancement toward independence.

- Mizuho Trust & Banking and Mizuho Real Estate Management raise funds from investors who support assistance for single-parent families and establish a rental housing fund.
- Through the fund, economic and social independence of residents is supported by offering preferential rent and career self-reliance support programs.

Key examples of impact-related support

Mizuho provides diverse solutions that meet clients' needs by leveraging insights accumulated through participation in various initiatives and collaboration with external parties.

	Clients' needs	Key solutions provided by Mizuho
Issue recognition	Visualize the social impact generated by various projects	MHRT* consulting support through the Mizuho Impact Navigator
Strategy planning	Incorporate an impact-oriented mindset into corporate management	MHRT consulting support through the Mizuho Impact Navigator
	Contribute to positive impact generation at other companies	Introduction of the Mizuho Impact Deposit
	Raise funds for positive impact generation	Positive Impact Finance Positive Impact Finance PRO Mizuho Eco Finance
Strategy implementation	Specifically, generate impact related to human capital management	Mizuho Human Capital Management Impact Finance
	Specifically, generate impact related to natural capital	Mizuho Natural Capital Impact Finance
	Specifically, visualize GHG emissions and generate impact	GHG Visualization Impact Finance
	Specifically, evaluate avoided emissions and generate impact	New Mizuho Avoided Emissions Impact Finance https://www.mizuhobank.co.jp/corporate/sustainability/aeif/index.html (Available in the Japanese language only)

*Mizuho Research & Technologies

Human Capital
Impact
Finance

Shaping the future of human capital management through Impact Finance

■ In addition to financial support, Mizuho provides a broad range of support for human capital management initiatives through discussions, monitoring, etc.

Challenge

[Background and issues]

- Amid intensified competition for human resources and changes in industrial structure, the source of corporate value has shifted from tangible to intangible assets. In this context, visualization and disclosure related to human capital are required.

Solution

[Initiatives]

- Mizuho has developed a framework that comprehensively evaluates companies' human capital management initiatives by assigning scores based on disclosed information and provides labelled lending to companies that achieve scores above a specified threshold.

Result

[Initiative outcomes]

- Mizuho supports companies in generating positive impact related to the visualization and execution of human capital management through the evaluation of initiatives, feedback, annual monitoring, engagement, and other activities.

*Mizuho Research & Technologies

Comment by person in charge

There are few precedents for financing that focuses on human capital management, and this was a new endeavor for Mizuho as well. By evaluating not only whether indicators are disclosed but also the purpose and rationale behind the disclosures, as well as the relationship between the disclosures and strategy, we support human capital management initiatives as a part of human resource strategies linked to management strategies.

Contribution to positive impact generation through deposits

Impact

Deposit

- In October 2024, Mizuho Bank began offering the Mizuho Impact Deposit to corporate clients.
- As the deposited funds are used to finance companies that strive to generate positive impact for the environment, society, and the economy, clients can indirectly contribute to positive impact generation.

Challenge

[Background and issues]

- Mizuho became the first Japanese private financial institution to offer an impact deposit to generate greater positive impact for the environment, society, and the economy.

Solution

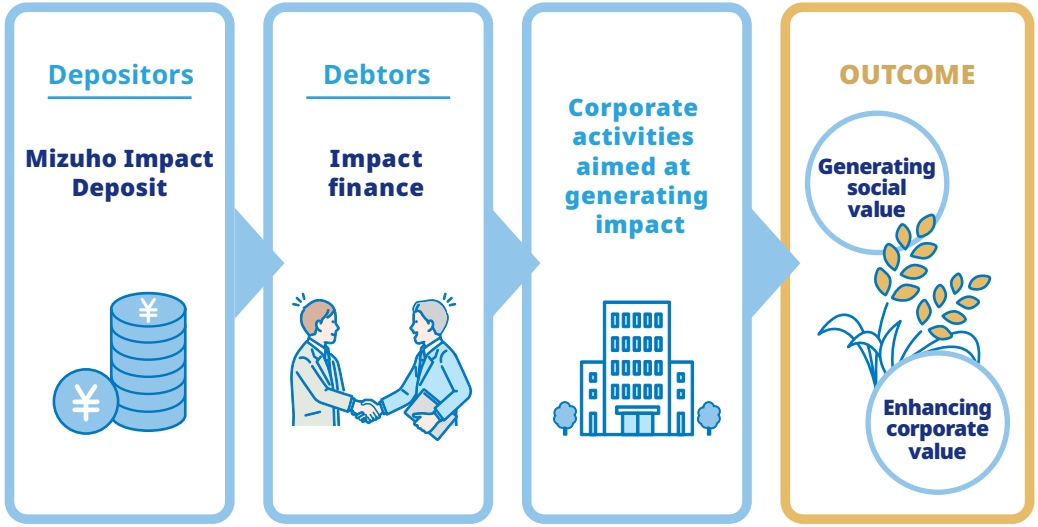
[Initiatives]

- To gain broader support, the product was structured to reference large time deposits that are covered by deposit insurance and carry no foreign exchange risk.

Result

[Initiative outcomes]

- The deposit facilitates support for corporate activities with a positive impact on the environment, society, and the economy. Companies can also highlight their activities in the sustainability field.



Comment by person in charge

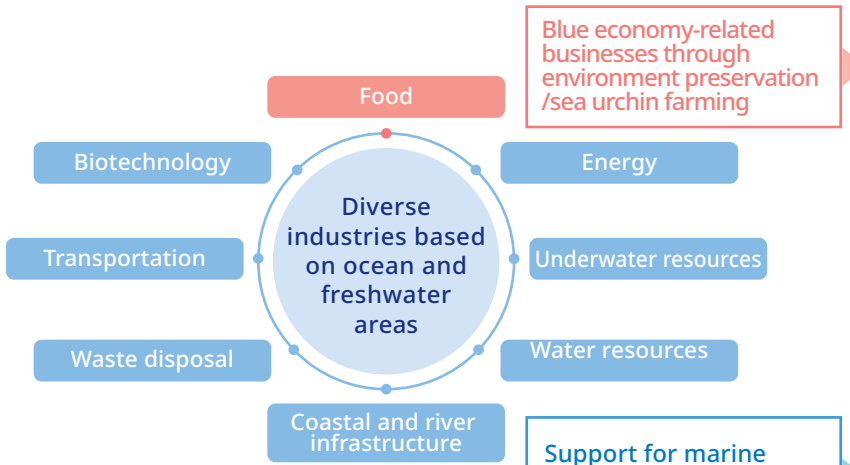
Companies with an interest in sustainability management have welcomed this deposit, and applications from corporate clients have exceeded the initial cap of JPY 100 billion. We therefore closed the first round of applications and in March 2025 raised the cap and launched a second round.

Column

Expectation for blue economy-related businesses utilizing Japan's water resources

As an island nation with an extensive exclusive economic zone, Japan has limited land-based resources, but its utilization of abundant water resources is attracting growing attention. According to statistics from the Organisation for Economic Co-operation and Development (OECD), the total added value in this field is expected to reach USD 3 trillion by 2030 as its economic scale continues to expand. Because blue is the color that symbolizes Mizuho, we will actively support initiatives related to blue economy-related businesses.

Overview of blue economy-related businesses



Japan's total area, including land and its exclusive economic zone
6th largest in the world

Total added value expected to reach
USD 3 trillion by 2030

For preservation of the marine environment, creation of blue carbon, and high-quality sea urchin farming

(Investment in Verdant Bloom Ltd., the parent company of Urchinomics Group)

- Underwater seagrass beds provide an important habitat for marine species and serve as a vital source of blue carbon, as they absorb CO_2 through photosynthesis.
- Urchin barrens, a phenomenon in which large numbers of sea urchins consume all the kelp, has led to the degradation of marine biodiversity.

- Harvest undernourished, inedible sea urchins that cause urchin barrens and raise them into high-quality edible sea urchins.
- These efforts achieve both marine environment preservation and blue carbon generation. The company has received high international recognition, and Mizuho supports these efforts through investment.*

*This is an officially endorsed project of a company that was selected as one of only three for-profit corporations globally under the United Nations Decade of Ocean Science for Sustainable Development adopted at the United Nations General Assembly.

Funding for advanced marine education and research

(Hokkaido University's "HU Ambitious Bond" Issuance)

- Hokkaido University issued a Sustainability/Blue Bond to raise funds for developing advanced educational and research environments. Mizuho supported the development of the framework.
- The framework establishes Blue eligibility criteria as one of its key elements, enabling fundraising through the "HU Ambitious Bond" for projects that contribute to a sustainable marine value chain.

Source: Compiled by Mizuho Financial Group based on various published materials

Column

Adaptation initiatives ①

In the *Global Risks Report* published by the World Economic Forum, failure to mitigate or adapt to extreme weather and climate change has been ranked as one of the top risks since 2019. Although climate change measures have traditionally focused on "mitigation"—particularly the reduction of GHG emissions—the limits of mitigation are becoming apparent. In this context, it is essential to address both ongoing and potential climate change and its impacts. Countries vulnerable to climate change risks include those in Southeast Asia, South America, and Africa. Actions to address climate change are unavoidable, and, for Southeast Asia in particular, where a lot of production sites of Japanese companies are located, the impact on the Japanese economy is significant, making the issue urgent.

