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Mizuho Industry Research No.72

Medium-term Outlook for Japanese Industry

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1. Industry Overview

Resolving structural challenges can unlock growth for Japanese industry, persevering through the declining trends in domestic demand and production

I. Business Environment

(Short term)

- Manufacturing industries will see supply constraints such as the semiconductor shortage gradually dissipate heading towards 2023, but a drop in exports associated with slowing overseas economies will weigh down production activities. In the service sector, while the recovery from the pandemic and re-opening of Japan for inbound tourism will progress further, domestic consumption will lack strength due to high prices and uncertainty about the future.

(Medium term)

- From 2024 onwards, structural changes such as Japan's shrinking population and sluggish exports of key industries will surface at last.
- In terms of specific industries, materials and automotive industries will be forced to adopt game-changing measures such as decarbonization and switching to EVs amid slashing of production levels due to declines in both domestic demand and exports. As for electronics and IT-related industries, the market will grow steadily with the continuing advancement of digitalization, but this also means that global competition will intensify. While the energy sector's top priority is currently stable supply and supply security, it is also wasting no time in making changes in the supply structure geared toward a carbon-neutral society. The domestic demand-based lifestyle and social infrastructure industries will see further downward pressure on demand due to population decline, and labor shortages in sectors including construction and logistics will become increasingly serious.

II. Mid-Term Challenges

- Japanese industry will face four key structural challenges as a result of changes in the business environment over the mid-term.
- The first challenge is that as a drop in domestic production is unavoidable in light of decreasing domestic demand and exports, how can Japan maintain its industrial competitiveness from such perspectives as the stable supply of goods and services and maintaining its technological capabilities and human resources?
- Second, considering that Japan is a resource-poor country and the decline in its workforce will accelerate, how can Japan address the concerns that will only continue to grow in the future about supply constraints including resources and labor?
- Third, as advances in digitalization are bringing about disruptive market changes in various industries along with business opportunities, can Japanese companies find a path to beating out the globally fierce competition?
- And fourth, while the CN area is highly likely to grow over the medium to long term, how can Japanese companies become more competitive as competition in this area between governments and companies heats up?

III. Mid-Term Strategies

- Japanese industry will need to undertake structural reforms, growth strategies, and transformation of the business model from a medium- to long-term perspective.

(Structural reforms initiatives)

- First, it will be important to optimize production levels in a planned and phased manner in cooperation with other companies. Second, diversification of energy procurement will require consideration of government support in addition to collaboration within industries. Third, leveraging digital technologies will be essential for more efficient and sophisticated supply management.

(Growth strategy initiatives)

- First, overseas business expansion will become even more meaningful amid an ongoing decline in domestic demand and exports going forward. Second, stepping up domestic production capabilities for critical commodities that Japan currently depends on imports for is expected to strengthen domestic infrastructure, including stable procurement and domestic R&D.

(Business model transformation initiatives)

- First, it will be effective for non-manufacturing industries to utilize intangible assets to provide services with high added value. Second, for manufacturing industries it will be important to use their manufacturing technology as a base for providing solutions that are in tune with changes in demand. Third, it will be vital to make continuous efforts in R&D and commercialization in areas such as CN to create new demand, even if such areas are subject to uncertainties with regard to future development of business.

Source: Compiled by Mizuho Bank Industry Research Department

This report considers an overall strategy for Japanese industry based on the business environment and challenges facing each of five industrial segments

- This report on Japanese industry overall describes the business environment (trends in supply and demand and competitive environment) and the challenges for a total of 25 industries organized into five industrial segments, based on which an overall picture of strategies to take in the mid-term is derived.

Five industrial segments

	Industrial segments	Industries	Positioning, characteristics
1	Materials, automotive	Chemicals, steel, non-ferrous metals, automotive	■ The key industries that have driven Japan's exports and domestic production
2	Electronics, IT	Semiconductors, electronic components, finished products, telecommunications, media services, IT services	■ While these are growth fields, these industries are up against fierce global competition
3	Lifestyle, social infrastructure	Processed food, construction, rail, logistics, aviation, retail, real estate, lodging	■ Industries based on domestic demand that provide services closely linked to everyday life
4	Energy	Oil, electric power, city gas	■ Industries that underpin all social and economic activities and are directly linked to the competitiveness of domestic production
5	Healthcare	Pharmaceuticals, medical devices, medical, nursing care	■ Industries that support Japan's super-aging society and people's well-being

Source: Compiled by Mizuho Bank Industry Research Department

Composition of this chapter

Section I: Business Environment
Overview of supply and demand trends and competitive environment for the 5 segments

Section II: Mid-Term Challenges
Identification of key structural challenges in light of changes in the business environment

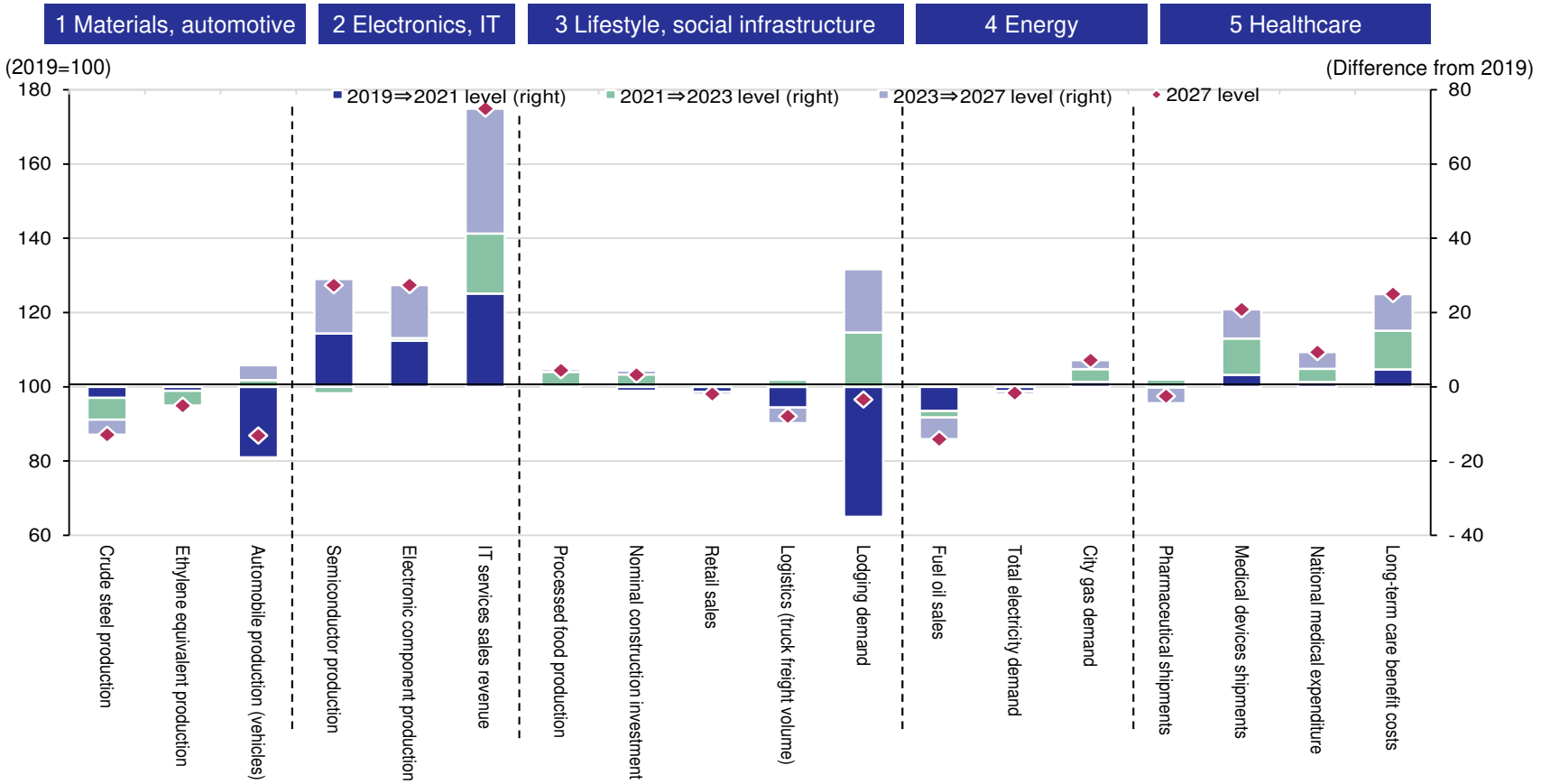
Section III: Mid-Term Strategies
Breakdown and discussion of overall strategies to address the key structural challenges in Section II

Source: Compiled by Mizuho Bank Industry Research Department

Japan's shrinking population and a decline in exports by key industries will increasingly drive demand and production downward

- While supply constraints for manufacturing industries, such as semiconductors, will gradually wane over 2023, a decline in exports associated with slowing overseas economies will weigh on production activities. Service industries will benefit from further recovery from the pandemic and resumption of inbound tourism, but domestic consumption is expected to be weak due to high prices and uncertainty about the future.
- From 2024 forwards, Japan will undergo structural changes, namely the decline in its population and a drop in exports of its key industries. These factors will produce strong downward momentum in domestic demand and production levels.

Medium-term outlook for domestic demand and production levels by industry



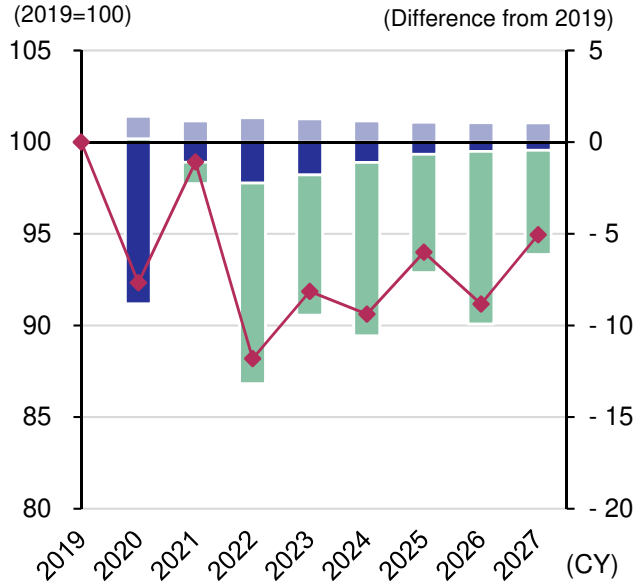
Note 1: Please refer to the sections on each industry for the sources for each indicator.
Note 2: The figures for 2022 onwards are IRD forecasts.
Source: Compiled by Mizuho Bank Industry Research Department based on various materials

As domestic demand and exports decline, the key industries for Japan's economy will slash their production levels

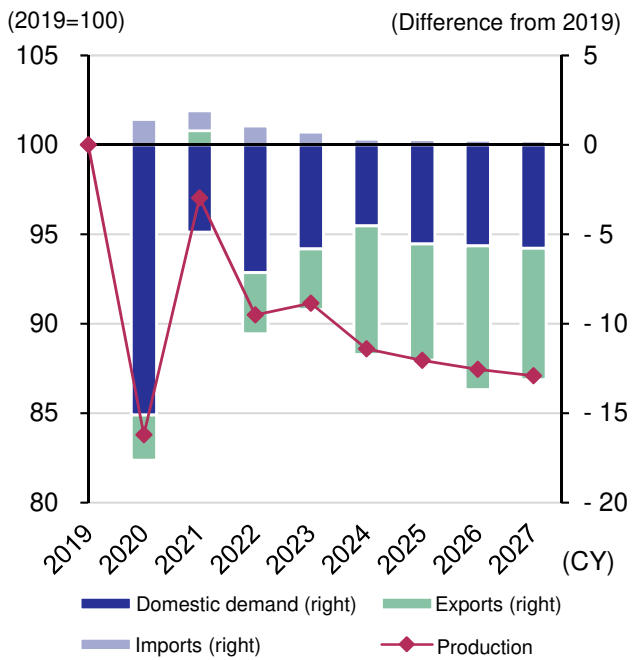
- Recovery in materials and automotive production is seen as weak on the whole, and in particular, a recovery in steel and auto production, which will be hit hard by both lower domestic demand and export volume, is unlikely.
  - Chemicals will see a moderate recovery in domestic demand thanks to an increase in demand for consumer goods in response to factors including inbound consumption picking up again. Recovery in exports, however, is expected to be sluggish due to the progress being made in China, Japan's largest export destination, on becoming self-sufficient for its chemicals supply.
  - The steel industry is being impacted by changing needs on a structural level such as the decline in population and number of households along with the shift to BEVs, which are slowing the recovery in domestic demand. Meanwhile, exports, mainly general-purpose products, are decreasing due to worsening profitability associated with increased production and exports from emerging countries such as China.
  - In the automotive industry, the recovery in auto exports will plateau due to slowing growth in domestic demand as the number of households decreases in addition to sluggish recovery in demand in North America and Europe, Japanese automakers' largest export destinations.

Medium-term outlook for production by industry

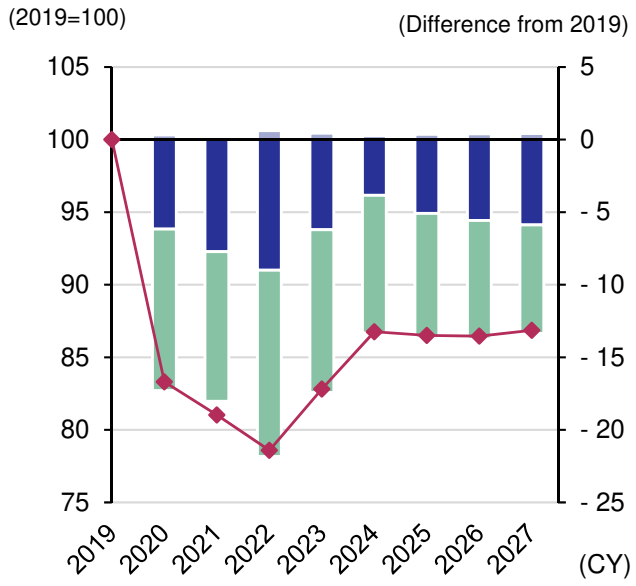
Chemicals (ethylene equivalent production)



Steel (crude steel production)



Automotive (no. of vehicles produced in Japan)



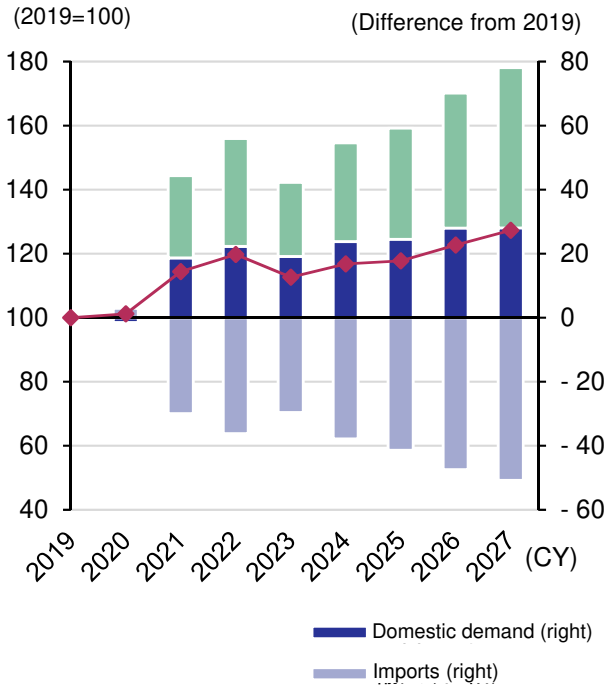
Note: The figures for 2022 onwards are IRD forecasts.
Source: Compiled by Mizuho Bank Industry Research Department based on various materials

The market is growing steadily thanks to progress with digitalization and other factors

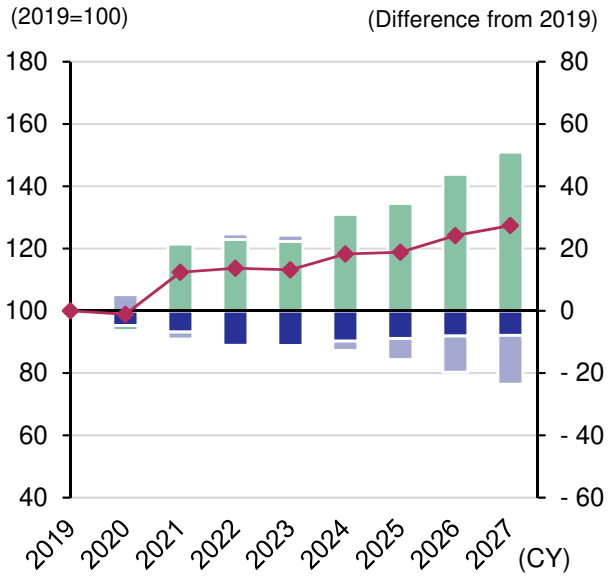
- Electronics and IT markets are expected to see robust growth on the back of advances in technology and digital transformation (DX) gaining momentum in both the public and private sectors.
  - Semiconductors and electronic components: Production is expected to expand, driven by exports as the number of such parts installed rises due to the automation and electrification of automobiles along with the sophistication and diversification of products. In addition, government-led measures to attract semiconductor plants to Japan and the effects of policies to facilitate the development of domestic IT infrastructure, such as the “Infrastructure Development Plan for a Digital Garden City Nation,” will contribute to growth in the sector.
  - IT services: Continued high growth is expected as private-sector companies and the government expand their investment in IT to achieve digitalization.