Measures to address climate change

Mitigation ⟷ **Adaptation**

Reducing GHG emissions and addressing the causes of climate change

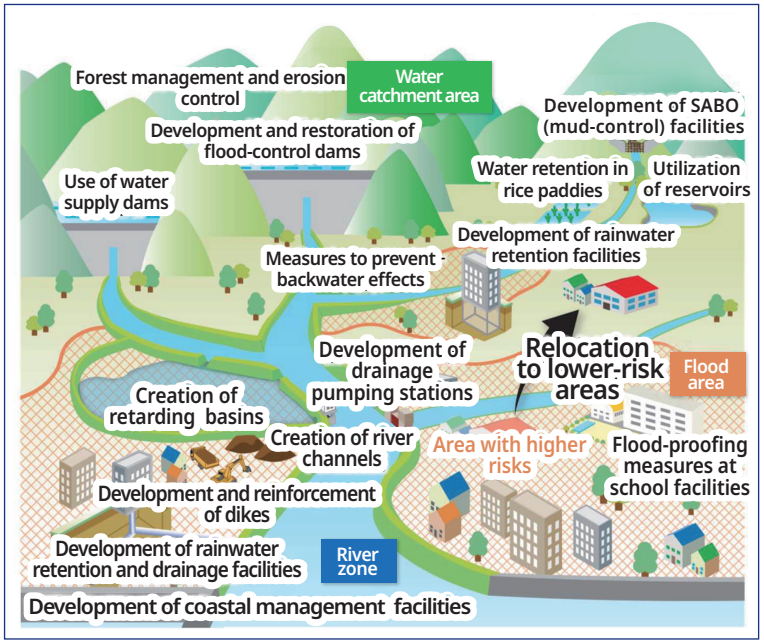
Addressing phenomena that emerge due to climate change

As the significant effects of climate change have surfaced, the importance of *adaptation*, as a risk management measure, has been increasingly recognized.

Adaptation measures

- Disaster preparedness
- Investment in ex-ante measures for disaster risk reduction
- Protection against heatstroke
- Development and cultivation of new crop varieties that can grow in higher temperatures
- Effective and efficient water utilization
- Protection against infectious diseases

Adaptation measures for water-related disasters (examples)



Source: Report on the promotion of flood control in watershed areas on the website of Japan's Ministry of Land, Infrastructure, Transport and Tourism (available in the Japanese language only)

Source: Compiled by Mizuho Financial Group based on various published materials

Column

Adaptation initiatives②

In Japan, where people are traditionally better prepared for disasters, the impact of climate change may have been felt limited until recently. However, extreme summer heat has heightened the public awareness of climate change. Meanwhile, in developing Southeast Asia, economies and societies are being directly affected by various phenomena, including stronger typhoons driven by rising seawater temperatures, floods and landslides caused by heavier rainfall, dry-season droughts, and rising sea levels. Rethinking of agriculture urban habitat, engagement with nature are needed, and no time can be wasted in advancing adaptation initiatives. Mizuho not only participates in discussions on adaptation finance in Southeast Asia but also applies them intoasbusiness, aiming for a world where Japan and Southeast Asia learn from one another.

Megumi Muto
Deputy Group Chief Sustainability Officer
(Previously Vice President and Chief Sustainability Officer of Japan International Cooperation Agency [JICA])

Executing finance

Issuance of green/nature bonds

- The Green/Nature Bond issued by Nagoya City designates the installation of air-conditioning systems in school gymnasiums as the use of proceeds, aiming to prevent heatstroke as part of climate change adaptation measures.
- This framework is the first in Japan to comply with ICMA's *Nature Bond Guidelines*, and Mizuho supported its development.

Project categories under the Green Bond Principles		Projects to which funds will be allocated	Environmental benefit
Green eligibility	Adaptation to climate change	Improvement of air-conditioning equipment in school gymnasiums	Protection against heatstroke
	Green buildings	Renovation of the Mizuho Park Athletics Stadium	CO_2 emissions reduction
	Prevention and management of pollution	Upgrading equipment at the Nanyo Incineration Plant	Reduction of hazardous material emissions CO_2 emissions reduction
Nature eligibility	Preservation of biodiversity	Renewal of the Higashiyama Zoo and Botanical Gardens (Protection and breeding of rare animals)	Conservation and breeding of rare animals Contribution to biodiversity conservation

Consideration of adaptation finance in Southeast Asia

Participation in the Working Group on Adaptation

- The Working Group on Adaptation was established as an industry advisory panel to the joint task force on sustainable finance of the ASEAN Capital Markets Forum (ACMF) and the ASEAN Working Committee on Capital Market Development (WC-CMD). Mizuho serves as the chair of the working group.
- The working group is designed to provide a platform for private-sector engagement and feedback and consists of members representing Asian and international capital markets, banks, insurance companies, and a broad range of other financial sectors.

Prediction of phenomena

Mizuho Research & Technologies (MHRT) Flood simulation service

- MHRT has simulation technologies capable of evaluating various types of floods, including urban floods, tsunamis, and storm surge, as well as technological insights in the adaptation field.

Source: Compiled by Mizuho Financial Group based on various published materials

Column

Visualization initiatives

To disclose companies' sustainability-related initiatives, it is essential to *visualize* them using quantitative metrics and to ultimately implement improvement activities. Specifically, quantitative indicators include GHG emissions, human capital investment, human rights initiatives, water usage volumes, and waste disposal volumes. In particular, GHG emissions disclosure is required across a wide range of industries. Mizuho supports companies in achieving smooth decarbonization through visualization and collaborates with e-dash—a capital and business alliance partner—to develop mechanisms that underpin decarbonization across supply chains and industrial structure transformation.

Initiative steps toward decarbonization

- STEP1 /Know
  - Information collection
  - Policy consideration
- STEP2 / Measure
  - Calculation of CO_2 emissions
  - Policy consideration
- STEP3 / Reduce
  - Formulation of reduction plans
  - Implementation of reduction measures
- STEP4 / Monitor
  - Measurement of the effects of reduction measures
  - Revision of reduction plans

Mizuho's initiatives

- Discussions with personnel responsible
- Provision of an emissions measurement system by e-dash
  - Bills for electricity, etc. → Automatic conversion into CO_2 emissions volumes → Data accumulation ▶ Support for CO_2 emissions visualization and development of reduction plans
- Consulting services by MHRT* and e-dash for planning and emissions reduction
  - More sophisticated advisory services available with collaboration between MHRT and e-dash
  - Consulting services for planning and emissions reduction
    - Accumulated data → Energy efficiency assessments / Renewable energy procurements / Energy-saving proposals / J-Credits
    - Proposing decarbonization solutions
    - ・Support for responding to CDP questionnaires
    - ・Support for obtaining SBT certificates for small- and medium-sized enterprises
    - Support for disclosures
- Support through solutions, including sustainable finance using emissions reductions as SPTs**

*Mizuho Research & Technologies **Sustainability Performance Targets

Through sophisticated visualization, contribute to the promotion of avoided emissions-related business.

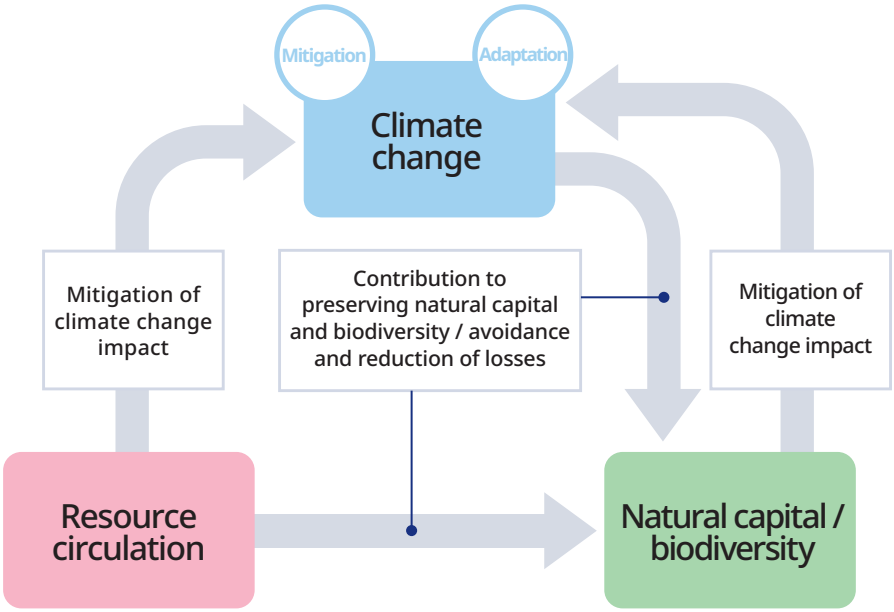
For details on avoided emissions, visit this website. ▶ https://www.mizuhogroup.com/binaries/content/assets/pdf/mizuhoglobal/sustainability/overview/report/avoided_emission_report_2025.pdf

Source: Compiled by Mizuho Financial Group based on various published materials

Contribute to addressing climate change and preserving natural capital through resource-circulation initiatives.

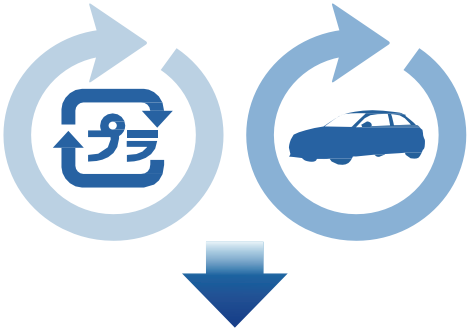
As environmental issues are interconnected, it is essential to do business taking into account both their positive and negative impact.
The importance of the circular economy is growing because it not only addresses economic security and resource constraints but also contributes to tackling climate change and preserving natural capital and biodiversity.
Mizuho supports efforts to generate positive impact on the environment by promoting the circular economy for more efficient use of valuable resources and energy.

Interconnectedness of environmental issues

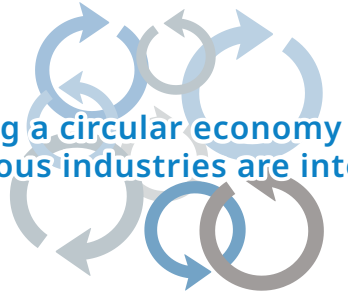


Sustainability initiatives can generate both synergies and trade-offs across various fields.

(Previous) Developing individual supply chains for each material or product



Mizuho plays a core role in developing the future *circular economy industry* with its "power to connect."



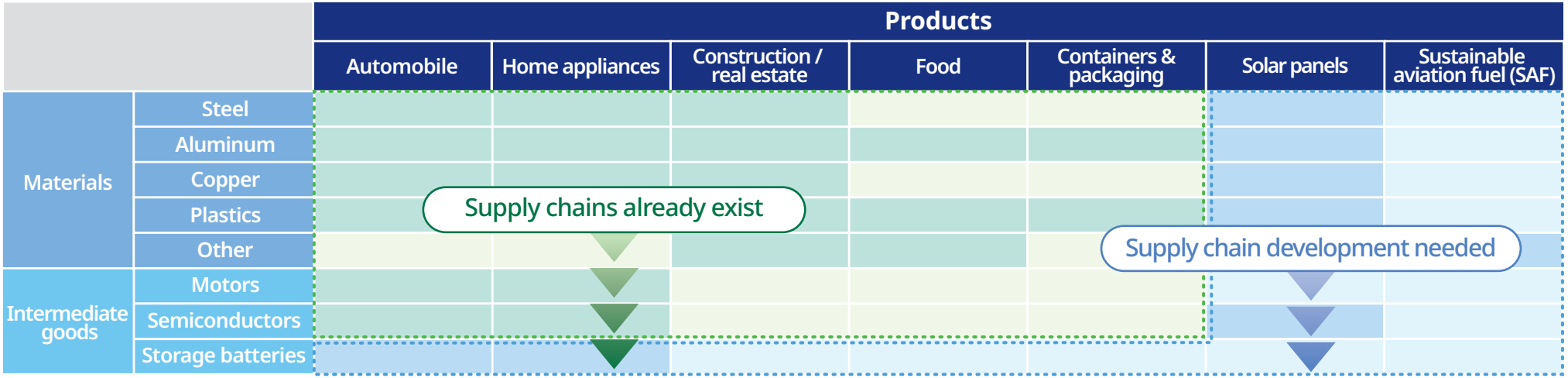
Developing a circular economy industry in which various industries are interconnected

Source: Compiled by Mizuho Financial Group based on various published materials

Approaches to the circular economy

Japan's issues include the fragmented supply chain linking industries in the forward and reverse supply chains, inefficient collection caused by dispersed operators, and weak demand for recycled materials. On the policy side, Japan's revised Act on the Promotion of Effective Utilization of Resources, which eases regulations and introduces subsidies, is being implemented. Going forward, it will be essential to advance initiatives from two perspectives: developing an efficient recycling system and creating demand for recycled materials. In particular, for the development of a recycling system, it is important to take approaches focusing on two aspects: how the existing supply chains can be used locally and how supply chains can be developed in new fields.

Approaches to the circular economy



Creating a local recycling system by connecting recyclers and local companies

Case 1 Support for the verification project for aluminum recycling → p.21

Case 2 Support for the verification project for waste plastic recycling → p.22

Recycling system development in new fields

Investment in Altilium Metals Ltd. (U.K.)

Point Support for developing a circular supply chain for rare metals

- The company operates a verification plant that recycles LiBs*, which are used in EVs and other applications, and produces low-carbon, sustainable materials for recycled batteries.

Participation in Green Fuel Forward

Point An initiative to develop a SAF supply chain in Asia

- Mizuho participates as the only Japanese company in Green Fuel Forward, which aims to expand demand for sustainable aviation fuel (SAF) in the Asia-Pacific region.

Source: Compiled by Mizuho Financial Group based on various published materials

*Lithium-ion battery

Aiming to develop a closed loop for End-of-Life truck bodies—a first for Japan

Circular economy

Verification project

- Japan is highly dependent on other countries for various materials, including aluminum.
- In April 2025, Mizuho announced Japan's first verification project to establish a supply chain within the country for aluminum recovered from End-of-Life truck bodies, in collaboration with Nippon Light Metal Group and TRE HOLDINGS.

Challenge

[Background and issues]

- Because Smelting primary aluminum requires massive amounts of electricity, Japan relies entirely on imports.
- Although recycled aluminum has a benefit of reducing GHG emissions to about 1/30th compared to those generated from primary aluminum, many sources of recycled aluminum, such as used cars and other used products, are exported to countries outside Japan.

Solution

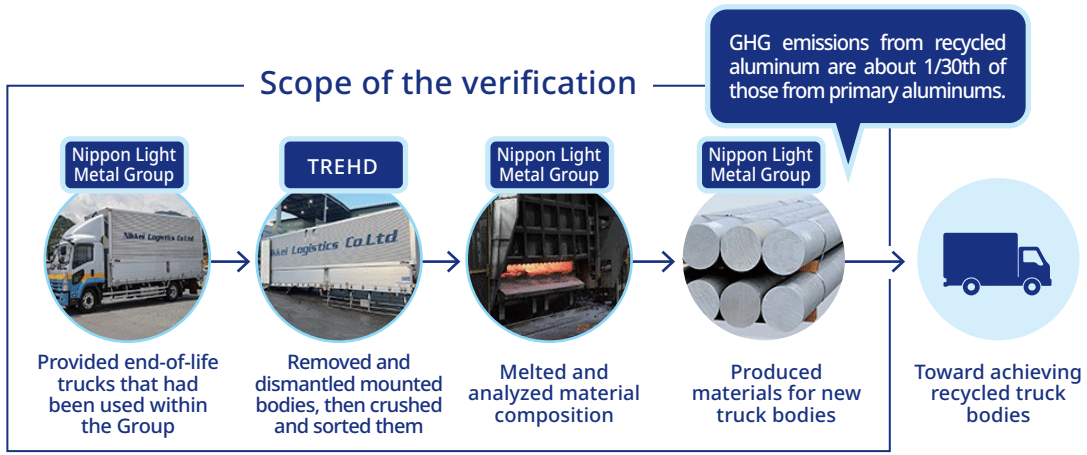
[Initiatives]

- This verification project showed that a closed loop within the supply chain in Japan can be established to strengthen Japan's industrial capabilities by reducing global GHG emissions and decreasing dependence on resources outside the country.

Result

[Initiative outcomes]

- Mizuho has played a central role in fostering collaboration between forward and reverse supply chain industries by leveraging its ability to connect companies and has promoted a shift toward a cross-industry supply chain that individual forward and reverse supply chain companies could not achieve on their own.
- Mizuho contributes by utilizing its leasing functions and expertise.



Working together to realize the concept

MIZUHO

MHRT* Advisory services for commercialization based on the verification project

MHLS** Providing truck leasing and rental functions

*Mizuho Research & Technologies **Mizuho Leasing

Comment by person in charge

To realize circular economy, cross-industry collaboration between forward and reverse supply chain companies is essential. We achieved this collaboration by fully leveraging Mizuho's industrial expertise and networks, partnering with TRE HOLDINGS, a leading company in waste management and recycling, and utilizing Mizuho's leasing and advisory functions. Going forward, we will further advance this initiative and work with Nippon Light Metal Group to contribute to enhancing the competitiveness of Japanese industries and companies through the realization of circular economy.

Aiming to develop a resource circulation supply chain for waste plastics

Circular economy

Verification project

- In October 2025, Ogawa-econos, Mizuho Bank, and Mizuho Research & Technologies announced a collaboration aimed at the social implementation of an advanced regional recycling flow as the first step toward realizing a circular economy for waste plastics.
- The verification project showed the feasibility of achieving horizontal recycling through the chemical recycling connection of wasted food trays. As a result, Ogawa-econos decided to invest in advanced recycling equipment that promotes resource circulation for waste plastics. For the investment, Mizuho will consider supporting the development of a resource circulation supply chain, in addition to providing support through sustainable finance.

Challenge

[Background and issues]

- Many wasted food trays are disposed of by incineration after distribution. Even when they are recycled, the process is often one-way, and cases of the horizontal recycling of food trays remain rare.