Medium-term outlook for domestic demand and production levels by industry

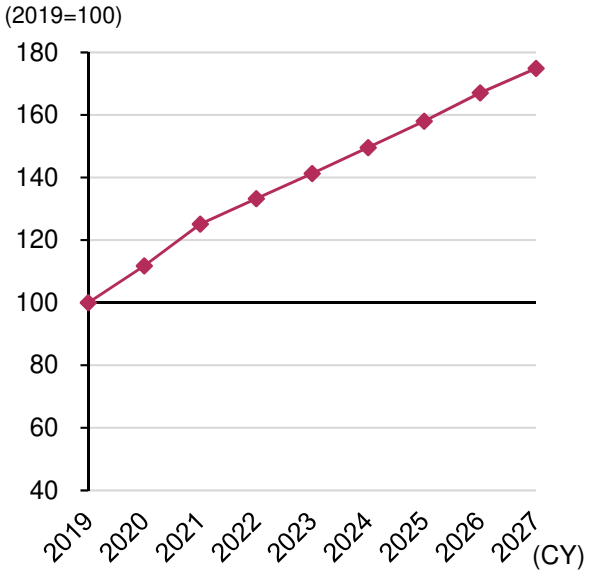
Semiconductor production



Electronic components production



IT services sales revenue

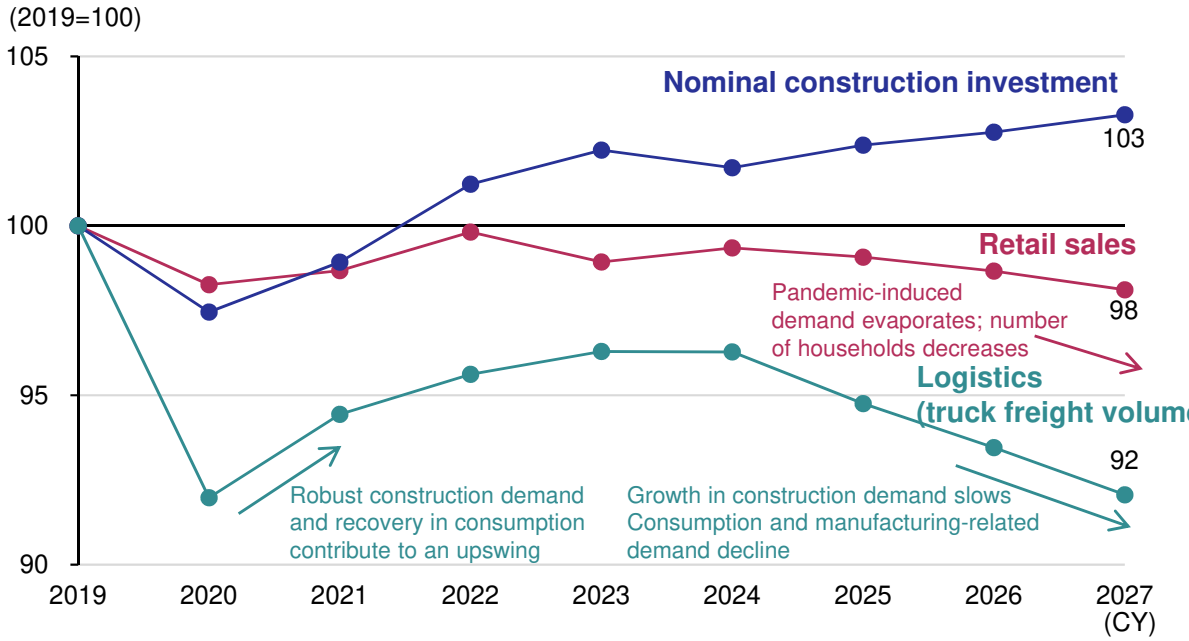


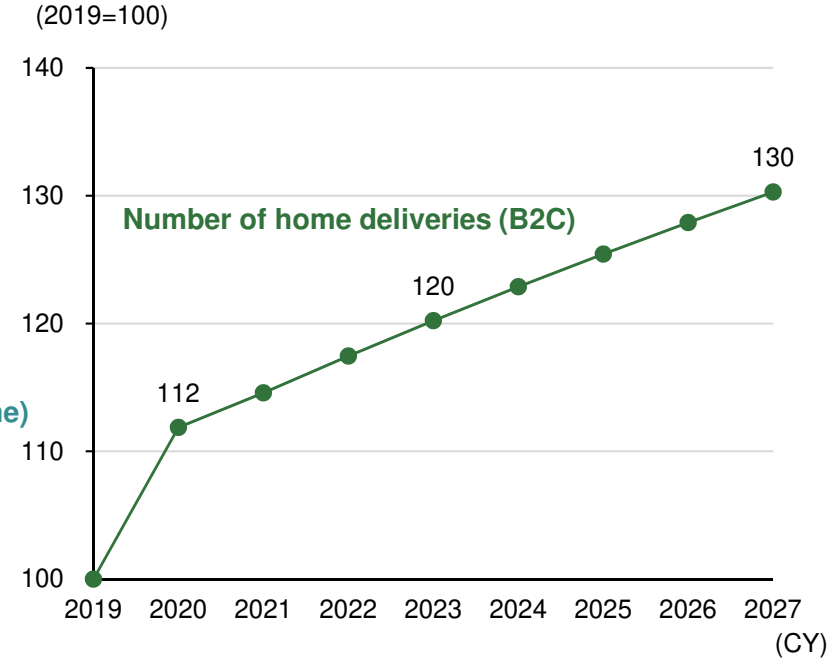
Note: The figures for 2022 onwards are IRD forecasts.
Source: Compiled by Mizuho Bank Industry Research Department based on various materials

Downward pressure on domestic demand is expected to intensify due to population decline, etc.

- Increasing recovery from the pandemic and re-opening for inbound tourism will be seen through 2023, but the downward pressures on domestic demand exerted by the decline in population are expected to intensify further beginning in 2024.
  - Construction: Housing starts are expected to fall gradually due to the shrinking population, and while public demand such as building, maintenance and renewal of infrastructure is expected to be flat and then taper off slightly, the sector will be supported by demand for domestic factories, warehouses, and other non-residential construction.
  - Retail: While inbound demand will contribute to a boost, this will be offset by the decreasing number of households, and domestic demand will decline gradually as a whole.
  - Logistics (truck freight volume): Despite a gradual recovery through 2024, demand for logistics will fall from 2025 due to the slowdown in construction-related demand and declines in consumption and manufacturing-related demand. However, home deliveries (B2C) will increase steadily with disruptive growth in e-commerce demand stemming from the pandemic.

Medium-term outlook for domestic demand by industry



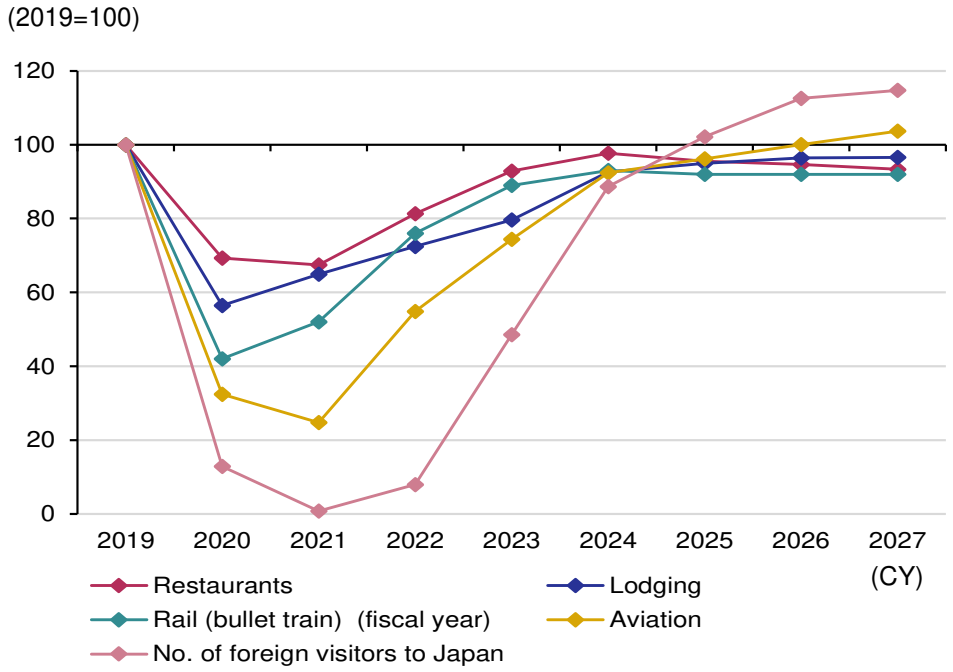


Note: The figures for 2022 onwards are IRD forecasts.
Source: Compiled by Mizuho Bank Industry Research Department based on various materials

While the service and mobility sectors will recover from the impact of the pandemic, growth will slow down due to structural changes in domestic demand

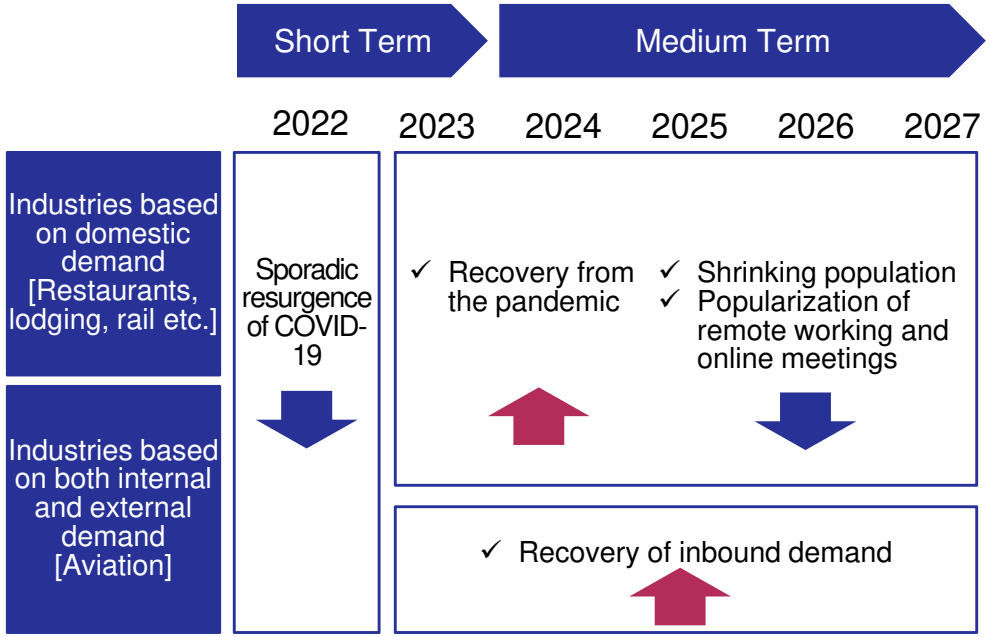
- Continued recovery from the COVID-19 pandemic is expected for the hard-hit service and transportation sectors, but the degree of recovery is expected to differ depending on whether the structural changes in domestic demand and the tailwind from external (inbound) demand can be received.
  - The recovery in demand for restaurants, lodging, and transportation between cities (bullet trains) is expected to slow due to decreased demand for domestic business travel associated with the spread of online meetings and the impact of the shrinking population.
  - The outlook for aviation shows overall demand exceeding pre-COVID levels, as the expansion of demand for international flights resulting from the re-opening of inbound tourism will compensate for slowing demand for domestic flights in the medium term.

Medium-term outlook for domestic demand by industry



Note: The figures for 2022 onwards are IRD forecasts.
Source: Compiled by Mizuho Bank Industry Research Department based on various materials

Key points of the medium-term outlook

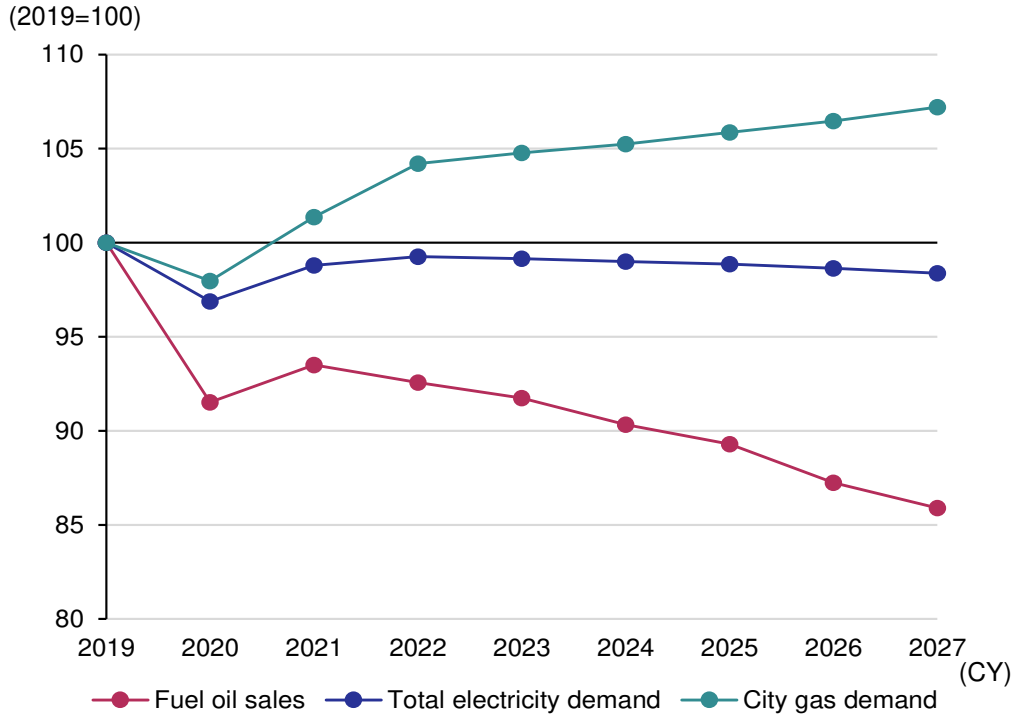


Note: Red up-arrows indicate factors increasing demand and blue down-arrows indicate factors decreasing demand.
Source: Compiled by Mizuho Bank Industry Research Department

Demand for electric power and gas will stay flat, but risks related to supply will persist

- Aside from petroleum, for which demand is shrinking on a structural basis, electric power and gas demand will stay flat, but supply-related risks will persist due to heightened geopolitical risks stemming from the war in Ukraine.
  - Petroleum: Domestic demand will continue to decline due to a decrease in the number of vehicles owned, improved fuel efficiency, and the shift in industrial fuels.
  - Electric power: Domestic demand will gradually decrease as a result of progress in energy conservation. As for the supply side, however, while stable supply will be maintained from 2023 forward as more nuclear reactors are brought back online and progress is made with the adoption of renewable energy, supply risks will persist for reasons including potential disruptions in LNG supply related to geopolitical risks.
  - City gas: Demand for residential use will remain almost flat, and while commercial use will decline with advances in electrification, demand for gas for industrial use is expected to increase in the near term due to fuel conversion from other fuels.

Medium-term outlook for domestic demand by industry

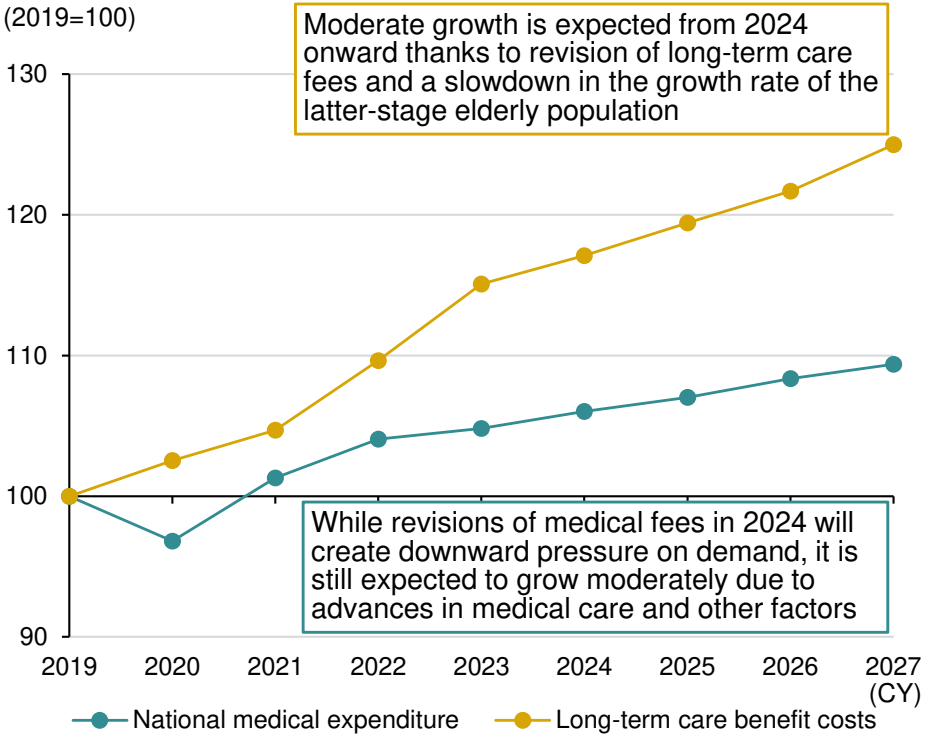


Note: The figures for 2022 onwards are IRD forecasts.
Source: Compiled by Mizuho Bank Industry Research Department based on various materials

Social security costs will continue to swell, and demand for specialized types of pharmaceuticals and medical devices will increase as well

- National medical expenditure and long-term care benefit costs will increase due to the aging society along with advances in medical care.
- While domestic demand for pharmaceuticals will gradually decline as a result of annual revision of drug prices, demand for biopharmaceuticals, a growth field, will increase.
- Similar to medical expenses, domestic demand for medical devices will expand steadily.

Medium-term outlook for domestic demand by industry



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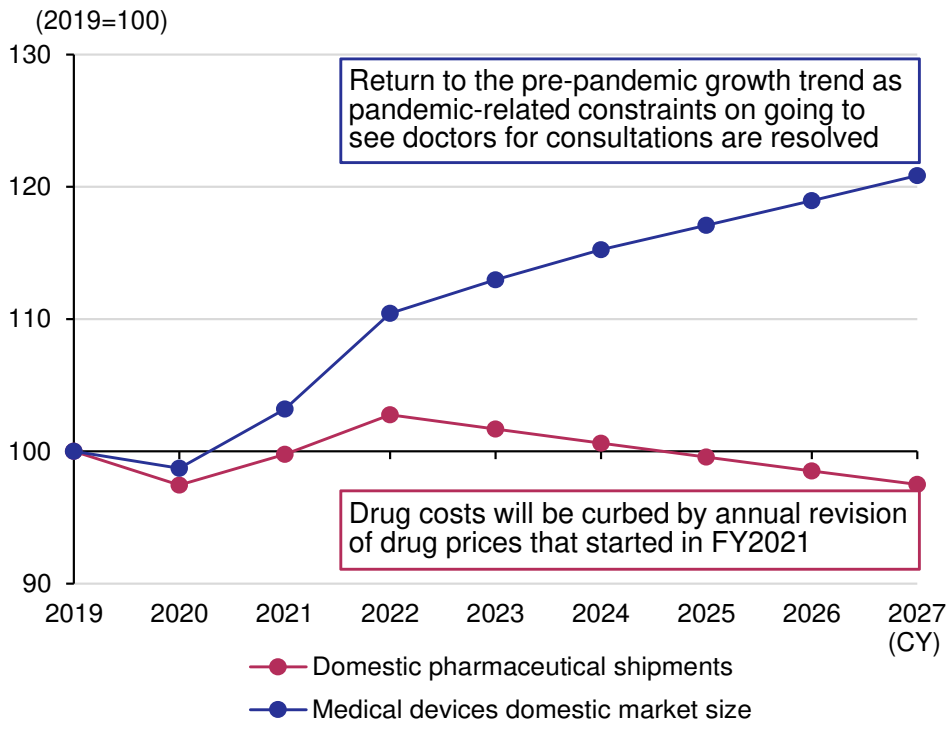


Note: The figures for 2022 onwards are IRD forecasts.
Source: Compiled by Mizuho Bank Industry Research Department based on various materials

Changes in the business environment are making the structural challenges facing Japan's industries more and more apparent

- In the medium to long term, structural challenges for Japanese industry will become more and more apparent due to changes in the business environment such as the following.