Solution

[Initiatives]

- By combining their technologies, these companies verified the connection of chemical recycling technologies for PS*, PP**, PET, and other plastics and conducted a verification project to develop a social system through collaboration between forward and reverse supply chain companies.

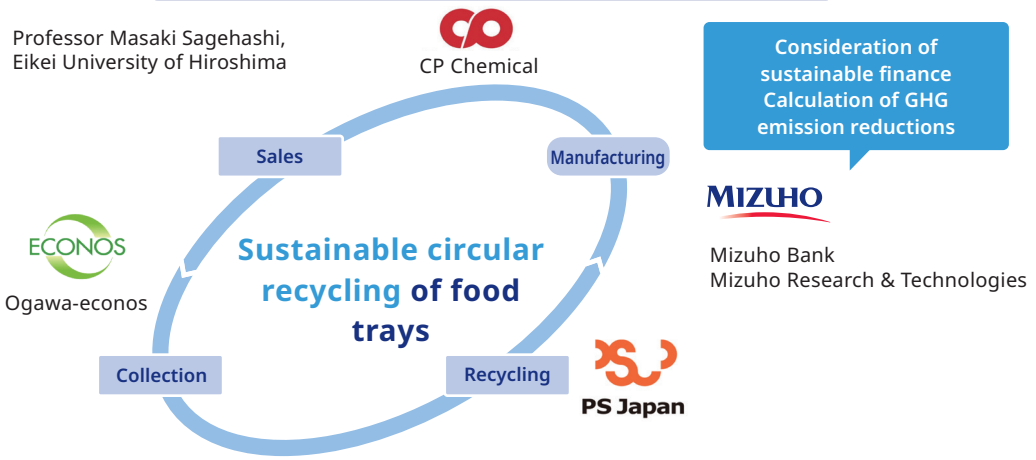
*Polystyrene **polypropylene

Result

[Initiative outcomes]

- The project confirmed that horizontal recycling can be achieved while delivering both GHG emissions reduction and resource circulation. Going forward, we will advance the project framework and make efforts with a view not only to the verification scheme for food trays but also to resource circulation for a broad range of packaging materials and key industries, including the automotive industry.

Chart of the academic-industrial collaboration adopted by Hiroshima Prefecture, Japan



A FY2024 project subsidized by Hiroshima Prefecture for promoting environment and energy industry clusters

Comment by person in charge

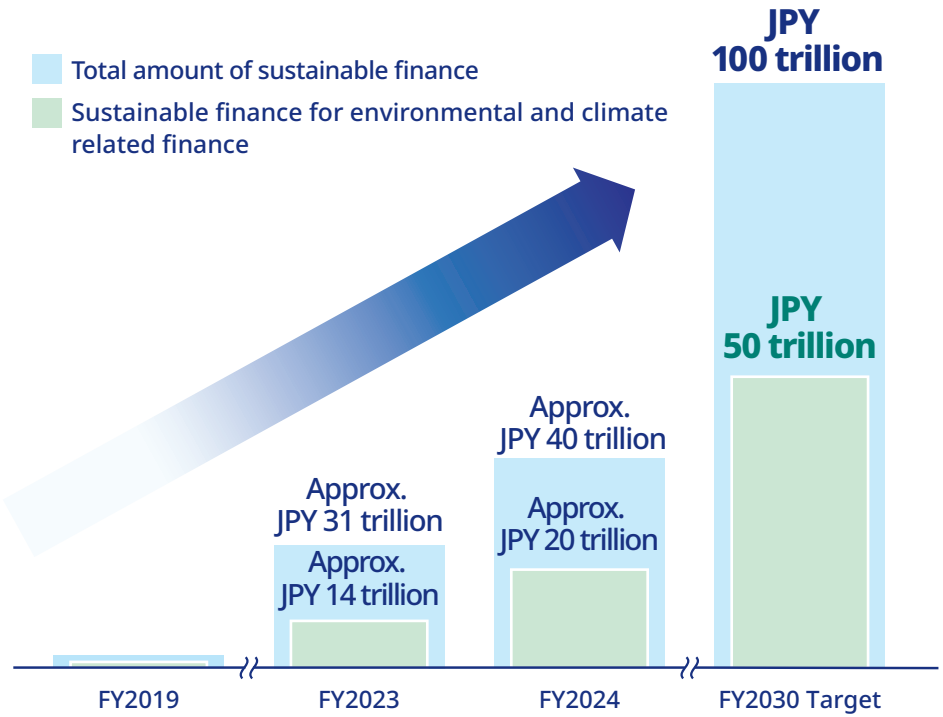
As a key driver of the circular economy, Mizuho aims to develop a regional recycling system that connects forward and reverse supply chain companies. We will take on challenges together with regional relevant parties to create a circular society.

Aim for Decarbonization

Consistent support for clients' transition

Given changes in both internal and external environments, promoting a *realistic* transition has become essential from the perspectives of industrial structure and growth strategies. Mizuho provides consistent support for sustainable finance by, for example, addressing clients' transition-related needs. In addition, through consulting services, etc., Mizuho engages in the social implementation and commercialization of new technologies, the reassessment of business portfolios, supply chain transitions, and other activities.

Trend in sustainable finance (since FY2019)



Source: Compiled by Mizuho Financial Group

League table / external evaluation

(Apr. 2024–Mar. 2025)
(Source: Capital Eye)

(Apr. 2024–Mar. 2025)
(Source: LSEG)

The 6th ESG Finance Awards Japan

- Mizuho Bank received the Gold Award (Minister of the Environment Award) in the Indirect Financing category.
- Mizuho Securities received the Bronze Award in the Financial Services category (for the fifth consecutive year).

Key examples of support for decarbonization initiatives

Mizuho supports clients across the business value chain by leveraging its strengths: *industrial expertise* and *expertise in environmental policies/technologies.*

	Clients' needs	Key solutions provided by Mizuho
Issue recognition	Deepen internal understanding of decarbonization initiatives as a management priority	Enlightening study sessions and workshops for officers and employees
	Measure and visualize Scope 1–3 emissions and identify issues	Support for visualizing GHG emissions Carbon footprint assessments for products, etc. Measuring avoided emissions
Strategy planning	Set reduction targets and devise pathways to achieve decarbonization	Formulating green transformation strategies and developing implementation frameworks
	Formulate business strategies that utilize the combination of decarbonization and new technologies	Business strategy formulation
Strategy implementation	Advance emission reductions within existing business portfolio	Support for renewable energy procurements Support for introducing energy-saving equipment Support for carbon credit procurements
	Advance emissions reductions through business structure transformation	Support for business transformation/business restructuring Support for research/demonstration projects for new technologies
	Consider financing options for strategy implementation	Sustainable finance products lineup

Examples of initiatives toward transitions

■ Mizuho works with clients to support their initiatives toward transitions by addressing sector-specific challenges.

Electricity

▶Served as bookrunner and SA* for the first transition bond issued by Hokkaido Electric Power (JPY 60 billion)

- The use of proceeds are for safety enhancement measures at Tomari Nuclear Power Station (e.g., construction of new sea walls, fire protection measures, and anti-seismic reinforcement).

Automobiles

▶Conducted market research and proposed implementation roadmap through consultations for formulating vehicle decarbonization business plans

- Considered not only hardware aspects, such as vehicle electrification, next-generation vehicle upgrades, biomass fuel adoption, and measures for adopting charging infrastructure, but also operational aspects, such as vehicle sharing

Oil & gas

▶Served as bookrunner and SA for the industry's first transition-linked bond issued by Osaka Gas (JPY 25 billion)

- An SPT** was set to reduce CO_2 emissions (Scope 1, 2, and 3) from Daigas Group's supply chain in Japan by 5 million tons in FY2030 (compared to FY2017).

Shipping

▶Developed Sustainable Shipping Impact Finance, a financing scheme that labels loans for vessels evaluated as environmentally friendly

- Closed the first loan agreements with Iino Kaiun (for a dual-fuel ethane carrier) and Shunzan Kaiun (for a dual-fuel LNG carrier)

Steel

▶Evaluated Kobe Steel's initiatives for transitions toward a decarbonized society and provided the Mizuho Eco Finance, a loan product linked to environmental assessments

- Other examples of consulting activities include research into the market trends of green steel products, LCA*** for products and services, and support for electricity procurement planning.

Aviation

▶Launched a project with Itochu, Eneos, Nippon Express Holdings, Japan Airlines, and Narita International Airport to develop a new scheme for trading Scope 3 Environmental Value, representing indirect CO_2 emission reduction effects from the use of SAF

Chemicals

▶Evaluated Yokohama Rubber's initiatives for transitions toward a decarbonized society and provided Mizuho Eco Finance—a loan product linked to environmental assessments

- Other examples of consulting activities include LCA for new technologies and support for transition planning and initiatives for avoided emissions.

Real estate

▶Established the Mizuho Green Recovery Fund to improve the environmental performance of properties over a certain age

- Launched the first project for an office building in Osaka Prefecture, marking Japan's first sustainability-linked loan within the category of real estate non-recourse finance—"Mizuho Real Estate Non-Recourse Sustainability-Linked Loans".

*Structuring Agent **Sustainability Performance Target ***Life Cycle Assessment

Decarbonization
Finance
Regional

Collaborate with local governments and support decarbonization at the Port of Yokohama in financial terms

- In March 2025, the Port of Yokohama CNP* Sustainable Finance Framework was announced. The framework was established by the City of Yokohama, as the port management body, with support from Mizuho Bank.
- As the first project, Mizuho concluded a green loan agreement with Daito Corporation to finance the construction of electric tugboats.

*CNP: Carbon Neutral Port

Challenge

[Background and issues]

- Promoting decarbonization is essential at ports, which serve as bases for international logistics and industries, and private-sector capital investment plays a critical role.
- Needs for mechanisms that support companies' initiatives in financial terms have become increasingly evident.

Solution

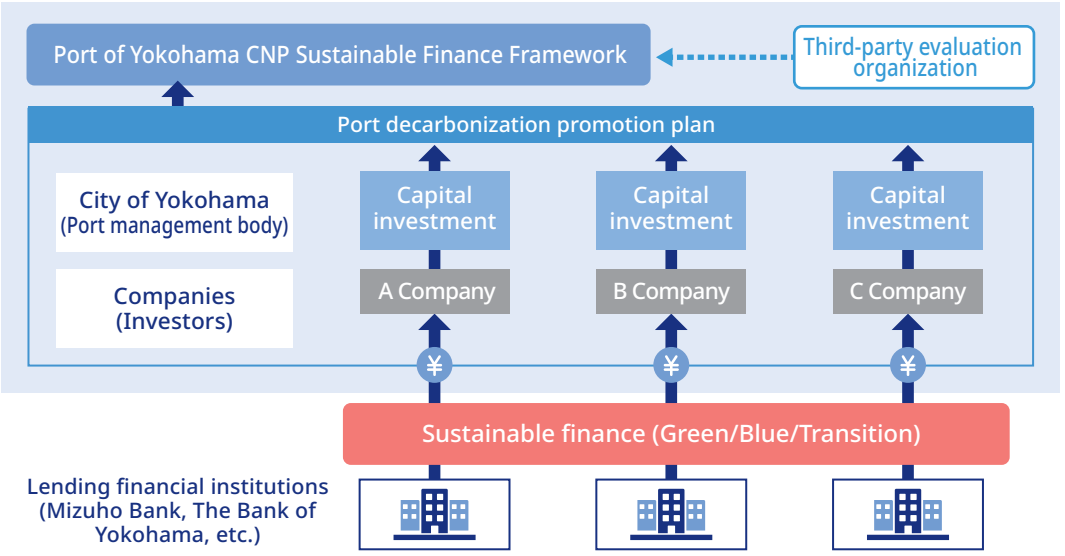
[Initiatives]

- The city (a local government) holds the framework for the entire port, which enables a wide range of operators to access sustainable finance while reducing their administrative and economic burdens.

Result

[Initiative outcomes]

- This has created a pioneering case where private-sector operators leverage a financing framework established by a local government. Other local governments are now examining or adopting similar initiatives, which shows a sign of broader rollout.



Comment by person in charge

The industry (clients), governments (national and local), and the financial sector (Mizuho Bank and regional financial institutions) took on challenges toward decarbonization in Japan in an integrated manner and created a pioneering case with potential for horizontal expansion. We believe that this is meaningful as an innovative step toward accelerating Japan's decarbonization initiatives.

Decarbonization
Renewable energy
Consulting

Research and analysis and consulting in the electricity field, including renewable energy

- Information on electricity prices is critical for business examination aimed at achieving carbon neutrality. As companies increasingly procure renewable electricity through corporate PPAs or other solutions in order to reduce their CO_2 emissions, the outlook for wholesale electricity market prices is expected to become an important reference indicator when determining renewable energy procurement prices.
- Mizuho Research & Technologies (MHRT) supports clients' initiatives by providing research and analysis and consulting services, such as scenario analysis of electricity prices, across a broad range of electricity fields, including renewable energy.

Challenge

[Background and issues]

- The need to review electricity projects and consider medium-to long-term electricity procurement methods is increasing as companies move toward carbon neutrality.
- At the same time, the electricity market is affected by international developments, making in-house analysis time- and labor-intensive.

Solution

[Initiatives]

- Mizuho provided analysis on output curtailment due to supply-demand constraints, as well as reports on the outlook for wholesale electricity market prices.
- Consultants with expertise in various fields offered advisory services.

Result

[Initiative outcomes]

- By obtaining these reports, companies could promptly establish conditions for initial consideration, enabling them to quickly advance this initial evaluation.
- In addition, consulting services, such as consideration of business strategies tailored to individual needs, facilitated project progress.

Examples of electricity-related services: Analysis of the outlook for wholesale electricity market prices

Sale of analytical reports based on MHRT-defined scenarios

Briefings for clients on scenarios and analysis

Creation of bespoke simulations and scenarios to support clients' business consideration

More-so-phisticated analysis

Price analysis based on three emissions reduction scenarios

Low reduction: Limited achievement
Medium reduction: Partial achievement
High reduction: Assumes achievement of carbon neutrality

Consulting services (examples)

- Business strategies that reflect changes in the wholesale electricity market
- Simulation of retail electricity prices
- Analysis of outlook for the supply & demand adjustment market
- Strategies for procuring renewable energy through corporate PPAs, etc.

For details of these services, visit this website.
https://www.mizuho-rt.co.jp/archive/solution/market/02.html (Available in the Japanese language only)

Comment by person in charge

The outlook for output curtailment of renewable energy and changes in the wholesale electricity market prices are important indicators for business consideration. Using these reports as a basis for business consideration will enable more quantitative and specific consideration at an early stage. Mizuho will support clients' initiatives in the electricity field by leveraging its expertise in various fields.

Global decarbonization initiatives, including transitions in Asia

International cooperation is essential for advancing decarbonization initiatives. In fast-growing Asia, in particular, region-wide commitment to a steady transition is critical. We believe that Japan's role in leading discussions toward decarbonization and supporting market development will enable both decarbonization and economic growth, contributing to region-wide growth.

Mizuho's initiatives

Financing for a geothermal power generation project

- Served as a Mandated Lead Arranger (MLA) for loans to a project in Bayern developing the world's first commercial-size closed-loop geothermal power generation and district heating system (Eavor Geothermal)

Acquisition of an advisory firm in the renewable energy and transition fields

- Acquired 100% of the shares of Augusta & Co Limited, a U.K. advisory firm specializing in the renewable energy and energy transition fields

Establishment of sustainability-linked guarantee facility

- Established a new sustainability-linked guarantee facility for ERG SpA, an Italian independent power producer
- The guaranteed fee for the facility is linked to ERG's two sustainability KPIs

Origination of a sustainability-linked loan

- Originated a syndicated loan of USD 500 million for Ultratech Cement, a cement company
- Set SPTs for reducing GHG emissions per ton of cementitious materials and for increasing the share of green energy

Asia Transition Finance Study Group (ATFSG) Annual Report 2025

- In October 2025, the Asia Transition Finance Study Group (ATFSG), in which Mizuho has participated as a core member since 2021, published the ATFSG Annual Report 2025.
- As a lead financial institution of ATFSG, we have navigated pragmatic discussions and activities for the promotion of transition finance in Asia

Execution of a sustainability-linked Ninja Loan

- Executed a syndicated sustainability-linked Ninja Loan of JPY 141.3 billion for True Corporation, Thailand's largest telecommunications service provider
- Set SPTs for reducing GHG emissions (Scope 1 and 2) and for increasing solar PV capacity at cell sites

Financing for a geothermal power expansion project

- Project financing for the geothermal power project in Muara Laboh involving companies such as Sumitomo Corporation and Inpex
- Signed a syndicated loan agreement totaling approx. USD 370 million
- A public-private project involving the Asian Development Bank (ADB), Japan Bank for International Cooperation (JBIC), and Nippon Export and Investment Insurance (NEXI)

*AZEC: Asia Zero Emission Community

Source: Compiled by Mizuho Financial Group

Approaches to the realization of a hydrogen society

Hydrogen and ammonia, which broadly contribute to the decarbonization of power sources, heat sources, and raw materials, are key to achieving carbon neutrality in Japan by 2050. Challenges to the widespread adoption of hydrogen are reducing production and utilization costs to stimulate demand and developing supply chains capable of matching supply with that demand. Mizuho is engaged in discussions with both the supply and demand sides for collaboration in developing these supply chains.
In Japan, public support programs aligned with the Basic Hydrogen Strategy have been established under the Hydrogen Society Promotion Act to address these challenges. Mizuho works with clients to help them utilize these public programs.

Latest changes in the external environment

Inflation has driven up project costs. Projects are showing a tendency to stagnate both in and outside Japan.

In Japan, as hydrogen projects have stagnated and other factors have emerged, LNG-fired power generation with Carbon Capture and Storage (CCS) has attracted attention.

Mizuho's future initiatives

- Focus on LNG-fired power generation with CCS for energy transition
- Support for projects involving local production for local consumption in Japan, as well as approaches to the development of supply chains with a view toward future imports into the country

Mizuho's initiatives

Support for investment participation in Gold Hydrogen, a natural hydrogen and helium exploration company

Point **Connecting Japanese companies with cutting-edge overseas technologies and partners**

In Japan, where renewable energy potential is limited, the utilization of hydrogen is essential. Although hydrogen production and supply in Japan face many challenges, including costs, natural hydrogen as a subterranean resource offers the possibility of lower costs.