Overview of the supply and demand trends and competitive environment surrounding each industry

	Industry Segment	Trends in Supply and Demand	Competitive Environment
1	Materials, automotive	■ Reduction of production levels due to decreasing domestic demand and exports ■ Increased Chinese and ASEAN production and export of general-purpose products (chemicals, steel, non-ferrous metals)	■ There is a growing threat of foreign companies catching up in terms of the technology for high-performance products (steel, non-ferrous metals). ■ Competition is progressing in the technological development of diverse environmentally-friendly materials (chemicals). ■ Along with an increasing ratio of BEV sales mainly in Europe, the U.S., and China, new players are emerging (automotive). ■ National industrial policies are leading to increased demand for local production and consumption of batteries (automotive).
2	Electronics, IT	■ The market is growing steadily thanks to progress in digitalization and the government's industrial policies (attracting semiconductor factories to Japan, support for domestic IT infrastructure development, etc.)	■ Global competition is intensifying due to new players from other industries entering the market and the emergence of companies from developing countries (semiconductors, electronic components, IT services). ■ The decoupling of the U.S. and China is becoming prolonged and normalized (semiconductors).
3	Lifestyle, social infrastructure	■ There is increasing downward pressure on domestic demand in many industries.	■ Consumer needs, such as health and convenience, are becoming more diversified (food). ■ The labor shortage is becoming more severe, and there is no time to wait to improve productivity (construction, logistics). ■ Amid intensifying competition to acquire customers in the same and other sectors, both on- and offline, there is increasing convergence between business categories (retail).
4	Energy	■ Domestic demand for oil will shrink due to higher automobile fuel efficiency, etc. ■ Supply-related risks will persist for electric power and gas supply in view of geopolitical risks heightened by the crisis in Ukraine, etc.	■ Progress in the changes in the supply structure for decarbonization (oil, electric power, city gas). ■ Amid the tight LNG supply and demand environment resulting from Western countries' moves to break away from Russia in response to the invasion of Ukraine, market volatility is increasing and pushing down earnings (electric power, city gas). ■ There is potential for a return to increasing demand for electric power for industrial use based on building of data centers, expansion of semiconductor production capacity, etc. (electric power).
5	Healthcare	■ National medical expenditure and nursing care demand will increase due to the aging society and advances in medical care. ■ While domestic demand for pharmaceuticals overall will be kept down to curb swelling social security costs, demand for biopharmaceuticals, a growth field, will increase. ■ Domestic demand for medical devices will see robust growth.	■ A labor crunch is expected from 2024 due to the trend toward stricter labor regulations for physicians. In addition to progress with task shifting and sharing, it will be necessary to improve productivity by leveraging digital technologies (medical care). ■ R&D expenses will rise with the increasing difficulty of drug discovery (pharmaceuticals). ■ As prevention and prognosis become increasingly important, the focus point for medical care will shift from physicians and hospitals to patients, who have their health and medical data. Moreover, there are growing needs for solutions that contribute to improving the sophistication and efficiency of physicians' diagnoses and hospital management (medical care, medical devices)

Source: Compiled by Mizuho Bank Industry Research Department

The four key structural challenges for Japanese industries

■ The mid-term challenges facing the 5 industrial segments are regrouped into 4 key structural challenges.

Mid-term challenges derived from changes in the business environment

	Industrial segment	Mid-term challenges (the color of the box (■) corresponds to the key structural challenge described on the right)
1	Materials, automotive	■ Addressing shrinking domestic demand and production levels (maintaining technology and employment) ■ Adopting game-changing measures such as CN, switching to EVs
2	Electronics, IT	■ Demand is growing worldwide, but global competition is intensifying ■ Concerns of disruptions in supply networks caused by the pandemic and geopolitical risks
3	Lifestyle, social infrastructure	■ Many industries will face increased downward pressure on domestic demand due to population decline and other factors ■ Due to behavioral changes during COVID, a return to pre-pandemic demand for commuting, business trips and such is unlikely ■ More serious labor shortage, no time to wait to improve productivity
4	Energy	■ Changes in the supply structure for decarbonization ■ Stable supply, ensuring energy security — Gas: Amid concerns over a decline in demand in the long term related to decarbonization, it will be challenging for private-sector companies to maintain long-term procurement on their own as in the past. — Electric power: While supply is expected to increase with the restarting of nuclear reactors, supply-related risks will persist due to geopolitical risks and other factors.
5	Healthcare	■ Pharmaceuticals: While demand for biopharmaceuticals will grow, annual revisions in drug prices will result in an overall decline in domestic demand. There are concerns that Japanese makers will fall behind overseas competitors in terms of the scale of investment in R&D, etc. ■ Medical devices: There will be a quantitative increase in demand alongside continuing qualitative changes. ■ Medical care, nursing: Amid growing demand to curb social security costs, personnel costs associated with improvement of working conditions and IT investment in digitalization will impose a heavy burden.

Key structural challenges

- How to maintain industrial competitiveness amid a decline in domestic demand and production
- How to address increasing concerns around supply constraints such as resources, materials, and labor in a resource-poor country with a shrinking workforce
- How can Japanese companies capitalize on market growth opportunities associated with the progress of digitalization
- How can Japanese companies capitalize on market growth opportunities associated with decarbonization

Source: Compiled by Mizuho Bank Industry Research Department

Need to address structural reforms, growth strategy, and transforming the business model from a medium- to long-term perspective

■ While tackling the immediate issues at hand, Japanese industry must also adopt a medium to long-term perspective to develop initiatives for structural reforms, growth strategy, and transforming the business model.

Strategic direction derived from mid-term challenges

Key structural challenges	Strategic direction	Categorization of strategy		
		Structural reforms	Growth strategy	Business model shift
How to maintain industrial competitiveness amid a decline in domestic demand and production	■ Reduce the scale of production by leveraging industrial-academic-government collaboration (1 chemicals, steel, non-ferrous metals, 4 oil etc.)	●		
	■ Diversify businesses into growth areas (3 construction, rail, aviation, etc.)		●	
	■ Expand overseas business (1 materials, 3 food, construction, logistics, aviation, retail, 4 electric power, etc.)		●	
How to address increasing concerns around supply constraints such as resources, materials, and labor in a resource-poor country with a shrinking workforce	■ Diversify overseas procurement and increase reserves to ensure stable supply and secure the supply (4 electric power, city gas, etc.)	●		
	■ Use digital technology to improve efficiency and productivity (3 construction, logistics, retail, 5 healthcare, etc.)	●		
	■ Strengthen domestic production capacity for critical commodities, etc. (2 semiconductors, 5 pharmaceuticals, etc.)	●	●	
How can Japanese companies capitalize on market growth opportunities associated with the progress of digitalization	■ Leverage intangible assets to create high added-value services (3 logistics, rail, retail, 5 healthcare, etc.)			●
	■ Integration of manufacturing technology and services (1 automotive, 2 semiconductors, electronic components, 5 medical devices, etc.)			●
How can Japanese companies capitalize on market growth opportunities associated with decarbonization	■ Provide CN and CE (circular economy) solutions (1 chemicals, steel, non-ferrous metals, 2 semiconductors, electronic components, IT services, 3 logistics, 4 energy, etc.)			●

Source: Compiled by Mizuho Bank Industry Research Department

Structural reforms becoming increasingly urgent in light of declining domestic demand and production plus supply constraints including resources and labor

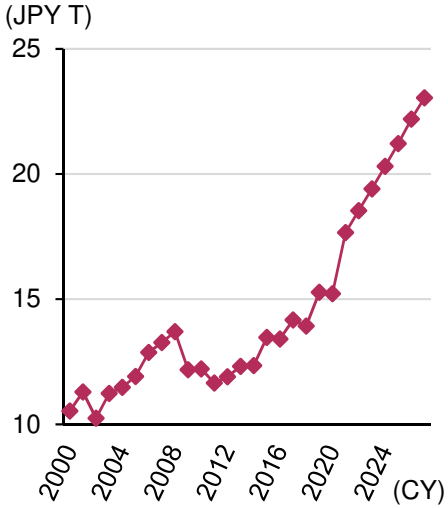
- The first type of initiatives Japanese industry needs to consider are structural reform as a "defense" against the contraction of domestic demand and production, and supply constraints such as resources and labor. Three points are touched on below.
  - First, as there are limits to what companies can do individually to right-size production, initiatives such as sharing of production processes and facilities will be necessary in addition to corporate restructuring. However, from the standpoint of maintaining a stable supply of goods and services, technological capabilities, and human resources, planned and phased implementation will be the key.
  - Second, in order to diversify energy procurement, companies will need to diversify their procurement portfolios and sophisticate their risk management, along with collaborating with other companies. Meanwhile, policy support will need to be considered for risk-taking in the long term.
  - Third, the use of digital technology will be essential for improving supply efficiency and productivity. Medium-term digitalization initiatives in each industry are expected to mainly involve the visualization and analysis of data and the streamlining and automation of operations, and IT investment will expand further.

Efforts to optimize the expected scale of production

Industry	Medium-term initiatives
Steel	Sharing of blast furnaces (upper process) ■ As there is a need to consider shutting down more blast furnaces due to the decline in domestic demand, pursue a smooth transition by sharing blast furnaces and coordinating on semi-finished products
Non-ferrous metals	Streamline copper smelting companies ■ In addition to mergers between smelting companies, establish joint smelters and manage them as cross-company cost centers
Oil	Inter-industry collaboration to make complexes carbon neutral ■ Joint procurement and utilization of hydrogen and ammonia ■ Joint CO2 capture and utilization ■ Joint procurement and utilization of waste plastics ■ Joint implementation of CCUS

Source: Compiled by Mizuho Bank Industry Research Department

Outlook for Japan's private-sector IT investment



Industry	Medium-term digitalization initiatives
Chemicals	✓ Measure and manage the carbon footprint of materials, visualize by using digital tools
Non-ferrous metals	✓ Utilize automation and AI for pre-processing
Construction	✓ Improve productivity through construction using ICT, automation, etc.
Retail	✓ Reduce store operating costs

Note 1: The figures for 2021 onwards are IRD forecasts.
Note 2: Amount of IT investment = amount invested in telecommunications equipment + computers and auxiliary equipment + software.
Source: Compiled by Mizuho Bank Industry Research Department based on Ministry of Economy, Trade, and Industry, *Survey of Selected Service Industries*, Ministry of Internal Affairs and Communication, *IT Investment and Research and Development*, and Cabinet Office, *National Accounts*.

Strategies for growth under a business environment that will grow increasingly challenging going forward

- The second type of initiatives Japanese industry needs to consider are growth strategies, which are “offensive” moves to address the increasingly challenging business environment. Two points are touched on below.
  - First, although overseas business expansion will require a bold commitment, particularly for industries that are domestic demand-driven, these efforts will be increasingly significant as the slowdown and decline in domestic demand and export growth eventually come into sharper focus going forward.
  - Second, it will be vital to strengthen Japan’s domestic production capabilities for critical commodities, not only from the standpoint of establishing a supply structure that is not overly reliant on imports, but also to reinforce domestic research and development infrastructure, as governments and corporations worldwide are in all-out competition to develop cutting-edge technologies.

Conceivable initiatives for overseas business expansion

Industry	Medium-term initiatives
Food	Actively pursue M&As to build an overseas business platform ■ Investments and M&As in frozen foods and plant-based meat products, where growth is expected due to heightened health and environmental awareness among consumers
Steel	Expand overseas production ■ Expand overseas production (mass production) and extend value chains (integrated manufacturing)
Electric power	Capture the ASEAN market, which has tremendous growth potential ■ Participate in renewable energy development projects in ASEAN, and capture the increase in electricity demand while also contributing to decarbonization in the region
Retail	Leverage the expertise cultivated in Japan and strengths in service provision in order to differentiate ■ Expand the Japanese convenience store value chain model to overseas markets

Source: Compiled by Mizuho Bank Industry Research Department

Initiatives to reinforce domestic production capabilities

Industry	Medium-term initiatives
Pharma-ceuticals	Manufacture vaccines in Japan ■ 17 vaccine manufacturing site development projects have been selected (FY2021 supplementary budget) for a total of around JPY 226.5 billion. This is expected to generate JPY 250 billion or more in capital investment
Semi-conductors	Manufacture cutting-edge semiconductors in Japan ■ In November 2022, Rapidus was established with the goal of reviving the semiconductor industry in Japan and manufacturing next-generation semiconductors domestically ■ The aim is for mass production of 2nm or smaller logic semiconductors starting in 2027

Source: Compiled by Mizuho Bank Industry Research Department

Taking on the challenge of transforming the business model

- The third type of initiatives Japanese industry needs to consider are those which involve the challenge of changing the business model in view of disruptive and dramatic future changes in the competitive landscape. Three points are touched on below.
  - First, when a decline of the added value of conventional services is anticipated in non-manufacturing industries, it will be essential to pursue higher added-value services by leveraging intangible assets.
  - Second, in manufacturing industries such as materials, automotive, electronics, and medical devices, it will be important to provide solutions that fit the changing needs of consumers and demand industries, based on the manufacturing technologies that Japan has refined up until now.
  - Third, the development of environmentally-friendly values and the building of value chains such as hydrogen and ammonia are areas that hold promise for generating new demand in view of the progress of decarbonization. Even if there is still significant uncertainty in terms of technology and profitability, in the short to medium-term, it is necessary for industry, academia, and government to work together to identify promising technological areas and promote research and development and demonstration. Also, in the medium to long term, long-term efforts such as aiming to capture the market on a global scale are necessary.

Achieving business innovation by leveraging intangible assets

Industry	Medium-term initiatives
Logistics	Shift added value from providing transport capacity to building logistics information platforms and data analysis ■ Transform the logistics company business model in order to add value, with a view to changing from provision of transport capacity to 1visualization of logistics information, 2 collaboration and standardization, and 3 using data to analyze supply chains

Source: Compiled by Mizuho Bank Industry Research Department

Initiatives to provide a combination of manufacturing and services

Industry	Medium-term initiatives
Medical devices	Change the business model from providing devices to providing solutions ■ To meet the need for more efficient diagnosis and treatment operations, change the business model from one which provides stand-alone devices to providing integrated solutions combining devices with services, etc.
Automobiles	Shift from the conventional product/brand strategy tied to products that pursue volume growth ■ To address deteriorating profitability due to the shift to BEVs and changing customer needs, shift focus to mobility experiences and platforms and establish recurring business that offers new value and continually generates profits

Source: Compiled by Mizuho Bank Industry Research Department

Initiatives to generate new demand

Industry	Medium-term initiatives
Chemicals	Strategy to differentiate by pursuing environmental measures ■ Aim to use obtaining of certification and industrial-academic-government collaboration to reduce supply costs, with an eye to future business opportunities responding to downstream users who are seeking environmentally-friendly materials
Oil, electric power	Capture needs for emissions reduction solutions ■ In order to address the decreasing demand for petroleum, take the lead in supplying the carbon neutral fuels that will take the place of fossil fuels (hydrogen, ammonia, SAF, etc.)

Source: Compiled by Mizuho Bank Industry Research Department

(Reference) List of "Analyst's View" topics covered for each industry 1/2

- Business strategies in light of changes in the business environment and topics that analysists are focusing on are listed here as "Analyst's View" topics.
  - These pages categorize the business strategies under structural reforms, growth strategy, and business model shift.