Following discussions aimed at global value creation and seven months of due diligence, Japanese companies successfully participated in investment in Gold Hydrogen.

Investment in Japan Suiso Energy (JSE)

Point **Contributing to the development of ocean transportation technologies for hydrogen**

Because Japan faces difficulties in procuring low-cost renewable energy, hydrogen production potential there is limited. Hydrogen procurement from other countries is an important consideration.

Ocean transportation of liquefied hydrogen is regarded as a promising option for imports into Japan. JSE aims to develop the transportation technologies to build commercial-scale international supply chains.

Financial solutions that contribute to decarbonization projects: Approaches to carbon credits

Carbon credits are a mechanism for channeling funds into decarbonization projects. The compliance market, a regulatory approach driven by state governments, and the voluntary market led by the private sector play roles in complementing companies' decarbonization efforts.
Mizuho views carbon credits as a system that contributes to a virtuous cycle between the economy and the environment and is committed to improving and developing the carbon market to support clients' efforts for emissions reduction.

Latest changes in the external environment

Enhancement and expansion of regulations and systems
As countries advance the development of frameworks for their decarbonization plans, more concrete systems and guidelines for the use of carbon credits are increasingly required.

Changes in demand structure
Interest has grown in the carbon removal and in Article 6 credits under the Paris Agreement framework for international cooperation.

Mizuho's future activities

- Support for Japanese clients in implementing credit generation projects
- Focus on developing the martkets for J-credit and JCM credit
- Contributing to the advancement of carbon removal projects
- Concreting the incorporation of carbon credits into large-scale financing for international energy transition

Mizuho's activities

Proposing J-Credit trading based on extensive track records

Point **Mizuho Bank has been recognized by the Tokyo Stock Exchange as the Best Market Maker in the carbon credit market for two consecutive years**

The GX-ETS, scheduled for full operation in fiscal year 2026, will see an expansion in the volume of J-Credits/JCM Credits circulating as they become eligible credits.

Mizuho provide clients with reliable and transparent trading services by establishing a trading desk for J-Credits and facilitating credit trading in the markets.

Advancing carbon credit financing methods*

Point **Focus on transition credits that integrate the phase-out of coal-fired power generation with the shift to renewable energy generation for Asia's decarbonization**

Aiming to create a mechanism that monetizes environmental value from CO_2 emissions reductions achieved through early phase-out from coal-fired power plants to renewable energy, using the proceeds to cover energy transition costs.

Mizuho envisions incorporating carbon credits into large-scale financing methods and is also engaging in policy advocacy for institutional design.

*Related information: https://www.mizuho-fg.co.jp/sx/news-release/pdf/20251113.pdf (Available in the Japanese language only)

Decarbonization
Carbon credits
Strategic partnership

Toward a sustainable, prosperous future for the food and agriculture fields through the use of carbon credits

- In April 2025, Mizuho Bank announced a strategic partnership for the sustainable development of the food and agriculture fields with Kubota, a company committed to solving global challenges related to food, water, and the environment.
- As the first partnership project, the two companies will leverage Mizuho Bank's client network to expand initiatives aimed at reducing GHG emissions while increasing producers' income by generating and selling J-Credits through the Prolongation of mid-season drainage in paddy rice cultivation, an approach promoted by Kubota.

Challenge

[Background and issues]

- There is a need to promote reforms across entire value chains to ensure the sustainable development of the food and agriculture fields.
- As the impact of initiatives implemented by a single company is limited, creating open innovation across industries and sectors is essential.

Solution

[Initiatives]

- By combining Kubota's technologies and expertise with Mizuho Bank's client network, the initiative pursues the expansion of the market for J-Credits on both the supply and demand sides.
- Mizuho supports matching supply with demand across regions and industries, while also proposing value-added uses of credits beyond simple offsetting.

Result

[Initiative outcomes]

- This initiative enables companies to address, with meticulous care, the needs of those who wish to indirectly contribute to local communities and industries through the purchase of credits.

Vision to be pursued through the partnership

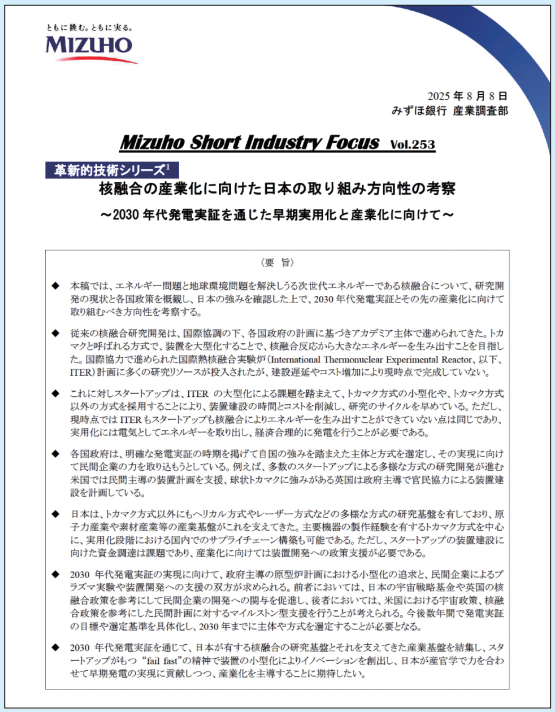
Comment by person in charge

Through this partnership between both companies, we will propose narratives that lead to offsetting, too, as added value to contribute to the expansion of the initiatives. Going forward, by co-creating with a wide range of stakeholders, beyond just this partnership, we will aim to promote open innovation and realize a sustainable and prosperous future for the food and agriculture fields.

Enhancing research capabilities for the development of innovative technologies

Mizuho Bank's Industry Research Department publishes a series of reports by leveraging its industrial and technological expertise and conducting research into innovative technologies from both sustainability and digital perspectives.
As the latest sustainability theme, it covered fusion energy and discussed the direction of Japan's initiatives toward early commercialization and industrialization of the technology through demonstration projects planned for the 2030s.

Innovative technology series



ともに挑む。ともに実る。
MIZUHO

2025 年 8 月 8 日
みずほ銀行 産業調査部

Mizuho Short Industry Focus Vol.253

革新的技術シリーズ[1]

核融合の産業化に向けた日本の取り組み方向性の考察

～2030 年代発電実証を通じた早期実用化と産業化に向けて～

〈要 旨〉

◆ 本稿では、エネルギー問題と地球環境問題を解決しうる次世代エネルギーである核融合について、研究開発の現状と各国政策を概観し、日本の強みを確認した上で、2030 年代発電実証とその先の産業化に向けて取り組むべき方向性を考察する。

◆ 従来の核融合研究開発は、国際協調の下、各国政府の計画に基づきアカデミア主体で進められてきた。トカマクと呼ばれる方式で、装置を大型化することで、核融合反応から大きなエネルギーを生み出すことを目指した。国際協力で進められた国際熱核融合実験炉（International Thermonuclear Experimental Reactor、以下、ITER）計画に多くの研究リソースが投入されたが、建設遅延やコスト増加により現時点で完成していない。

◆ これに対しスタートアップは、ITER の大型化による課題を踏まえて、トカマク方式の小型化や、トカマク方式以外の方式を採用することにより、装置建設の時間とコストを削減し、研究のサイクルを早めている。ただし、現時点では ITER もスタートアップも、核融合によりエネルギーを生み出すことができていない点は同じであり、実用化には電気としてエネルギーを取り出し、経済合理的に発電を行うことが必要である。