	Details	(Reference) Categorization of business strategy		
		Structural reforms	Growth strategy	Business model shift
Processed food	1 Strengthen overseas business, 2 D2C, 3 sustainability and nutrition issues		●	●
Chemicals	1 Realize environmental value and reduce environmental costs 2 Pursue cutting-edge areas in functional chemistry by refining competitiveness	●	●	●
Pharmaceuticals	1 Actions necessary for pharmaceutical companies 2 Changes in pharmaceutical companies' value chains 3 Address supply chain risks	●	●	●
Oil	1 Reduce capacity after securing stable supply 2 Pursue decarbonization alongside growth strategies	●	●	●
Steel	1 Pursue growth strategies while also making structural reforms 2 Carbon neutrality initiatives	●	●	●
Non-ferrous metals	1 Strategies necessary for copper processing (copper products) companies 2 [Topics] Copper smelting strategy and changes in Onaha Smelting and Refining's investment structure	●	●	
Medical devices	1 Provision of solutions integrated with services 2 Expansion of medical data		●	●
Electronics (semiconductors)	・Impact of shifting semiconductor design in-house		●	●
Electronics (electronic components)	・Pursue both improved performance of individual electronic components and proposal-making by electronic component manufacturers		●	●
Electronics (finished products)	・Strategies that respond to user needs		●	●
Automotive	・Necessity of business model transformation / accelerate Japanese automakers' shift to BEVs			●
Construction	1 Initiatives to boost productivity spanning multiple industries 2 Allocation of resources to new businesses for the future	●	●	

Source: Compiled by Mizuho Bank Industry Research Department

(Reference) List of "Analyst's View" topics covered for each industry 2/2

	Details	(Reference) Categorization of business strategy		
		Structural reforms	Growth strategy	Business model shift
Electric power	1 Direction of measures for electric power retail business 2 Direction for development of renewable energy 3 Building of hydrogen and ammonia supply chains	●	●	●
City gas	1 Reducing LNG-related risks is critical 2 Methanation is the key to carbon neutrality 3 Digital Transformation initiatives by local city gas companies	●	●	●
Telecommunications	・Actions necessary for telecommunications providers		●	
Media services	・Actions necessary for key stations	●	●	
IT services	1 Actions for infrastructure managed service providers 2 Actions to capture needs on the user business side	●		●
Rail	1 Develop an ecosystem 2 Establish asset management functions		●	
Logistics	1 High added value for logistics providers 2 Measures to achieve carbon neutrality	●	●	●
Aviation	1 Diversified approach that does not rely on travel business 2 Strengthen compliance with CO2 emissions regulations		●	
Retail	1 Strengthening supply chain management 2 Change the business model using digital technology		●	●
Real estate	1 Initiatives necessary for real estate business operators 2 Initiatives necessary for housing-related industries			●
Lodging	1 Strategic direction for major business operators 2 Strategic direction for small business operators 3 How to provide SaaS functions	●	●	
Medical	1 Strategic direction for healthcare providers 2 Strategic direction for medical-related companies	●	●	
Nursing care	1 Creation of market for B2B services 2 Private nursing homes run by new operators		●	

Source: Compiled by Mizuho Bank Industry Research Department

(Reference) Trends in Global Demand Indicators

(2019=100)

Industry	Indicator	2020 (Actual)	2021 (Actual)	2022 (Estimate)	2023 (Projected)	2027 (Projected)	CAGR 2022-2027
Processed food	Processed food sales (retail channels)	104	105	107	109	118	2.0%
Chemicals	Ethylene equivalent demand	104	109	112	115	129	2.8%
Pharmaceuticals	Pharmaceutical sales	103	113	114	119	137	3.7%
Oil	Oil demand	91	97	100	102	105	1.1%
Steel	Crude steel apparent consumption	100	103	101	102	104	0.5%
Non-ferrous metals	Electrolytic copper demand	103	104	106	107	115	1.8%
Medical devices	Global market size	98	111	123	130	162	5.7%
Automotive	Number of vehicles sold (major countries/regions)	87	91	91	95	102	2.3%
	Number of vehicles sold (global)	86	91	90	93	101	2.5%
Electronics (semiconductors)	Semiconductor demand	111	141	147	137	168	2.7%
Electronics (electronic components)	Electronic components demand	100	115	116	116	143	4.2%
Electronics (finished products)	Demand for major electronics products	100	115	109	111	138	4.7%
Electric power	Electricity demand	101	106	108	109	117	1.6%
City gas	Natural gas demand	98	101	102	101	103	0.3%
Telecommunications	Number of lines	100	103	107	107	110	0.6%
	ARPU	98	81	79	78	75	- 0.9%
	ARPU x number of lines	98	83	84	84	83	- 0.3%
Media services	Advertising expenses	93	113	118	125	144	4.0%
IT services	Investment in IT services/software	108	121	134	147	214	9.8%
Logistics	Shipping (major liner lading: Americas/Europe/Asia)	99	107	105	105	119	2.6%
Aviation	Scheduled transport/passenger kilometers	34	42	78	90	118	8.6%
Retail	Retail sales revenue	102	111	119	124	146	4.3%

Note: For electronics (finished products) only, 2020=100
Source: Compiled by Mizuho Bank Industry Research Department based on various materials

(Reference) Trends in Domestic Demand Indicators

(2019=100)

Industry	Indicator	2020 (Actual)	2021 (Actual)	2022 (Estimate)	2023 (Projected)	2027 (Projected)	CAGR 2022-2027
Processed food	Food expenditure	91	90	94	98	97	0.7%
Chemicals	Ethylene equivalent demand	88	99	97	98	99	0.5%
Pharmaceuticals	Domestic pharmaceutical shipments	97	100	103	102	97	- 1.0%
Oil	Oil demand	92	93	93	92	86	- 1.5%
Steel	Crude steel apparent consumption	79	93	90	92	92	0.4%
Non-ferrous metals	Electrolytic copper demand	88	90	91	90	95	1.0%
Medical devices	Medical devices domestic market size	99	103	110	113	121	1.8%
Electronics (semiconductors)	Semiconductor demand	97	132	138	133	148	1.4%
Electronics (electronic components)	Electronic components demand	89	84	75	74	82	1.9%
Electronics (finished products)	Demand for major electronics products	98	104	92	90	103	2.3%
Automotive	Number of vehicles sold	89	86	83	88	89	1.4%
Construction	Nominal construction investment (fiscal year)	97	99	101	102	103	0.4%
Electric power	Total electricity demand	97	99	99	99	98	- 0.2%
City gas	City gas demand	98	101	104	105	107	0.6%
Telecommunications	Telecommunications (ARPU)	96	92	85	83	80	- 1.1%
	Number of mobile phone/PHS lines	103	106	107	106	107	0.0%
	ARPU x number of lines	99	98	91	88	86	- 1.1%
Media services	Domestic advertising expenses	89	98	99	100	100	0.3%
IT services	IT services sales revenue	112	125	133	141	175	5.6%
Rail	Rail (bullet train) (fiscal year)	42	52	76	89	92	3.9%
Logistics	Domestic truck freight volume (fiscal year)	92	94	96	96	92	- 0.8%
	Number of home deliveries (annual)	112	115	117	120	130	2.1%
Aviation	International and domestic scheduled/passenger kilometers	32	25	55	74	104	13.6%
Retail	Retail sales (excluding automobile and fuel retailing)	98	99	100	99	98	- 0.3%
	Inbound consumption/shopping by visitors to Japan	12	3	8	48	123	72.6%
Real estate	Demand for office floor space	99	98	98	99	101	0.7%
	New housing construction starts	90	95	95	95	92	- 0.6%
Lodging	Number of foreign tourists visiting Japan	13	1	8	49	115	70.6%
	Lodging demand (number of nights)	56	65	72	80	97	5.9%
Medical	National medical expenditure	97	101	104	105	109	1.0%
Nursing care	Nursing care demand	103	105	110	115	125	2.7%

Source: Compiled by Mizuho Bank Industry Research Department based on various materials

(Reference) Trends in Export and Production Indicators

[Export Indicators]

(2019=100)

Industry	Indicator	2020 (Actual)	2021 (Actual)	2022 (Estimate)	2023 (Projected)	2027 (Projected)	CAGR 2022-2027
Processed food	Processed food exports	112	134	151	166	242	10.0%
Chemicals	Ethylene equivalent exports	100	97	72	80	85	3.5%
Pharmaceuticals	Pharmaceutical exports	117	129	141	154	208	8.1%
Oil	Petroleum product exports	63	65	75	75	70	- 1.4%
Steel	Crude steel equivalent steel imports/exports	93	102	91	91	80	- 2.5%
Non-ferrous metals	Copper ingot exports	141	113	114	112	94	- 3.7%
Medical devices	Medical device exports	96	108	122	127	142	3.0%
Electronics (semiconductors)	Semiconductor exports	100	118	123	116	135	1.8%
Electronics (electronic components)	Electronic component exports	99	119	121	120	146	3.9%
Electronics (finished products)	Exports of major electronic products	97	103	94	93	109	3.0%
Automotive	Number of vehicles exported	78	79	74	77	85	2.8%

[Production Indicators]

(2019=100)

	Indicator	2020 (Actual)	2021 (Actual)	2022 (Estimate)	2023 (Projected)	2027 (Projected)	CAGR 2022-2027
Processed food	Processed food production	98	100	103	104	104	0.4%
Chemicals	Ethylene equivalent production	92	99	88	92	95	1.5%
Pharmaceuticals	Production of pharmaceuticals for domestic use	98	97	102	96	88	- 2.9%
Oil	Petroleum product production	81	81	81	80	75	- 1.4%
Steel	Crude steel production	84	97	90	91	87	- 0.8%
Non-ferrous metals	Copper ingot production	106	101	106	100	97	- 1.8%
Medical devices	Domestic medical device production	96	103	100	104	108	1.6%
Electronics (semiconductors)	Semiconductor production	101	114	120	113	127	1.2%
Electronics (electronic components)	Electronic component production	99	112	114	113	127	2.3%
Electronics (finished products)	Production of major electronic products	86	85	79	78	86	1.9%
Automotive	Number of vehicles produced	83	81	79	83	87	2.0%

Source: Compiled by Mizuho Bank Industry Research Department based on various materials

2. Logistics

Strategic Planning Based on Medium to Long Term Changes in Cargo Volume and Value-Add is Important

I. Supply & demand trends

Domestic truck transport

- In the short term, the B2B market is expected to grow by +1.2% YoY in FY2022 due to firm demand for consumption and production-related cargo, but will decline in the medium term. Expansion of the B2C market will continue.

Maritime container transport

- In the short term, the increase in cargo movement due to COVID-19 is expected to slow down, and growth will slow because of a decrease in consumer spending due to inflation. 2022 is forecast to be -1.2% YoY for all target routes. Over the medium term, cargo movement is expected to increase in line with economic growth in each country.

II. Competitive environment

Domestic truck transport

- Due to the emergence of labor shortages, companies with transportation capacity will gain power in the short term. In the medium to long term, there is a possibility that M&A will progress due to decreases in cargo volume and the progress of automation and digitalization.

Maritime container transport

- In international logistics, competition amongst transport operators is intensifying due to M&A of major forwarders, the expansion container shipping companies' international logistics businesses, and the rise of digital forwarders.

III. Risks & opportunities

<Risks>

- Competition amongst logistics providers will intensify due to a decline in domestic cargo volume over the medium to long term. There is the possibility of companies being weeded out/eliminated if cargo shifts to oligopolies, if industry logistics become closed in, or if companies are unable to secure cargo, including for non-Japanese companies overseas.
- Major overseas logistics companies have significantly increased their global presence through large-scale M&A. Japanese logistics companies' global presence is declining in relative terms, and it may become difficult for them to strengthen their overseas business and acquire non-Japanese shippers.

<Opportunities>

- In the short term, companies with transportation capacity are expected to gain an advantage due to the emergence of labor shortages, and strengthening transportation businesses will be effective.
- Over the medium to long term, the momentum for DX and carbon neutrality will expand. Because the added value of transportation capacity is declining in relative terms, it will be important to consolidate and control the logistics in each industry and move towards oligopolies.
- Mergers and alliances are already underway around the globe. Japanese companies will be required to provide added value to the logistics for each industries without relying on economies of scale and to secure customers.

IV. Analyst's view 1

Changes in logistics companies' added value

- In the medium to long term, added value will shift from transportation capacity to data utilization. In order to capture demand, including from non-Japanese shippers, overall optimization of logistics, which includes carbon neutrality, will become important.
- In addition to visualization, sharing and standardizing logistics, as well as customer supply chain analysis via the use of data will be required.
- In light of medium to long term changes, in the near term it will be important to accumulate profits by securing transportation capacity and to promote visualization and standardization.

IV. Analyst's view 2

Carbon neutrality response

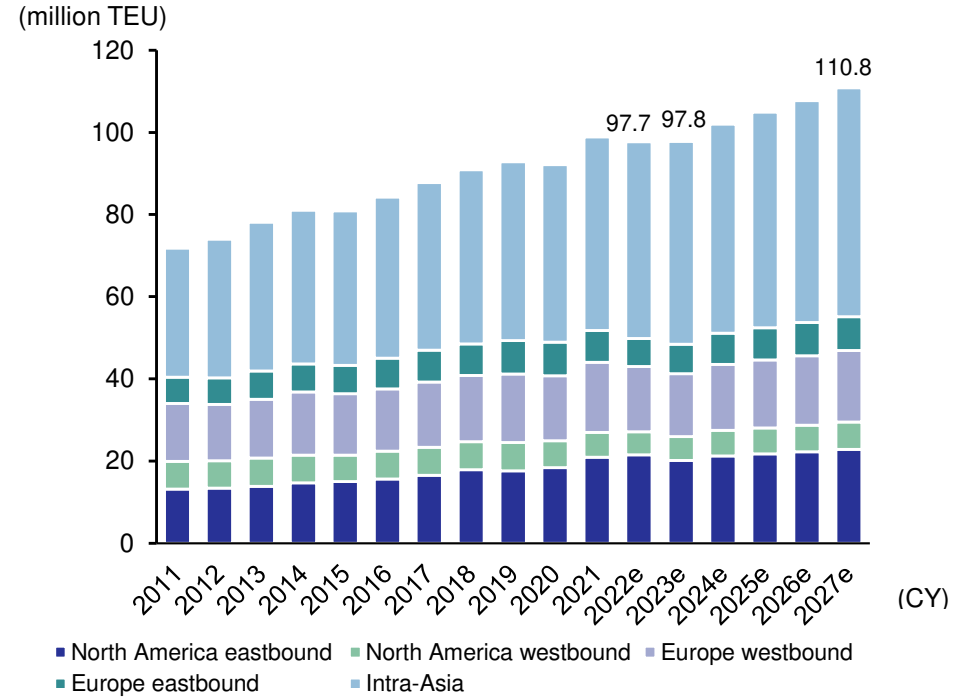
- Major European forwarders are collaborating with the shipping and aviation industries to promote initiatives that reduce CO2 emissions throughout the entire supply chain. In addition to visualization and asset switching, they are realizing carbon neutral transportation through the use of alternative fuels and the acquisition of emissions credits, etc.
- As demand for carbon neutrality from shippers increases, Japanese companies will also be required to respond, including via proposals for transportation routes and transportation modes across the entire supply chain.

Source: Compiled by Mizuho Bank Industry Research Department

[Global Demand] Short Term Slowdown, but Economic Recovery will Lead to Increased Demand for Transportation in the Medium Term

- Maritime container cargo volume in 2022 is expected to slow down (-1.2% YoY for all target routes) due to the impact of the situation in Ukraine, a lull in stay-at-home demand, and sluggish consumer spending due to inflation.
- As for the outlook over the next five years, although there is a high degree of uncertainty due to China's zero-Covid policy, the situation in Ukraine, and the economic recession, cargo movement is expected to increase (annual rate of +2.6% for all target routes) in line with the economic growth of each country.
- In terms of supply and demand balance, from 2023 onwards, despite an increase in tonnage due to continued completions of new containerships, it is expected that there will be supply adjustments from slow steaming because of the application of the IMO's (International Maritime Organization) EEXI (Energy Efficiency Existing Ship Index) and from a reduction in alliance units.

Trends in annual cargo movement for global maritime container cargo



Note: Figures for 2022 and beyond are forecasts by the Mizuho Bank Industry Research Department
Source: Compiled by Mizuho Bank Industry Research Department based on Japan Maritime Center materials

Outlook for each region (Upper row: Cargo volume (1,000 TEU); Lower row: YoY rate of change)

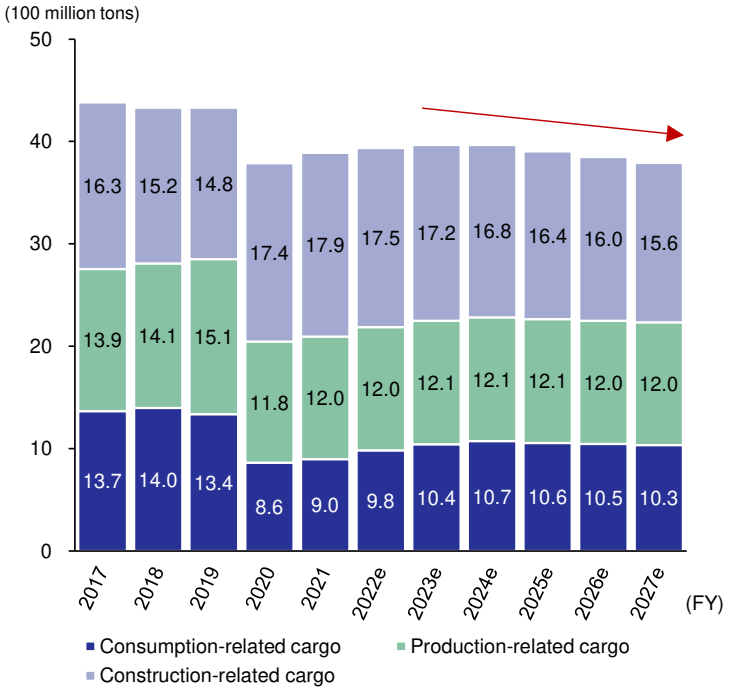
Region	2021 (Results)	2022 (Expected)	2023 (Predicted)	2027 (Predicted)	CAGR '22-'27	Points
North America Eastbound (from Asia to NA)	20,892	21,503	20,155	22,881		Demand will slow down and cargo movement will decrease in the short term due to declining consumption, but expansion is expected in the medium term due to economic recovery
	+13.6%	+2.9%	-6.3%	-	+1.3%	
North America Westbound (from NA to Asia)	6,033	5,588	5,792	6,589	-	Although the situation where container forwarding was prioritized has improved and some recovery is expected, growth is expected to slow due to trade frictions between the US and China
	-8.0%	-7.4%	+3.7%	-	+3.4%	
Europe Westbound (from Asia to Europe)	17,069	15,908	15,311	17,444	-	In the short term, consumption is expected to decline and the situation in Ukraine will slow down, but in the medium term, cargo movement is expected to increase due to economic recovery
	+8.2%	-6.8%	-3.8%	-	+1.9%	
Europe Eastbound (from Europe to Asia)	7,751	6,844	7,187	8,254	-	There was a significant decline in 2022 due to the situation in Ukraine and the Shanghai lockdown, but economic recovery is expected in the medium term
	-5.6%	-11.7%	+5.0%	-	+3.8%	
Intra-Asia Routes	47,146	47,818	49,365	55,637	-	Although growth slowed in 2022 due to the impact of the lockdown in Shanghai, growth is expected in the medium term against the backdrop of an economic expansion
	+9.1%	+1.4%	+3.2%	-	+3.1%	

Note: Figures for 2022 and beyond are forecasts by the Mizuho Bank Industry Research Department
Source: Compiled by Mizuho Bank Industry Research Department based on Japan Maritime Center materials and other various materials

[Domestic Demand] Medium Term Decline in B2B Market Continued Expansion of B2C Market is Expected

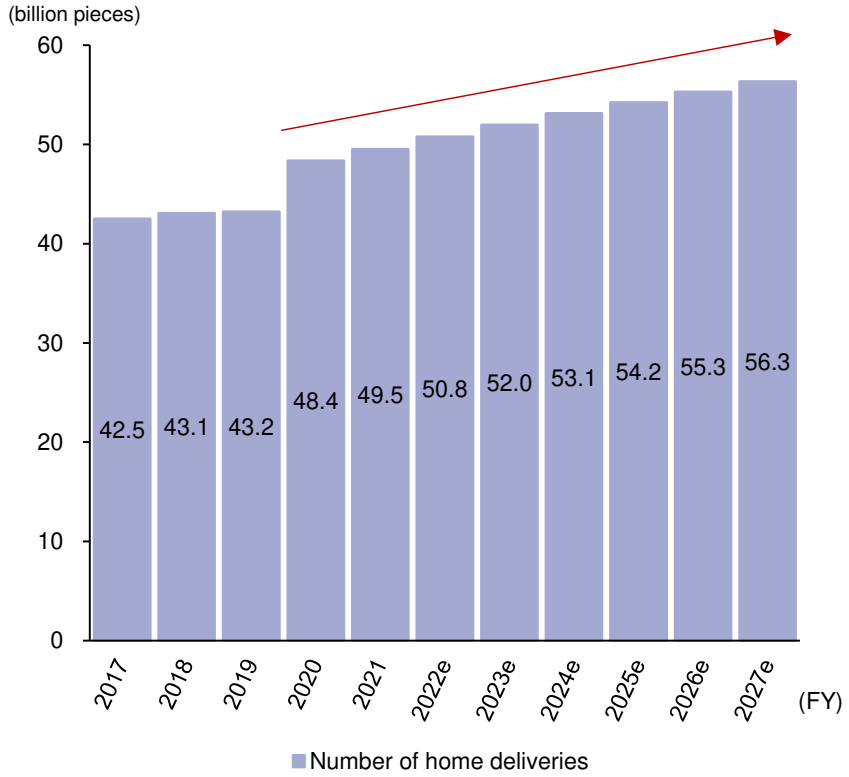
- In FY2022, domestic truck transport volume (B2B) is predicted to increase +1.2% YoY because of an increase in food service cargo due to a recovery in consumption from goods to services in consumption-related cargo and a reasonable expected increase in steel and automobile-related cargo despite production-related cargo not returning to pre-COVID-19 levels.
- In the medium term, domestic truck transport volume (B2B) is expected to moderately decline due to population decline and a contraction of the domestic market. On the other hand, the number of home deliveries (B2C) is expected to increase as the EC market expands.

Medium term outlook for domestic truck transport volume (B2B)



Note 1: Figures for FY2022 and beyond are forecasts by the Mizuho Bank Industry Research Department
Note 2: Since April 2020, the survey method and aggregation method for freight vehicles changed, so there is a discontinuity in the statistical information between FY2019 and FY2020
Source: Compiled by Mizuho Bank Industry Research Department based on Ministry of Land, Infrastructure, Transport and Tourism statistics

Medium term outlook for home delivery volume (B2C)

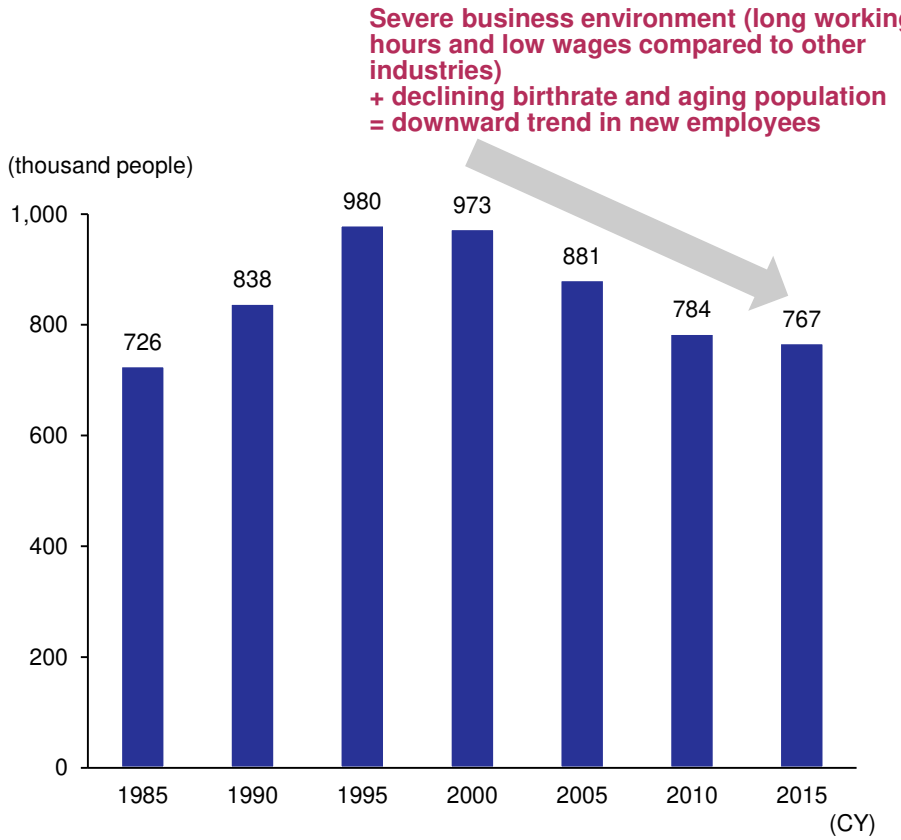


Note 1: Figures for FY2022 and beyond are forecasts by the Mizuho Bank Industry Research Department
Source: Compiled by Mizuho Bank Industry Research Department based on Ministry of Land, Infrastructure, Transport and Tourism statistics

[Supply and Demand Balance] Sellers have an Advantage, and Logistics Costs may also Rise

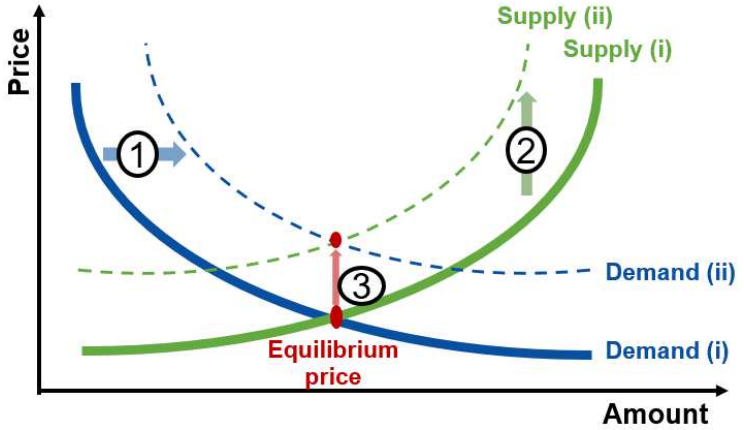
- While logistics demand will continue to be adequate going forward, the supply side is experiencing difficulties in attracting new employees due to the business environment, and the future impacts of a declining birthrate and aging population may accelerate the labor shortage.
- Supply and demand balance is expected to shift in favor of sellers, which will increase logistics costs and labor costs.
- Additionally, if supply and demand adjustments do not go smoothly, then companies without transportation capacity or transportation networks may not be able to transport goods.

Change in the number of drivers in the road freight transportation industry



Source: Compiled by Mizuho Bank Industry Research Department based on the "Population Census" by the Ministry of Internal Affairs and Communications

Price adjustment mechanism in the logistics market (Mizuho's understanding)



1. Demand
- ✓ Want to transport as much as possible at the same price
- ✓ Due to expanded EC demand, there is a corresponding demand for the transportation industry as a whole.

2. Supply
- ✓ Want to transport the same amount at the highest possible price
- ✓ Declining birthrate/aging population, and 2024 problem will further exacerbate labor shortages

3. Equilibrium Price
- ✓ If sellers (supply) become dominant, **prices will rise**
- ✓ Will price equilibrium and supply/demand adjustments go smoothly (time axis?)
  - ➢ If this process does not go smoothly, then companies without transportation capacity/networks **will be unable to transport cargo**

Source: Compiled by Mizuho Bank Industry Research Department

Securing Transportation Capacity in Japan is Important. Globally, Competition is Intensifying due to Expansion of Scale and Digitalization.

- Domestically, there are concerns about supply shortages due to the declining population and the 2024 problem (upper limit on driver working hours), etc., and businesses that have secured transportation capacity and networks will have an advantage in the short term.
- Globally, M&As among major forwarders have already progressed. With the rise of container shipping companies, EC platforms, and digital forwarders, in addition to conventional logistics operators, it will be necessary for companies to respond to digitalization and work to differentiate themselves.

Analyst's view 1

5 force analysis of the logistics industry environment

Threat of New Entrants

[Short term (until 2027)]
- Expansion of container ship companies' logistics businesses
- Incorporation of logistics for overseas tech companies and EC platforms
- Global rise of digital forwarders

Buyers (Shippers)

[Short term (until 2027)]
- Due to the declining population and the 2024 problem (upper limit on driver working hours), shortages of logistics personnel and increases in logistics costs will become more serious
- There will be moves to review logistics due to labor shortages and the growing importance of supply chains

[Long term (from 2027)]
- Responding to supply chain diversification (where goods are sold and shipped from)
  - Importance of strengthening SCM
  - Networks (physical + information) that can handle a variety of routes will become necessary

Intra-Industry Competition

[Short term (until 2027)]
- In Japan, logistics companies with transportation capabilities will work to ensure that they have sufficient strength
- Globally, major M&As are moving forward and competition is intensifying

[Long term (from 2027)]
- Domestically, there is the possibility that M&A will move forward due decreased cargo volumes and the development of automation and digitalization
- It will be necessary to respond to changes in the added value of logistics (shift from maintaining transport capacity to constructing a logistics information platform and data analysis)

Suppliers (Logistics Companies)

[Short term (until 2027)]
- Bargaining power of drivers and warehouse workers will gradually increase due to labor shortages

[Long term (from 2027)]
- It will be necessary to switch and automated facilities/equipment and EVs, etc. due to labor shortages and decarbonization

[Long term vision]
- In the future, automated equipment and robots, etc. may replace basic logistics operations

Threat of Alternatives

[Long term vision]
- Transportation and storage functions replaced by robots and automated vehicles/warehouses/equipment
- 3PL/forwarder businesses replaced by systems due to the progress in logistics information platforms

Note: 3PL: Abbreviation for 3rd Party Logistics. Refers to a logistics business form in which the most efficient logistics strategy is planned on behalf of the shipper company, with the logistics services then being comprehensively contracted and executed.
Source: Compiled by Mizuho Bank Industry Research Department

[Risks] In Japan: Need to Respond to Changes in Transportation Capacity in the Short to Medium Term, and to Added Value Changes in the Long Term

- In the short to medium term domestically, as the population declines and the 2024 problem progresses, there is the possibility that sellers have an advantage, but logistics companies that cannot secure transportation capacity and networks run the risk of being weeded out/eliminated.
  - It will be necessary to secure profits during the transitional period when sellers have an advantage, and to improve the position of logistics in relationships with shippers.
- If it is not possible to secure profits and eliminate the subordinate relationship with shippers during the aforementioned transition period, then there is a risk of being weeded out/eliminated because it won't be possible to handle the investments in logistics information platforms and automated vehicles/warehouses/equipment that will become important in the long term. Analyst's view 1

Short and medium term risks: Responding to industry changes

Current Situation

[Positioning of logistics (businesses)]
- ✓ Logistics companies have a subordinate relationship with shippers
- ✓ Logistics is a cost for shippers, and they strongly demand lower costs from logistics companies

Shippers → Subordinate → Logistics companies

Japan's declining population

2024 problem

Short and Medium Term

[Positioning of logistics (businesses)]
- ✓ Logistics demand > logistics supply, so there is the possibility of a temporary increase in the profitability of logistics companies with transportation capacity
  - ➢ Prepare for the future by securing transportation capacity and securing profits
- ✓ On the other hand, dependence on shippers will continue if the industry structure cannot be successfully transformed

Improve the position of logistics?

Shippers ⇔ Logistics companies

Long term risks: Responding to added value changes in logistics

Current Situation

Value in transport capacity
- ✓ **Provide transportation/storage functions**
  - ➢ Own and operate vehicles/warehouses
- ✓ **Arrange/broker transportation**
  - ➢ Arrange transportation with assets or non-assets

- De-Population ⇒Transportation/storage functions will be replaced by robots and automated vehicles/warehouses/equipment, and quality will be the same regardless transporter
- Digitalization ⇒Transportation arrangements and brokering will be replaced by logistics information platforms
- De-carbonization ⇒There will be a need for carbon-neutral logistics designs

Long Term

Value in information processing and sustainable logistics
- ✓ **Stable operation of transportation/storage functions**
  - ➢ Stable and efficient operation of robots and automated vehicles/warehouses/equipment
- ✓ **Overall transport optimization**
  - ➢ As the shift to IT advances, it will be important to optimize transportation using the information that is collected on logistics information platforms

Prepare for investments that will be necessary from a long-term perspective

Source: Compiled by Mizuho Bank Industry Research Department

[Risks] Globally: Intensifying Competition in International Logistics, Possibility that Japanese Companies will be Weeded Out/Eliminated

- While M&A amongst major players in international logistics are progressing, the presence of Japanese companies is declining in relative terms.
  - In addition to competition amongst logistics companies, shipping companies and digital forwarders are encroaching on the domain of traditional forwarders.
- Although there is heightened interest in carriers with actual transportation means due to the current logistics turmoil, if none of them can provide cost reductions and new added value through intermodal transportation, then it is expected that they will be eliminated as international logistics players in the future.
  - In order to survive, it will be essential to provide added value, regardless of scale, while also utilizing digital technologies.

Analyst's view 1 & 2

Consolidated sales ranking of major listed logistics companies

(Units: million USD)

NO.	FY2015	Sales	FY2021	Sales	Type	Country
1	Deutsche Post	65,755	UPS	97,287	Parcel	USA
2	UPS	58,363	Deutsche Post	96,706	3PL	Germany
3	FedEx	50,365	FedEx	93,512	Parcel	USA
4	Kuehne + Nagel	17,392	Kuehne + Nagel	35,885	Forwarding	Switzerland
5	Nippon Express	15,903	SF Holding	32,093	Parcel	China
6	CH Robinson	13,476	DSV	28,999	Forwarding	Denmark
7	Bollore	12,016	C.H. Robinson	23,102	3PL	USA
8	YAMATO HOLDINGS	11,799	NIPPON EXPRESS HOLDINGS	20,809	Forwarding	Japan
9	TNT Express	7,676	Sinotrans	19,261	Forwarding	China
10	XPO Logistics	7,623	Expeditors	16,524	Forwarding	USA
11	DSV	7,571	JD Logistics	16,217	3PL	China
12	Sinotrans	7,245	YAMATO HOLDINGS	15,970	Parcel	Japan
13	CWT	7,227	SG HOLDINGS	14,143	Parcel	Japan
14	Expeditors	6,617	XPO Logistics	12,806	Trucking	USA
15	J.B. Hunt	6,188	J.B. Hunt	12,168	Trucking	USA
16	CJ Korea Express	6,089	Kerry Logistics	10,158	Forwarding	Hong Kong
17	PANALPINA	6,087	CJ Logistics	9,909	3PL	South Korea
18	Hitachi Transport System	5,667	GXO Logistics	7,940	3PL	USA
19	YRC Worldwide	4,832	TFI International	7,220	3PL	Canada
20	SEINO HOLDINGS	4,627	YTO Express Group	6,994	Parcel	China

Source: Compiled by Mizuho Bank Industry Research Department based on information disclosed by each company.

Competitive environment in international logistics

Shipping Companies Strengthening Logistics

Maersk, MSC, CMA-CGM, etc.

Encroachment

Major Conventional Forwarders

DHL, Kuehne + Nagel, DSV, etc.

Encroachment

Digital Forwarders

Flexport, Forto, sender, Zencargo, etc.