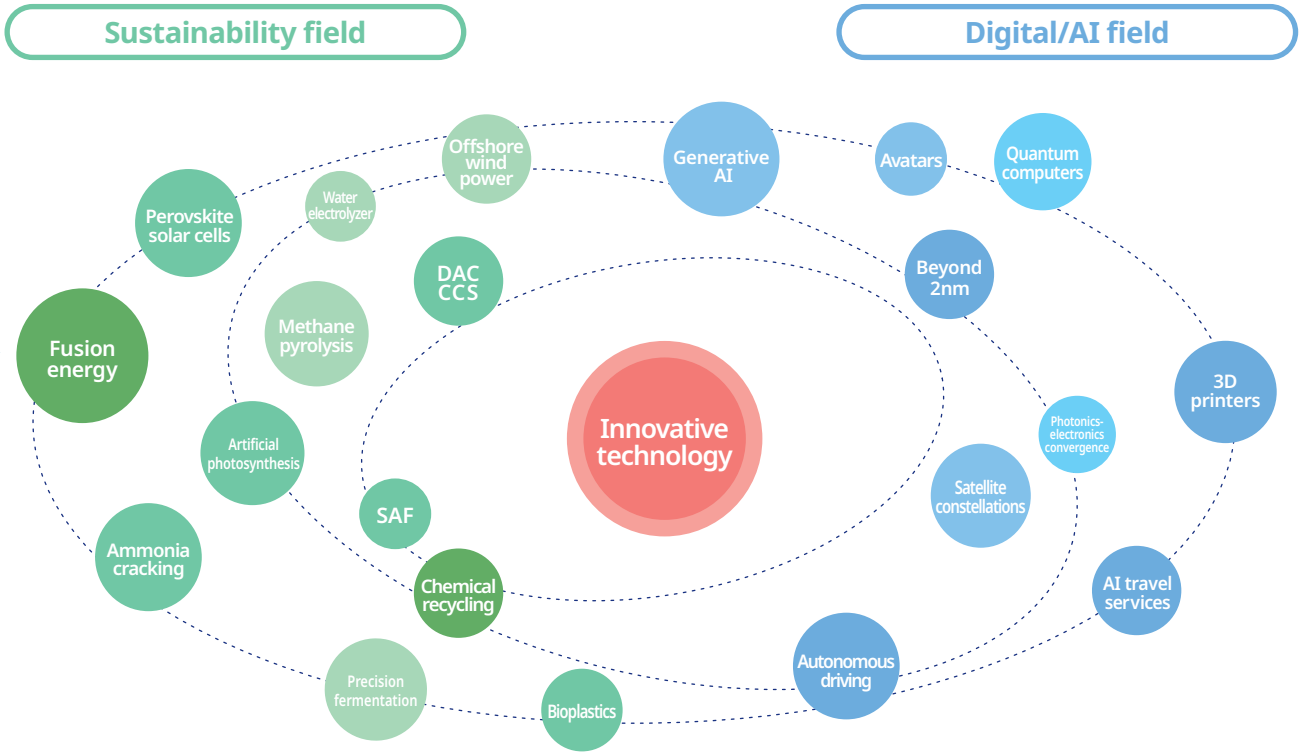
◆ 各国政府は、明確な発電実証の時期を掲げて自国の強みを踏まえた主体と方式を選定し、その実現に向けて民間企業の力を取り込もうとしている。例えば、多数のスタートアップによる多様な方式の研究開発が進む米国では民間主導の装置計画を支援、球状トカマクに強みがある英国は政府主導で官民協力による装置建設を計画している。

◆ 日本は、トカマク方式以外にもヘリカル方式やレーザー方式などの多様な方式の研究基盤を有しており、原子力産業や素材産業等の産業基盤がこれを支えてきた。主要機器の製作経験を有するトカマク方式を中心に、実用化段階における国内でのサプライチェーン構築も可能である。ただし、スタートアップの装置建設に向けた資金調達は課題であり、産業化に向けては装置開発への政策支援が必要である。

◆ 2030 年代発電実証の実現に向けて、政府主導の原型炉計画における小型化の追求と、民間企業によるプラズマ実験や装置開発への支援の双方が求められる。前者においては、日本の宇宙戦略基金や英国の核融合政策を参考にして民間企業の開発への関与を促進し、後者においては、米国における宇宙政策、核融合政策を参考にした民間計画に対するマイルストン型支援を行うことが考えられる。今後数年間で発電実証の目標や選定基準を具体化し、2030 年までに主体や方式を選定することが必要となる。

◆ 2030 年代発電実証を通じて、日本が有する核融合の研究基盤とそれを支えてきた産業基盤を結集し、スタートアップがもつ "fail fast"の精神で装置の小型化によりイノベーションを創出し、日本が産官学で力を合わせて早期発電の実現に貢献しつつ、産業化を主導することに期待したい。

https://www.mizuhobank.co.jp/corporate/industry/pdf/msif_253.pdf
(Available in the Japanese language only)



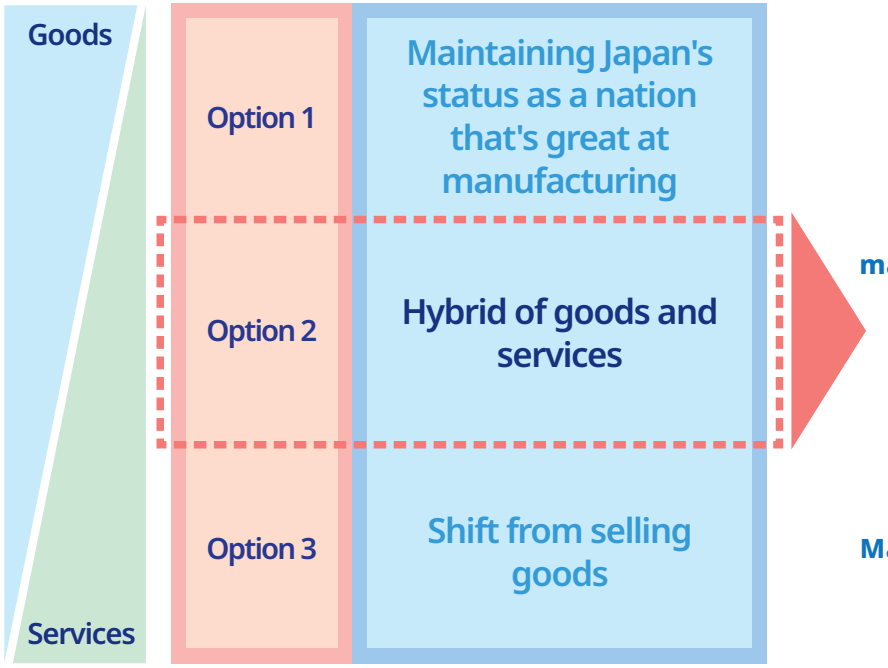
List of reports published by the Industry Research Department, Mizuho Bank
https://www.mizuhobank.co.jp/corporate/industry/index.html (Available in the Japanese language only)

Appendix

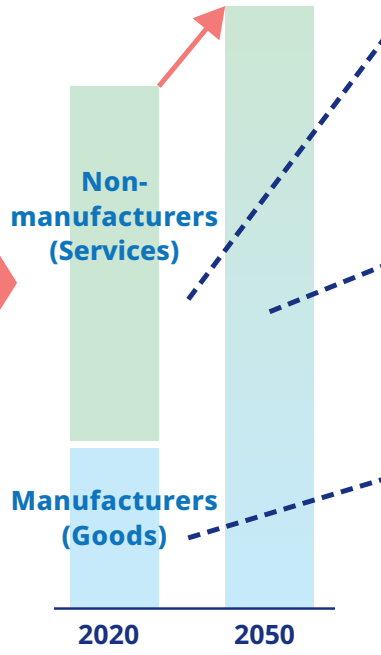
Grand Design

Enhance industrial competitiveness through *a hybrid of goods and services* to drive economic growth.

Toward 2050, Japan may face a challenging future due to various factors, such as the contraction of key industries driven by a declining population and global advancement in the trend of local production for local consumption, as well as increased financial pressures on the national government resulting from rising social security costs. Although Japan's economy has developed with its manufacturing industry as a foundation, changes in the external environment suggest that one of the solutions to future growth lies in creating a hybrid of goods and services aimed at achieving the best mix of the manufacturing (goods) and service industries—that is, developing the manufacturing industry by utilizing Japanese industrial advantages while striving to advance the service industry. The Japanese industry's achievement of carbon neutrality and sustainable economic growth would enhance the roles that Japan can play across Asia and internationally.



Source: Compiled by Mizuho Financial Group



Note: The graph above illustrates changes in GDP in an exaggerated manner, and the scaling is not proportionate to the actual GDP estimates.

Drivers of economic growth

It is essential to develop industries with high growth potential, such as the healthcare/nursing care, inbound tourism, and content industries, into core industries, while further raising productivity through the use of technologies.

Convergence of goods and services

The manufacturing industry will transform into a new industry by expanding its value chains into the service areas.

Adding more value

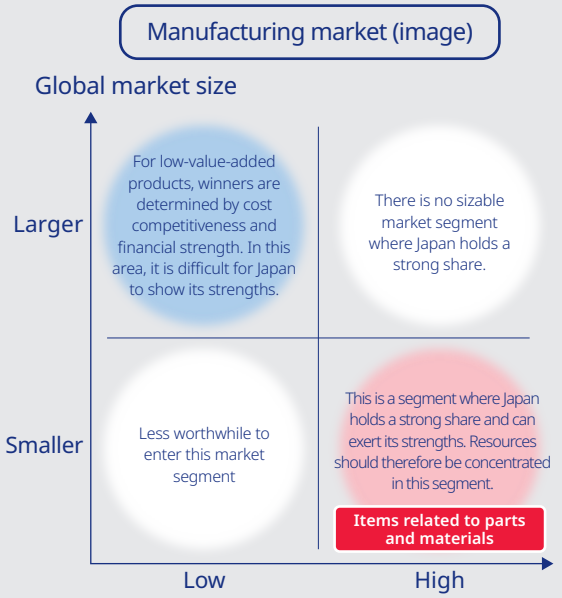
The key industries' output volumes will decline. New business opportunities for the manufacturing industry will arise from a shift toward more value-added fields to maintain sustainable growth. This will accelerate a shift toward highly functional goods, including electronic parts/components and high-performance materials.

Process of transforming Japan's industrial structure toward 2050

Japan's manufacturing sector currently accounts for a relatively high share of GDP compared with other developed countries, making it dependent on this area to a certain extent. Meanwhile, it is likely to be difficult to maintain the current production volumes in the manufacturing industry due to weaker demand and a decline in the workforce caused by the population decrease and the rise of China, India, and other countries. There is a need to implement measures to achieve further economic growth while maintaining the manufacturing industry's strengths, and Mizuho has identified three solutions.