Source: Compiled by Mizuho Bank Industry Research Department

[Opportunities] Improve Presence by Securing Transport Capacity and Shifting to Platforms

- It is expected that securing transportation capacity will be effective in the short to medium term due to labor shortages, but, at the same time, it is also speculated that it will be important to build relationships with shippers (breaking away from subordinate relationships).
- On the other hand, because the added value of transportation capacity is expected to decrease in the long term, and in preparation for future growth investments (including support for digitalization and data utilization), accumulating profits when the supply side becomes dominant will improve future presence
- Even in international logistics, the scale of competition has greatly increased, with many competitors engaged in fierce competition, and, both domestically and overseas, companies will have to provide added value by securing cargo via industry-focused platforms and by supply chain proposals for shippers. Analyst's view 1 & 2

Short/medium/long term changes in industry environment

Short → Long (Time Axis)

2024 Problem	■ Depending on transportation (arrangement) capacity, possibility of not being able to transport goods ■ Expanded profits will be temporary if bargaining power cannot be strengthened when supply side has an advantage
International Logistics	■ Intensifying competition, including for shipping companies and digital forwarders ■ M&A are progressing in international logistics, and expanded scale alone may not lead to enhanced competitiveness
Digital Response	■ Digitalization is progressing, including for transportation arrangements and visualization ■ Companies that cannot make logistics proposals that include carbon neutrality may be weeded out/eliminated
Structural Changes	■ In the medium to long term, there is the possibility that added value will shift from transportation capacity to information processing and optimization ■ Companies face the possibility of being weeded out/eliminated in the future if they only strengthen transportation capacity

Source: Compiled by Mizuho Bank Industry Research Department

Response direction in anticipation of changes in industry environment

[Short term (until 2027)]
- Strengthen transportation capacity, including for inorganics, and secure profits
- Reconstruct relationships with shippers when supply side becomes dominant
- Digitalize operations, and visualize supply chains

[Long term (from 2027)]
- Promote standardization of both logistics software and hardware via negotiations with shippers in each industry
- Accumulate and analyze data via the progress of standardization
- Promotion a shift to platforms for each industry

[Long term vision]
- Construct a platform for each industry
- Conduct supply chain analysis by using data
- Be a partner on the logistics side, including via proposals for customer supply chains

Source: Compiled by Mizuho Bank Industry Research Department

In the Short to Medium Term, it will be Important to Share and Standardize Shippers' Logistics Operations from Visualization

- The added value of logistics companies has shifted from providing transportation capacity to 1) visualization of logistics information,
  2) sharing and standardization, and 3) supply chain analysis by using data. Companies will need to provide sustainable logistics and to maintain and strengthen the supply chains of customer shippers.
  - Visualization is currently being worked on, mainly by major logistics companies. After 2024, there is the possibility that sellers have an advantage and that logistics companies' subordinate relationship with shippers will be dissolved. In that case, there is the possibility that the promotion of sharing and standardization will accelerate in the logistics for each industry.
- Primarily centered around major global logistics companies, there is currently progress being made on optimizations via sharing and visualizing customer supply chains
  - In the future, a key will be connecting this to presenting hypothetical proposals for strategic logistics via analysis of customer supply chains that use data

Areas that will provide future added value to logistics companies

Now — 1. Visualization

- ✓ Visualization of logistics business processes, costs, performance, and the details of contracts with business operators
- ✓ Identify bottlenecks, then implement further productivity improvements and optimizations

After 2024 — 2. Sharing and standardization

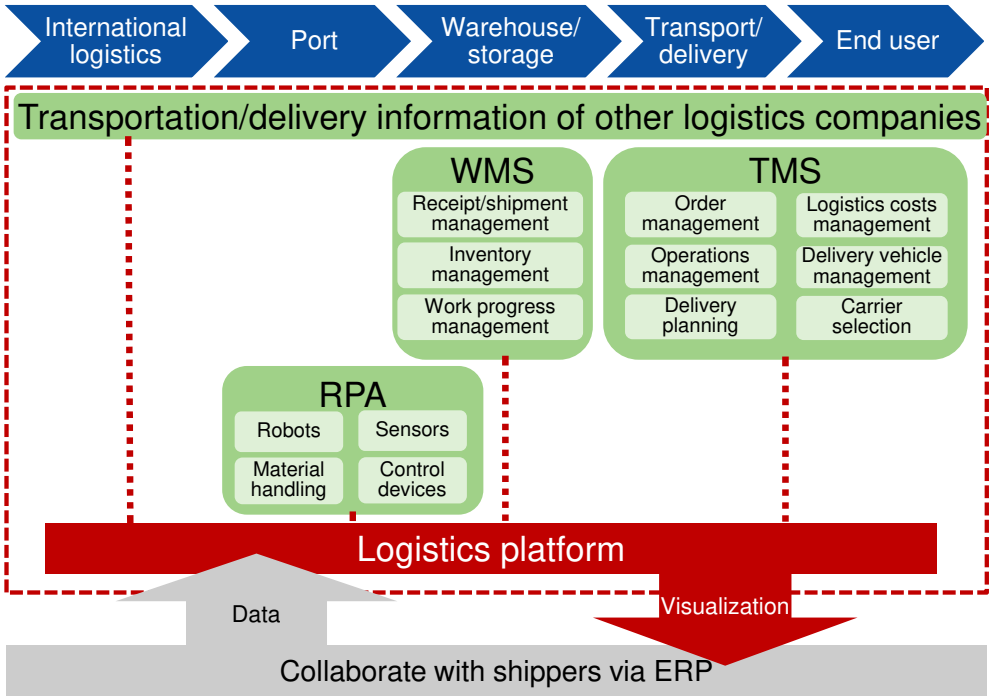
- ✓ Bundle shippers within an industry, work towards shared and standardized logistics (both hardware and software), maintain the level of logistics services, and provide maximum cost benefits and sustainable logistics

Long Term — 3. Supply chain analysis using data

- ✓ In order to increase logistics companies' added value, contribute to maintaining and strengthening customer shippers' supply chains by presenting strategic logistics proposals that are based on analysis of customer supply chains
  - ➢ To that end, the aforementioned "1. Visualization" and "2. Sharing and standardization" are important

Source: Compiled by Mizuho Bank Industry Research Department

Major logistics companies' efforts to visualize and share customer supply chains



Note 1: WMS: Abbreviation for "Warehouse Management System."
Note 2: TMS: Abbreviation for "Transport Management System."
Source: Compiled by Mizuho Bank Industry Research Department

Taking into Consideration Trends Amongst Shippers, Responding Early to Carbon Neutrality will be Necessary

- In order to reduce CO2 emissions throughout the entire supply chain, European forwarders are implementing decarbonization initiatives, including for the aviation and maritime shipping industries, such as promoting the development/use of alternative fuels and carbon neutral transportation by offsetting CO2 emission.
- Japanese companies will also be required to visualize environmental value, provide decarbonized transportation, and propose environmentally friendly supply chains based on demands from global shippers for carbon neutrality.
- Amidst increased demands from shippers for carbon neutrality, not only visualization will be necessary, but also proposals of transportation routes and transportation modes for the entire supply chain

Initiatives by European forwarders

Company	Environmental target	Primary initiatives
Deutsche Post DHL	■ Reduce CO2 emissions to less than 29 million tons by 2030 ■ Achieve carbon neutrality by 2050	■ Provide carbon neutrality through the use of biofuels in marine LCL transport and provide optional services that use biofuels in marine FCL transport ■ Participation in the Eco-Skies Alliance program to promote the use of SAF
Kuehne + Nagel	■ As of 2020, was completely carbon neutral for direct CO2 emissions (Scope 1 and 2) ■ By 2030, 33% reduction in CO2 emissions from suppliers and customers (Scope 3)	■ Offset CO2 emissions through environmental projects to make marine LCL transport and marine FCL guaranteed arrivals carbon neutral ■ Promote the introduction of SAF with European and American airlines, and offer the use of SAF as a standard option
DSV	■ By 2030, 40% reduction compared to 2019 (Scope 1 and 2) ■ By 2030, 30% reduction compared to 2030 (Scope 3)	■ Participation in a project to develop production and supply facilities for hydrogen and synthetic fuels for transportation with Maersk, etc. ■ Participation in the Eco-Skies Alliance program to promote the use of SAF

Source: Compiled by Mizuho Bank Industry Research Department based on information disclosed by each company.

Direction of CO2 reductions for logistics companies

Reduce own CO2 emissions	■ Reduce own CO2 emissions by switching/updating company assets (buildings, equipment, vehicles, etc.) ■ Promote joint transportation
Visualize environmental value of shipper's supply chain	■ Calculate CO2 emitted by shippers, develop and provide environmental impact visualization solutions ■ Provide optimal transport modes and supply chains based on simulations
Promote use of alternative fuels in collaboration with shipping/aviation industries	■ Promote the introduction of low-carbon fuels in marine and air freight transport ■ Provide optional services using low-carbon fuels
Realize carbon-neutral transportation	■ In the future, achieve carbon neutrality during transport by offsetting CO2 emissions via the acquisition of emissions credits, etc. ■ Provide carbon-neutral transportation services

Source: Compiled by Mizuho Bank Industry Research Department

3. Medical

Functional Upgrades based on the Community Healthcare Concept as well as DX aimed at Productivity Improvement are Required

I. Supply and demand trends

(Short term)
- Medical care expenditure will continue to grow due to the increasingly-aging society and advancements in medical care. FY 2022 saw a 2.7% increase on the previous fiscal year due to factors such as the addition of treatment cost payments for COVID-19 patients, recovery from the pandemic, and increased demand due to the first baby boomers reaching the age of 75. A 0.7% increase is projected in FY 2023

(Medium term)
- Looking ahead to FY 2027, in addition to the decreasing population and the altered tendency to seek medical treatment spurred by the pandemic, the Government's efforts to reduce medical care expenditure will continue. However, factor such as the increasingly-aging society and advancements in medical care are still projected to lead to an ongoing 1.0% annual increase
- In terms of supply, the effect of the decreasing working-age population will become pronounced, causing constraints in both human and financial resources

II. Competitive environment

- Providing financial support for implementing the community healthcare concept including encouraging the functional handover to convalescent and home healthcare and reducing acute phase hospital beds
- Doctors' work style reform will be applied from FY 2024. Initiatives to improve productivity through utilizing technology are essential
- Actions toward FY 2024 - when the Eighth Medical Plan takes effect - are a priority

III. Risks and opportunities

<Risks>
- In addition to the decrease in COVID-19 subsidies - which have underpinned hospital profits - the increase in personnel expenses and utilities costs are putting pressure on medical institutions' profitability. Rebuilding operational structures after the pandemic geared toward the normalization of ward operation and personnel allocation is required

<Opportunities>
- The government has strengthened promotion of medical DX, the slow pace of which was exposed during the pandemic. The government aims to rapidly implement medical information sharing platforms through initiatives such as support for the urgent implementation of online credentials checking systems etc. at medical institutions - including through subsidies and treatment cost payments - as well as establishing the "Headquarters for Medical Digital Transformation (DX) Promotion" chaired by the Prime Minister

IV. Analyst's view (1)

(Strategic direction of healthcare institutions)
- Clarification and strengthened linkages of functions in the community building on the community healthcare concept etc. Given the decreasing population, consider moving to a one-stop shop model which can address all the needs of local residents
- Faced with finance and labor force constraints, focus should be put on utilization of technology and promotion of DX (digital transformation) to deliver both functional upgrades and doctors' work style reform

IV. Analyst's view (2)

(Strategic direction of healthcare-related businesses)
- Business opportunities exist in developing solutions which contribute to diagnosis and treatment support for doctors, help lighten the load of front-line medical staff, and assist linkages with home healthcare
- It is necessary to work on business models which focus on sources of profitability such as subsidies and personnel cost reductions while paying close attention to central government moves to develop medical information sharing platforms
- Private sector-led initiatives for building cross-functional development and operational platforms as well as spaces for collaboration in establishing rules are demanded, which require government support

Source: Compiled by Mizuho Bank Industry Research Department

Global Demand: The Asian Healthcare Market will Continue to Grow Strongly due to the Increasingly-Aging Society etc.

- Global demand refers to China and ASEAN countries, which are anticipated to the main targets for overseas expansion by Japanese medical service providers
- China's healthcare market is the second-largest in the world after the U.S.A., and is forecast to be worth 1.18 trillion dollars (5.8% greater than the previous year, approx. 166 trillion yen) in 2022. China's society is rapidly aging, with the proportion of elderly people forecast to reach 15% in 2027. The Government is endeavoring to reduce medical care expenditure such as through public hospital reform, but ongoing advancements in medical care mean that the high annual average growth of 8.4% is projected to continue until 2027
- Total medical care expenditure across the ASEAN countries are forecast to be 123.9 billion dollars (5.5% greater than the previous year, approx. 18.4 trillion yen) in 2022, markedly recovering from the COVID-19 pandemic. Looking ahead to 2027, growing populations in many countries as well as rapidly-aging societies in Thailand and Singapore will drive increased demand for medical care, which coupled with growing prevalence of lifestyle-related diseases as well as improved access to healthcare through expanded insurance systems and infrastructure provision will lead to projected annual average growth of 4.4%

Medium-term forecast medical care expenditure in Asia

(Hundred million dollars)

Region	2021 (estimated)	2022 (forecast)	2023 (projection)	2027 (projection)	CAGR 2022-2027
China	11172	11816	12837	17725	-
Rate of increase/ decrease vs. PY (%)	+10.6%	+5.8%	+8.6%	-	+8.4%
ASEAN	1174	1239	1291	1540	-
Rate of increase/ decrease vs. PY (%)	+4.3%	+5.5%	+4.3%	-	+4.4%

Note 1: 2021 figures are estimates and figures from 2022 onwards are predictions by the Mizuho Bank Industry Research Department
Note: Figures regarding China are estimates and predictions based on the National Bureau of Statistics' "Total Health Expenditure," converted to U.S. dollars
Note 3: ASEAN countries includes Singapore, Malaysia, Thailand, Indonesia, the Philippines, and Vietnam. Estimates and predictions based on WHO Health Expenditure
Source: Compiled by Mizuho Bank Industry Research Department based on WHO *Global Health Expenditure Database*, national health statistics, etc.

Medium-term forecast of population, elderly population, and proportion of elderly people in Asia

(million people)	Indicators	2022 (forecast)	2023 (projection)	2027 (projection)	CAGR 2022-2027
China	Total population	1411	1414	1423	+0.2%
	Elderly population	181	186	214	+3.4%
	Proportion of elderly	12.8%	13.2%	15.0%	-
ASEAN	Total population	600	605	626	+0.9%
	Elderly population	48	50	60	+4.7%
	Proportion of elderly	7.9%	8.2%	9.6%	-
(Reference) Japan	Total population	125	124	122	-0.5%
	Elderly population	36	36	37	+0.2%
	Proportion of elderly	29.1%	29.3%	30.1%	-

◆ ASEAN breakdown (top row: total population (million people), bottom row: proportion of elderly, total population in descending order)

	2022	2027	CAGR
Indonesia	279.1	292.1	0.7%
	6.8%	8.2%	-
The Philippines	112.5	119.6	1.0%
	6.0%	6.9%	-
Vietnam	99	102.4	0.5%
	8.6%	10.6%	-

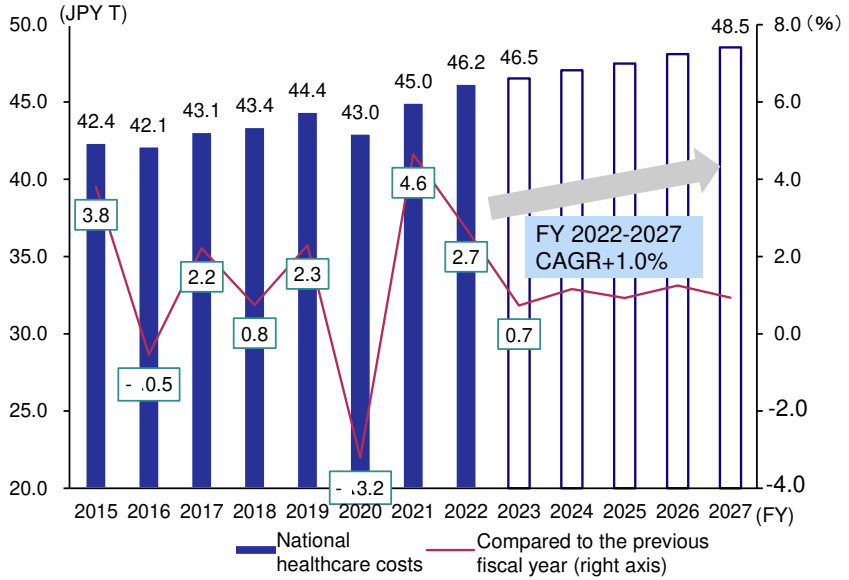
	2022	2027	CAGR
Thailand	70.1	70.4	0.1%
	14.1%	17.5%	-
Malaysia	33.2	35.1	0.9%
	7.8%	9.1%	-
Singapore	5.8	6.1	0.7%
	15.5%	19.7%	-

Source: Compiled by Mizuho Bank Industry Research Department based on UN "World Population Prospects" and materials from the National Institute of Population and Social Security Research

Domestic Demand: Projected as 46.5 Trillion Yen in FY 2023 and to Gradually Grow at 1.0% Annually to 2027

- Medical care expenditure continue to grow due to factors such as the increasingly-aging society and advancements in medical care
- The healthcare market (national medical care expenditure) is projected as 46.2 trillion yen (2.7% greater than the previous fiscal year) in FY 2022 and 46.5 trillion yen (+0.7% greater) in FY 2023
  - As well as the special case of additional treatment cost payments for COVID-19, the reduction in treatment for conditions other than COVID-19 is tending toward recovery due to medical institutions continuing to establish the appropriate structures
  - Demand for medical care will increase due to baby boomers becoming latter-stage elderly between FY 2022 and 2025
- Looking ahead to FY 2027, in addition to the effect of the decreasing population as well as the increased awareness of disease prevention and altered tendency to seek medical treatment due to the pandemic, the Government's efforts to reduce medical care expenditure will continue. However, factor such as the increasingly-aging society and advancements in medical care are still projected to lead to an ongoing 1.0% annual increase

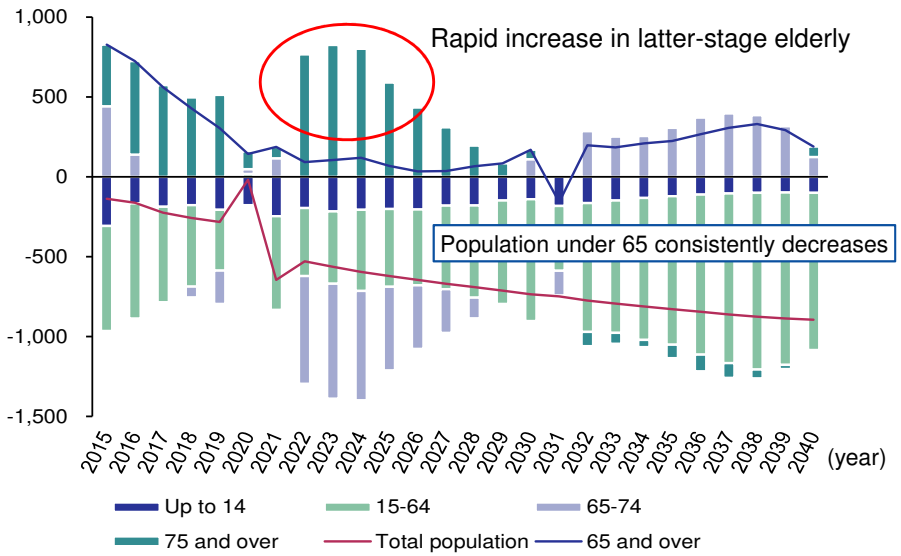
Medium-term forecast national medical care expenditure



Note: FY 2021 figures are estimates based on calculated medical care expenditure. FY 2022 onwards are predictions by the Mizuho Bank Industry Research Department

Source: Compiled by Mizuho Bank Industry Research Department based on "National Medical Care Expenditure" and "Trends in Medical Care Expenditure" from the Ministry of Health, Labour and Welfare as well as "Japan Population Projections" from the National Institute of Population and Social Security Research, etc.

Forecast of annual population change trends by age band

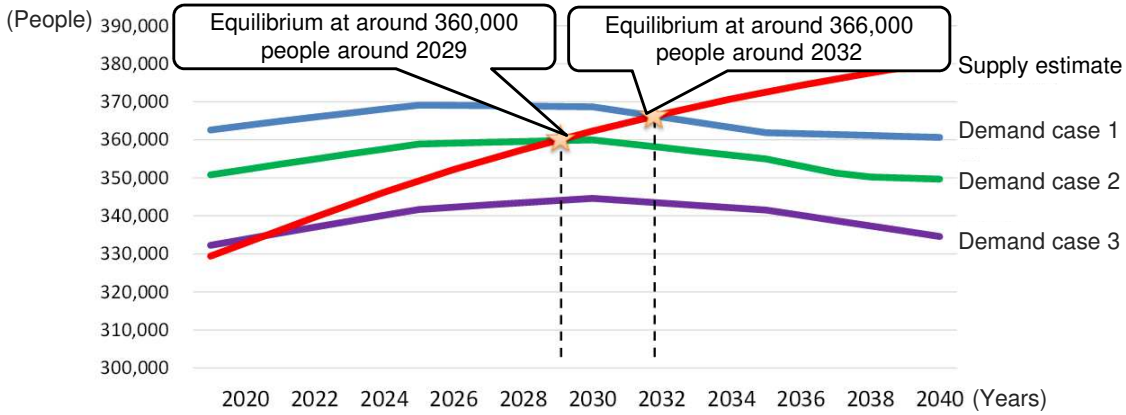


Source: Compiled by Mizuho Bank Industry Research Department based on "Population Estimates" from the Ministry of Internal Affairs and Communications and "Japan Population Projections" from the National Institute of Population and Social Security Research

Domestic Supply: The Doctor Shortage Continues. As the Population Decreases, Concerns that Difficulty in Securing Human Resources will Cause Supply Constraints

- The doctor shortage is anticipated to continue until around 2030 according to projections from the Ministry of Health, Labour and Welfare, after which uneven distributions are forecast to remain in some regions and medical specializations. There are concerns that difficulty in securing human resources will cause supply constraints, including compliance with the overtime limit for doctors taking effect from FY 2024
- While the number of workers required in the health and welfare sector - which includes staff other than doctors - is forecast to increase, the working-age population will decrease rapidly from 2025. The declining working-age population also means fewer people to support the social security system, possibly leading to supply constraints in terms of both personnel and finance

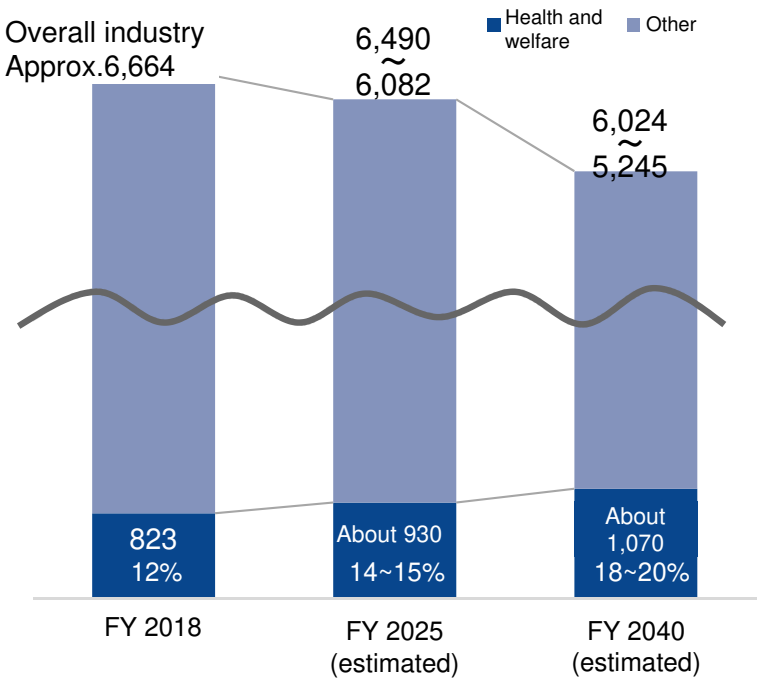
Outlook on doctor supply and demand (projections by the Ministry of Health, Labour and Welfare)



Demand estimates	Working hours limit	(Annual overtime and weekend work)
Demand case 1	55 hours/week	(720 hours/year)
Demand case 2	60 hours/week	(960 hours/year)
Demand case 3	80 hours/week	(1,860 hours/year)

Source: Reproduced from "Results of 2020 Doctor Demand and Supply Estimates" materials, Doctor Demand and Supply Subcommittee, Commission about Demand and Supply for Medical Professionals, Ministry of Health, Labour and Welfare

Outlook on number of workers (10,000 people)



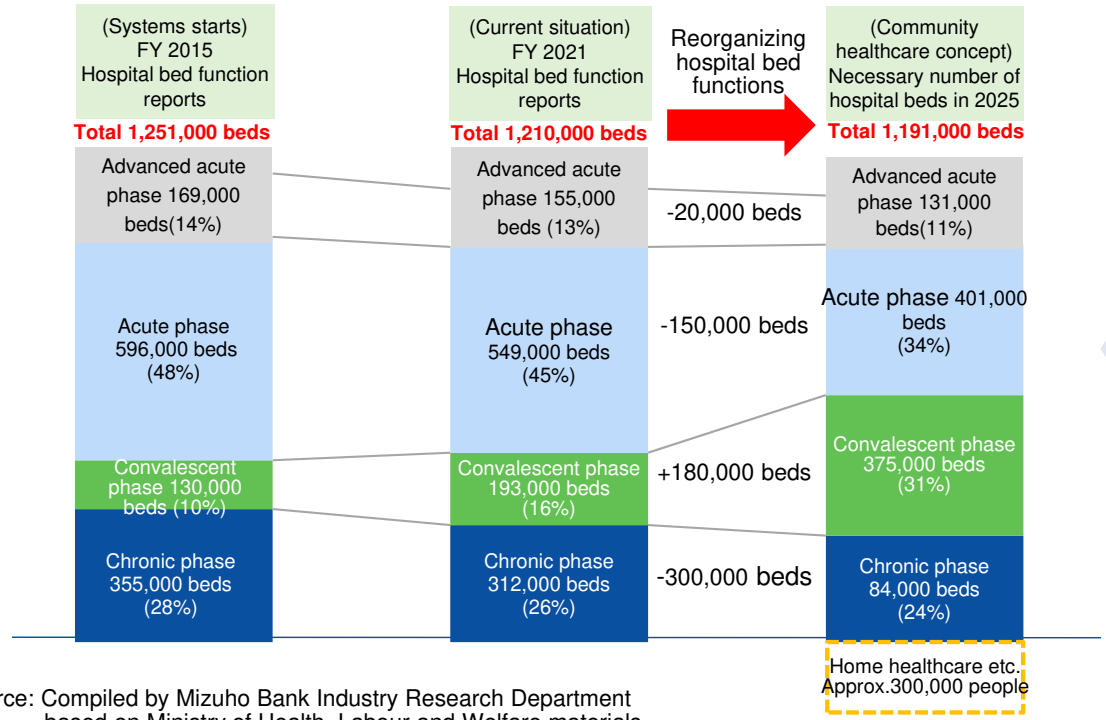
Source: Compiled by Mizuho Bank Industry Research Department based on materials from the "Compilation of the Center for Social Security and Work Style Reforms Toward 2040," Ministry of Health, Labour and Welfare, etc.

Right-Sizing the Excess of Acute Phase Hospital Beds Working Toward Implementing the Community Healthcare Concept in 2025

- The Ministry of Health, Labour and Welfare is promoting the implementation of the community healthcare concept, which aims to optimally allocate medical resources by 2025, when demand for medical care will be greater
  - Converting acute phase hospital beds - which will be in surplus in the future due to changes in the pattern of disease caused by the aging population - to convalescent and home healthcare etc. However, progress has been slow
  - The government is encouraging the functional handover through measures such as stricter requirements for acute phase hospital bed treatment cost payments and financial support for reducing bed numbers and related investment
    - These measures include grants for reducing bed numbers and reorganizations and mergers, as well as lower registration and license tax and real estate acquisition tax when purchasing real estate based on an approved reorganization plan
- Furthermore, discussions aimed at generating new concepts are planned to begin from FY 2023 with a view to changes between 2025 and 2040 such as in the population structure

Future image of the healthcare and nursing care provision structure aimed at 2025 (2025 model)

Community healthcare concept	Estimating the demand for medical care and necessary number of hospital beds in 2025 - when the entire baby-boomer generation will be 75 or over - by region and hospital bed function (advanced acute phase, acute phase, convalescent phase, chronic phase). Prefectural governments will formulate and promote measures to achieve the ideal healthcare provision structure



Major measures promoting achievement

- Incentives via treatment cost payment reform
- Utilization of the Community Medical and Nursing Care General Protection Fund
- Greater powers for governors
- Discussion at community healthcare concept coordination meetings
- Establishment of community healthcare linkage promotion organizations
- Establishment of long-term nursing care facilities
- Formulating reorganization and merger plans for public hospitals etc.
- National government selects “focal support regions” (FY 2019 onwards)
- Financial support for reducing bed numbers as well as reorganizations and mergers (FY 2020 onwards)
- Tax incentives for reorganizations (FY 2021 onwards)

Eligible for financial support

Source: Compiled by Mizuho Bank Industry Research Department based on Ministry of Health, Labour and Welfare materials

Improving Productivity through Utilizing Technology is Essential ahead of Doctors' Work Style Reform in FY 2024

- Acute phase hospital beds require focused allocation of doctors, nurses, etc. However, the demand and supply of doctors may be further squeezed by the overtime limit for doctors which takes effect from April 2024. Demand is forecast to increase due to the highly-aging population, but at the same time, staff numbers are expected to fall rapidly. The ability to secure human resources such as doctors and other health professionals may constrain the functional choices available to medical institutions Lowering the burden on and increasing the productivity of the front line - such as by promoting the introduction and utilization of ICT, robot, and AI technology in addition to task shifting and sharing - is a priority issue
- In addition, it is important to take initiatives consistent with the community healthcare concept. It will be necessary to promote optimization of human resource allocation on a community-wide basis through intra-community coordination, strategic functional division and linkages, and clustering by hospital bed reorganization

Analyst's view (1) (2)

The overtime limit for working doctors taking effect from April 2024 and compliance required with it

Applicable levels	Coverage	Annual overtime limit	Additional measures to ensure health	
			(1) Note 1	(2) Note 1
A	Applies to typical medical institutions	960 hours	Compulsory	Endeavor Compulsory
Linkage B Note 2	**Community medical care protection provisional special case standards** (specifying medical institutions) ◆ Linkage B: Hospitals dispatching doctors ◆ B: Emergency medicine etc.	1,860 hours ★ Resolution target of end FY 2035		Compulsory
B				
C-1	**Focused skill improvement standards** (specifying medical institutions) ◆ C-1: Training for specialist doctors and new medical interns ◆ C-2: Training to acquire advanced skills	1,860 hours		
C-2				

Initiatives addressing structural issues (government and ministries)

- Promoting optimal allocation of medical facilities (community healthcare concept, clarifying outpatient functions)
- Rectifying uneven distributions between regions and medical specializations
- Promoting appropriate treatment based on buy-in from the public

Promoting doctors' work style reform within medical institutions

- Promoting appropriate labor management
- Promoting task shifting and sharing (expanding and clarifying the scope of roles)
- Improving productivity through utilizing technology etc.

Note 1: (1) Face-to-face guidance and being prevented from further work in the event of exceeding the monthly limit,
(2) 28-hour continuous work limit, nine-hour interval between shifts, compensatory days off
Note 2: Linkage B (university hospitals dispatching doctors etc.) involves a maximum of 960 hours of overtime and weekend work per year at individual medical institutions
Source: Compiled by Mizuho Bank Industry Research Department based on Ministry of Health, Labour and Welfare materials

Actions toward FY 2024 - When a Range of Measures Including the Eighth Medical Plan Take Effect - are a priority

- The Eighth Medical Plan - which includes changes made in the wake of the COVID-19 pandemic - as well as doctors' work style reform will take effect in FY 2024
  - The healthcare provision structure is acknowledged to have been inadequate in the face of the pandemic, with discussions ongoing to redefine the functions of inpatient, outpatient, and family doctors
- The treatment cost payment and nursing care cost payment systems will be revised at the same time in FY 2024, and it is anticipated that measures based on the above will support the direction of the revisions. Healthcare institutions need to pay close attention to discussions oriented toward FY 2024, and work on prompt action from a medium-term perspective

	FY 2022	FY 2023	FY 2024	FY 2025	…	FY 2030	…	FY 2036	…	FY 2040
Cost payment revision	★ Treatment cost payment revision		● Revised together ★		★★	● Revised together ★	★★	● Revised together ★	★	★
Medical Cost Optimization Plan	Third Medical Cost Optimization Plan (2018-2023)		Fourth Plan (2024-2029)			Fifth Plan (2030-2035)		Sixth Plan (2036-2041)		
Medical Plan	Discussion and summary by the respective commissions and working groups, revising the basic policy and formulation guidelines etc.	Plan formulation by respective prefectural governments	Eighth Medical Plan (2024-2029)			Ninth Medical Plan (2030-2035)		Tenth Medical Plan (2036-2041)		
Community healthcare concept (Inpatient functions)	Community healthcare concept (until 2025)									
	Consideration of and initiatives toward the new community healthcare concept after 2025	Consideration and system-level actions by the national government		Formulation work by prefectural governments		Initiatives based on the new community healthcare concept (2026 onwards)				
Outpatient treatment/ family doctor functions	Preparation for making outpatient function reports (about Sept.) → Making and collating reports (about Dec.) → Discussion in community workshops/Announcing focal medical institutions for treatment by referral (by about Mar.)	Outpatient treatment plan formulation by respective prefectural governments	Outpatient Treatment Plan (Eighth Medical Plan)			Outpatient Treatment Plan (Ninth Medical Plan)		Outpatient Treatment Plan (Tenth Medical Plan)		
	Clarifying family doctor functions as well as considering specific measures to help family doctors function effectively for both patients and medical professionals		Measures based on the outcomes of consideration							
Doctors' work style reform	Surveying the state of medical institution preparedness as well as the impact on community healthcare (several times)		Implemented from FY 2024							
	Based on the survey results, prefectural governments will evaluate the impact on community healthcare in each region, discussing and coordinating with healthcare stakeholders in each community to ensure community healthcare is provided		(B) Standards: Considering staged revision based on survey results etc.					Resolution target planned to be end FY 2035		
			(C) Standards: Medium- to long-term evaluation as well as appraisal of training and healthcare quality							

Source: Compiled by Mizuho Bank Industry Research Department based on Ministry of Health, Labour and Welfare materials

Increased Costs for Complying with Work Style Reform and the Community Healthcare Concept will Put Pressure on Hospitals' Profitability

- Personnel expenses account for around half of a hospital's income and expenditure structure. Advancements in medical care, the promotion of team medicine, compliance with medical safety, and the response to the pandemic have meant that hospital staff numbers have been on an increasing trend. In addition, complying with doctors' work style reform may lead to further staff number increases, making the burden of personnel expenses heavier. In addition, increasing utility costs and overall product inflation in FY 2022 are putting further pressure on profitability
- COVID-19 subsidies have underpinned hospital balance sheets during the pandemic, but the coverage and amounts of subsidies are likely to become more demanding
- While rebuilding their operational structures geared toward the post-pandemic era, hospitals are required to carry out facilities renewals, functional upgrades and handovers based on the community healthcare concept, as well as equipment and IT investment aimed at improving productivity. However, factors such as increasing construction costs are leading to a situation of polarization depending on each hospital's financial resources

Hospital's income and expenditure structure

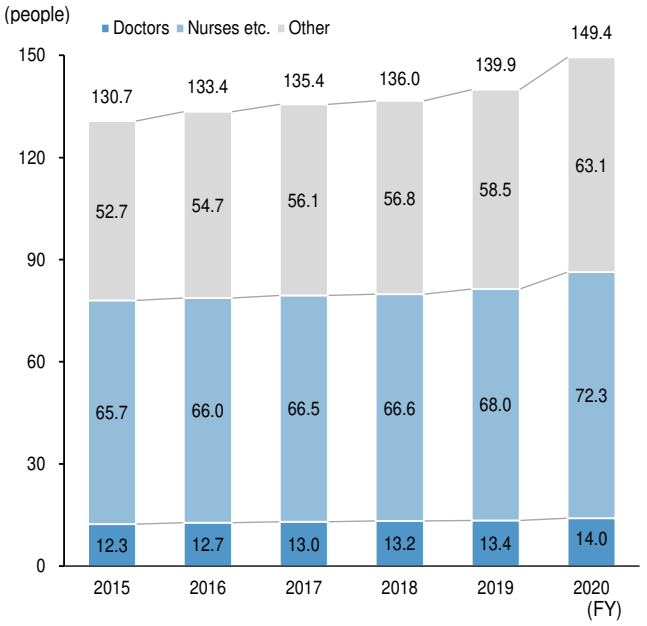
Total of the 140 hospitals of the National Hospital Organization (FY 2021)

Revenue from medical operations	100%
Costs in medical operations	104%
Personnel expenses	53%
Materials costs such as pharmaceuticals	27%
(pharmaceuticals included in the above)	(17%)
(medical supplies and catering materials costs included in the above)	(10%)
Facilities expenses	13%
Outsourcing fees	6%
Other expenses	4%
(utilities costs included in the above)	(2%)
Loss from medical operations	-4%

Note: Only costs in medical operations related to revenue from medical operations are allocated COVID-19-related subsidies are not included

Source: Compiled by Mizuho Bank Industry Research Department based on National Hospital Organization materials

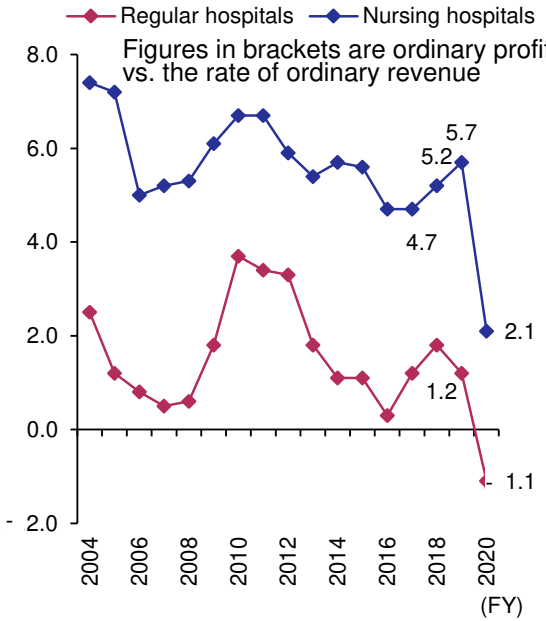
Staff numbers per 100 patients (typical hospitals)



Source: Compiled by Mizuho Bank Industry Research Department based on Welfare And Medical Service Agency materials

Profit margin from medical operations (operating profit ratio)