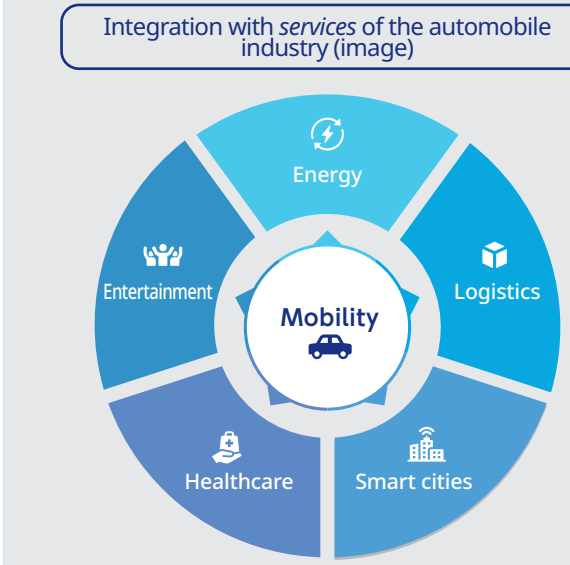
Adding more value to *goods*

- The manufacturing industry (goods) will maintain its competitiveness by **focusing on fields where it currently holds comparative advantages** (high-performance parts/materials) rather than general-purpose goods.



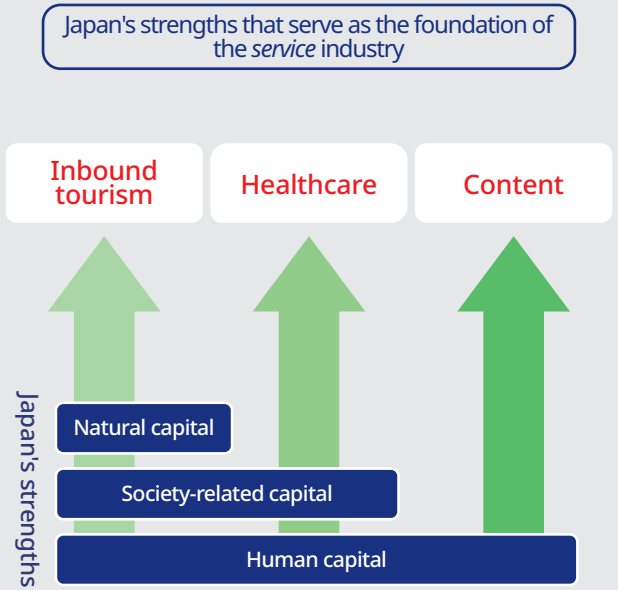
Convergence of *goods* and *services*

- Japan aims to make fields where *goods* and *services* converge into its strength by not only adding more value to *goods* but also by integrating its manufacturing and non-manufacturing (service) industries.
- It is essential to expand solutions by combining machinery and devices—the strengths of *goods*—with **software services.**



Development of *services*

- As **it is difficult to achieve 2% nominal GDP growth with the *goods* industry alone,** the development of the service industry is essential.
- Japan aims to develop its *service* industry, especially in fields where its full potential has yet to be realized and where future market expansion is expected.



Source: Compiled by Mizuho Financial Group

Develop the service industry by combining high-potential fields with forms of value that are difficult for other countries to replicate.

Leveraging Japan's strengths, such as high quality, safety, hospitality, and abundant natural and tourism resources—through the use of technologies for the development of the service industry—is one of the keys to economic growth.

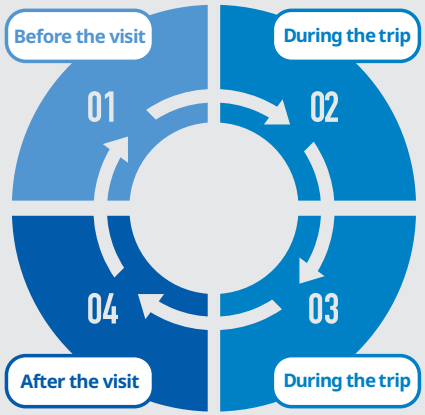
Development of the service industry: The case of inbound tourism

Using data for targeting and strategy formulation

- Maximizing per-visitor spending by targeting affluent and value-added visitors
- Building loyalty by engaging visitors at key life events
  ▶Offering study tour plans for students and long-stay plans utilizing longevity and healthcare-related services for seniors

Remote promotional activities aimed at increasing repeat visits

- Enhancing promotional activities by utilizing data collected during the trip
- Motivating revisits and promoting cross-border e-commerce through virtual fan communities accessed via smart devices



Providing comfortable and seamless transportation to help distribute visitors across different areas

- Developing infrastructure, including airports and public transportation, to accommodate more visitors
- Enabling seamless transportation and round trips: Making the act of traveling itself a valuable experience

Offering value-added experiences to increase repeat visits

- Enhancing experience-based tourism and encouraging premium consumption through Japanese cuisine, high-quality and comfortable services, animation, games, and more
- Aiming to attract affluent repeat visitors by offering a combination of longevity, healthcare, and green related elements, etc.

Fields with high potential

Inbound tourism | Content | Healthcare

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Value that is difficult to replicate

Natural and tourism resources | Quality, safety, and peace of mind | Hospitality

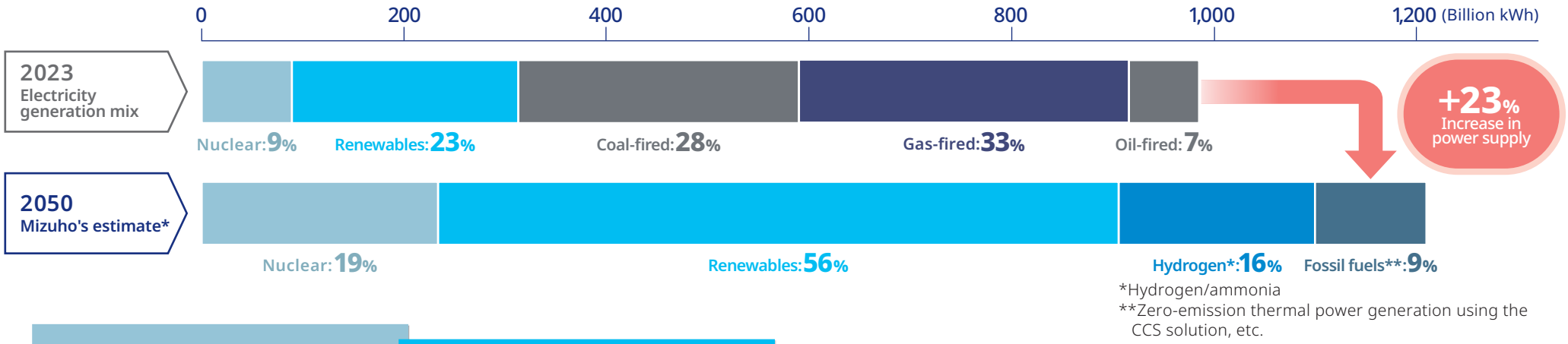
Economic growth of the *service* industry

Source: Compiled by Mizuho Financial Group

It is essential to secure clean energy as a foundation for sustainable economic growth.

As decarbonized power sources are limited in Japan, enhancing energy efficiency (energy per unit of GDP) is essential for economic growth. However, as renewable power sources face challenges in stable operation, and as there is limited room to further expand capacity, it is difficult to meet total electricity demand solely through renewables. Given these circumstances, Japan is expected to make maximum use of nuclear power as a baseload source and aims to achieve the ambitious goal of introducing renewable energy (broadly aligned with the government target) while using hydrogen and ammonia as alternative energy sources. It is needed to implement measures to achieve zero emissions (e.g., CCS/CDR technologies and carbon credits) while filling up the shortage with gas-fired power generation.

Electricity supply (electricity generation mix)



*Hydrogen/ammonia
**Zero-emission thermal power generation using the CCS solution, etc.

Maximum use of nuclear power

- Although restarting existing nuclear plants remains a challenge, Japan, which has limited renewables potential, needs to make maximum use of nuclear power and consider even constructing new plants.

Ambitious target for renewables

- Achieving the ambitious target will require quadrupling the current renewable generation capacity by 2050.
- In Japan, where there is no room to significantly expand solar power capacity under the current technological standards, achieving this target will be challenging.

Introduction of hydrogen/ammonia

- While these sources have potential to serve as alternatives to fossil fuels, challenges remain in the areas of cost reduction and establishment of a supply network.
- Efforts on both the supply and demand sides, such as expanding imports into Japan and promoting local production for local consumption, will be critical.

Utilization of zero-emission thermal power

- Zero-emission thermal power will be an important baseload source in terms of stable electricity supply and price stability.
- The application of carbon removal technologies will be essential.

*To be updated as necessary based on future announcements from the government, ministries, and agencies
Source: Compiled by the Industry Research Department, Mizuho Bank, based on the Comprehensive Energy Statistics issued by Japan's Agency for Natural Resources and Energy and other data

Innovating today. Transforming tomorrow.