(In FY 2020, ordinary profit increased due to COVID-19-related subsidies)

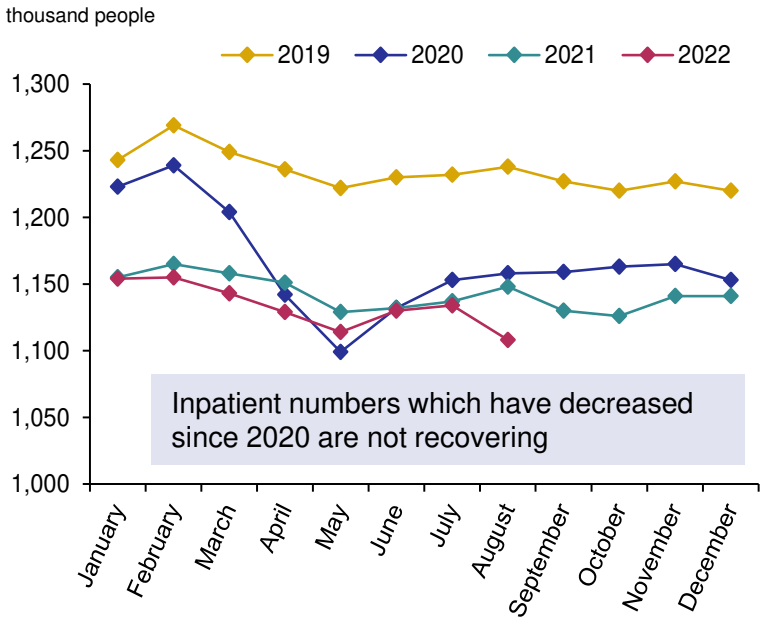


Source: Compiled by Mizuho Bank Industry Research Department based on Welfare And Medical Service Agency materials

The COVID-19 Pandemic Accelerated the Functional Division of Hospital Beds. Optimization of Bed Numbers and Linkages with Home Healthcare are a Priority

- The number of inpatients is on a decreasing trend due to focusing on the patients covered by each hospital bed function in treatment cost payments as well as initiatives toward earlier discharge
- The demand for inpatient treatment which decreased during the COVID-19 pandemic has still not recovered, and in addition, the refraining of seeking treatment and increased need for at-home nursing care during the pandemic may have caused a long-term change in how patients receive treatment
- As well as being pressed to reduce bed numbers and revise functions due to lower demand for inpatient treatment, linkages with home healthcare are a priority for hospitals. In order to fill the gap left by lower demand, it is also necessary to build new functions and sources of profit other than inpatient and outpatient treatment, such as follow-up and preventative services for patients at home

Trends in hospital average daily inpatient numbers



Source: Compiled by Mizuho Bank Industry Research Department based on Ministry of Health, Labour and Welfare “Hospital Report”

Causes of lower inpatient numbers and responses required of hospitals

Causes of recent lower inpatient numbers (envisaged)		Future (drivers of change in demand)
More demanding calculation requirements in treatment cost payments for acute phase hospital admissions		Decreasing population
Promotion of the community healthcare concept		Changes in community medical resources
Changes in the pattern of disease caused by the aging population	X	Further changes in the pattern of disease caused by the highly-aging population
Advancements in and lower invasiveness of medical technology		Advancements in and lower invasiveness of medical technology progress
Increased need for at-home nursing care due to the aging population		Decreased need for treatment due to expanded prevention
Increased need for at-home nursing care and refraining of seeking treatment due to the COVID-19 pandemic		Altered tendency to seek medical treatment Accelerated trend from hospital to home

Each hospital is reconsidering its functions and positioning (including potentially downsizing)

Source: Compiled by Mizuho Bank Industry Research Department

The Government has Strengthened Promotion of Medical DX, Looking to Rapidly Build Medical Information Sharing Platforms

- The government has strengthened promotion of medical DX, the slow pace of which was exposed during the pandemic. It is looking to quickly build information sharing platforms etc. based on online credentials checking systems. Issues facing real-world trials include system implementation by medical institutions and takeup of My Number cards as well as registration of health insurance cards for usage by the general population, but the government is providing support to medical institutions for rapid system implementation in the form of subsidies and treatment cost payments

<Progress>
- Online credentials checking: From April 2023, implementation at medical institutions and pharmacies will be made in principle compulsory. In fall 2024, health insurance cards will be in principle discontinued and combined with My Number cards
- Electronic prescriptions: Operation will begin from January 2023. Implementation nationwide is aimed to occur during FY 2024
- 64,380,000 (51.1%) My Number cards have been issued to date (as at the end of October 2022), and 22,760,000 health insurance cards have been registered for usage (as at September 19, 2022)

- Aiming to further strengthen the promotion of medical DX, in October 2022 the government established the "Headquarters for Medical Digital Transformation (DX) Promotion" chaired by the Prime Minister. It is considering three specific measures in order to rapidly implement medical DX, and aims to formulate a roadmap by around spring 2023 Analyst's view (1) (2)

Roadmap for medical etc. information viewable on Mynaportal

Data health reform roadmap (July 29, 2021 version)

	By FY 2021	FY 2022	FY 2023	Progressively from FY 2024
Health check-up and medical examination information	◆Vaccinations ◆Infant check-ups ◆Pregnancy check-ups ◆Specified health check-ups	◆Local government medical examination ◆School check-ups	◆Business check-ups	
Medical receipt and prescription information	◆Pharmaceutical information	◆Electronic prescription information ◆Names of medical institutions etc. ◆Surgery information ◆Dialysis information ◆Medical management information		
Electronic medical record and nursing care information				◆Test results ◆Allergy information ◆Names of notified illnesses ◆Imaging information ◆Nursing care information

Source: Compiled by Mizuho Bank Industry Research Department based on Ministry of Health, Labour and Welfare materials

Three specific measures which the Headquarters for Medical Digital Transformation (DX) Promotion should promote

Building nationwide medical information platforms	Expanding the online credentials checking systems network as well as building nationwide platforms which can share and exchange data such as medical receipts and specified health check-up information, vaccinations, electronic prescription information, local government medical examination information, and electronic medical records
Standardization of electronic medical record information etc.	Consistent formats etc. of medical information stored in electronic medical records Consideration of standardized electronic medical records Effective utilization of electronic medical record data in treatment optimization, development of new medical technology such as AI, and in pharmaceutical development
Treatment cost payment revision DX	Utilizing digital technology etc. to significantly streamline the work involved in treatment cost payment and its revisions as well as working on effective utilization of digital human resources and reduction in system costs etc.

Roadmap for specific measures formulated in spring 2023 (thereafter, measures are to be promoted by various government ministries and agencies)

Source: Compiled by Mizuho Bank Industry Research Department based on Cabinet Office "Headquarters for Medical Digital Transformation (DX) Promotion" materials

Strategic Direction of Healthcare Institutions: Promotion of DX based on Functional Upgrades / Linkages and Work Style Reform

- Redefining the functions of inpatient, outpatient, and family doctors is being progressed toward formulating the Eighth Medical Plan and implementing the community healthcare concept. In addition, factors such as the COVID-19 pandemic have driven polarization of hospital finances. Given these developments, looking forward, healthcare institutions need to re-analyze the internal and external environments, clarify the functions they should handle in their communities, and strengthen their linkages. Given the decreasing population, moving to a one-stop shop model which can address all the needs of local residents is a feasible option
- Taking initiatives regarding DX which deliver improvements in productivity and medical quality through linkages with other functions and within constraints in financial and human resources is a priority issue

Strategic direction required of healthcare institutions

1 Strengthened linkages as well as clarification and upgrading of functions in the community

Advanced acute phase → Acute phase → Convalescent phase → Chronic phase → Home healthcare → Nursing care

Individual hospitals

Clarification and upgrading of functions in the community

- ✓ Data-based analysis of the internal and external environments
- ✓ Ongoing recruitment and training of high-quality human resources
- ✓ Equipment and devices supporting strengthened medical functions

Strengthened linkages within the community

- ✓ Linkages with other inpatient functions (hospitals)
- ✓ Linkages with family doctors
- ✓ Linkages with home healthcare, nursing care, etc.

Overall group

One-stop healthcare and nursing care shop

Reorganizations and mergers by community and function

2 Utilizing technology and promoting DX

Front line digital transition
- ✓ Electronic medical records
- ✓ Online credentials checking systems

Improvements in productivity and medical quality
- ✓ AI consultation and diagnosis
- ✓ Online medical care
- ✓ Operations automation

Frameworks for sharing information(Note)
- ✓ EHR (Electric Health Record)
- ✓ Electronic prescriptions
- ✓ PHR (Personal Health Record)

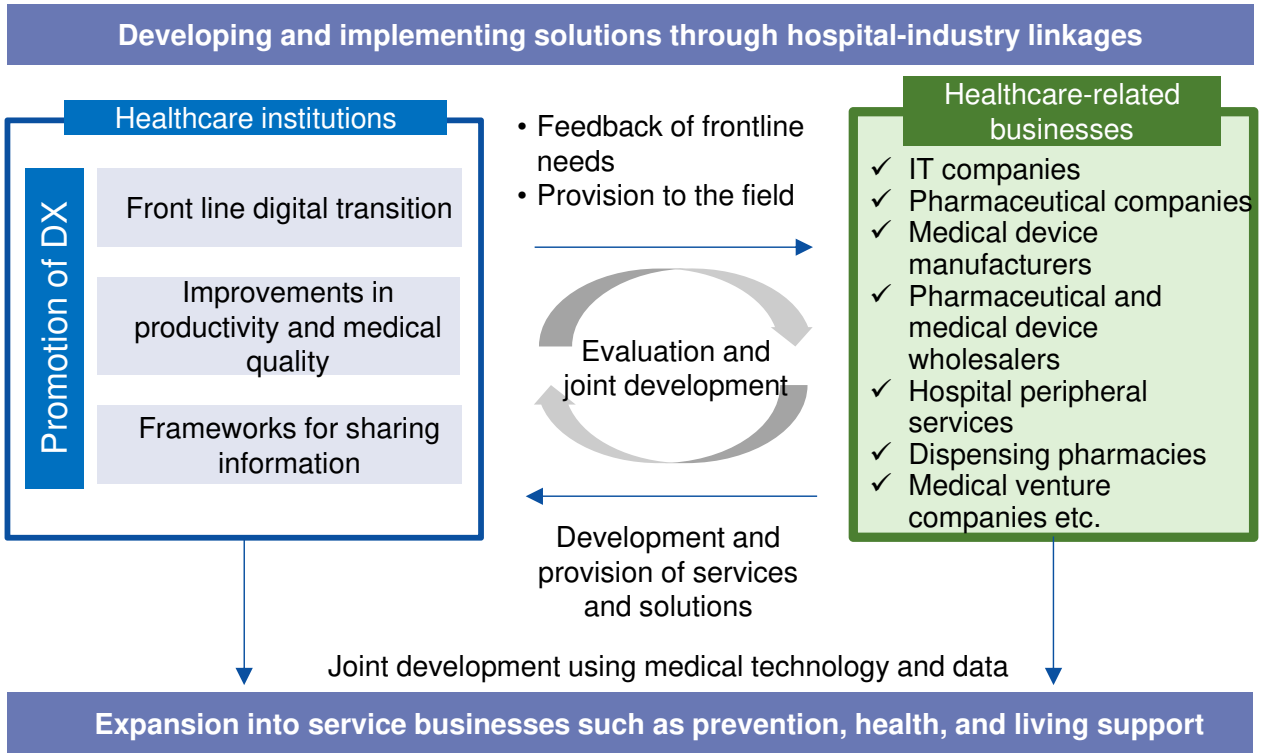
Note: EHR refers to frameworks for checking medical information by patients, medical institutions around Japan, etc.. PHR refers to frameworks for individuals viewing and utilizing their own health and wellbeing information on a computer or smartphone

Source: Compiled by Mizuho Bank Industry Research Department

Strategic Direction of Healthcare-Related Businesses: Support for Developing and Implementing Solutions through Hospital-Industry Linkages

- It is anticipated that commercial opportunities will grow for healthcare-related businesses to develop and support implementation of solutions which address issues facing medical institutions or support their functional upgrades. Initiatives are expected based on front-line needs via hospital-industry linkages
  - Developing solutions which contribute to diagnosis and treatment support for doctors, help improve the quality of medical care and lighten the load on staff, and assist linkages with home healthcare
  - In the medium term, combining accumulated data and doctors' knowledge to drive new service development which contributes to residents' health, including preventative care
- Thought will be required about how to monetize these opportunities as the business environment facing medical institutions becomes more adverse. It is necessary to work on business models which focus on financial issues such as subsidies and reductions in personnel expenses - which account for the majority of costs - while paying close attention to central government moves to develop medical information sharing platforms

Strategic direction required of healthcare-related businesses



Fields	Examples of services and solutions
(1) Technologies and services which contribute to lightening the load on doctors	Consultation, triage, image diagnosis assistance, treatment direction assistance etc. using AI Surgery robots Voice input electronic medical records, input substitution Assisting with shifting/sharing of tasks from doctors to other health professionals
(2) Technologies and services which contribute to greater efficiency on the medical front-line workflow and information sharing	Utilization of robots and ICT on the front line Treatment booking, invoicing, and payment systems Data linkages between medical institutions Data linkages between healthcare and nursing care Bed allocation and ambulance transport using AI
(3) Technologies and services which contribute to linkages between medical institutions and in-home services/ healthcare	Remote doctor consultations Remote monitoring/watching over people Services supporting self-monitoring for chronic illnesses (disease management services) In-home POCT devices and services

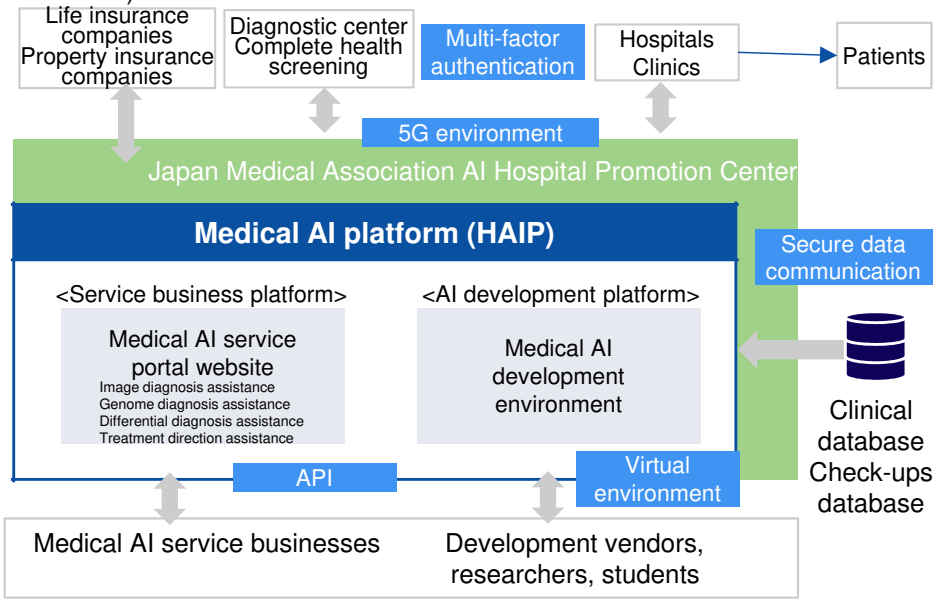
Source: Compiled by Mizuho Bank Industry Research Department

Appendix: Private-Sector Initiatives for Cross-Functional Platform Development aimed at Medical DX

- In medical DX-related solutions development, it is necessary to draw a clear distinction between fields in which companies collaborate and those in which they compete. In collaborative fields, building common platforms and setting rules across industries is required as it is inefficient for individual companies to work alone (such as in infrastructure aspects)
- It is necessary for the government to provide strong support, because building this infrastructure such as platforms is anticipated to lead to faster solutions development and real-world trials, therefore contributing to improving the quality of medical care and the sustainability of the system

CASE1: "Medical AI Platform" AI hospital

- Promoted as a Cabinet Office "Strategic Innovation Creation Program" (SIP)
- This system is comprised of three platforms: The "Service Business Platform," which offers a range of medical AI service portal functions, the "Lab Platform," which supports smooth linkages between AI developers, and the "AI Development Platform," which supports medical AI system development utilizing a large amount of clinical and diagnostic information. It aims to build an integrated platform handling everything from medical AI development and evaluation to portal services for a wide range of medical AI services (a total of 13 companies including BIPLOGY and Hitachi are involved)



Source: Compiled by Mizuho Bank Industry Research Department based on the Healthcare AI Platform Collaborative Innovation Partnership (HAIP) website

CASE2: PHR Service Operations Association (provisional name)

- With the support of the Ministry of Economy, Trade and Industry and other organizations, the Association is discussing formulation of rules etc. by private-sector PHR operators aimed at appropriate usage of private-sector PHR services "PHR Service Operations Association (provisional name)" planned for establishment (aiming for establishment early in FY 2023)

15 companies participating: Welby, Eisai, MTI, Omron, KDDI, Shionogi & Co., CMIC Holdings, Sumitomo Life, Sompo Holdings, TIS, Terumo, NTT, FiNC Technologies, Fujitsu, MICIN

★Organizer, ○ Deputy organizer

Subcommittee 1 Vision	★ SOMPO ○ Eisai	◆ Formulating the PHR service industry vision ◆ Consideration of the process toward business operator organization structure and establishment ◆ Consideration toward linkages between business operators and dialog with stakeholders
Subcommittee 2 Standardization	★ CMIC ○ MTI ○ Omron ○ NTT ○ Fujitsu	◆ Consideration toward standardization and ensuring portability of vital information and life logs obtained by users
Subcommittee 3 Service quality	★ KDDI ○ Terumo ○ FiNC ○ MICIN	◆ Establishing rules to ensure security and protection of personal information such as life logs obtained by users ◆ Establishing rules and the approach to recommendations ◆ Establishing a third-party authentication system for selection of high-quality services

Source: Compiled by Mizuho Bank Industry Research Department based on Ministry of Economy, Trade and Industry materials

4. Nursing care

A B2B Market Aimed at Achieving Outcome and Productivity Improvements is Emerging

I. Supply and demand trends

(Short term)
- Even though some people using the Long-term Care Service have refrained from using services due to the COVID-19 pandemic, the baby boomers becoming latter-stage elderly has meant the FY 2022 market is forecast to expand 4.7% on the previous fiscal year to 11.8 trillion yen, and then another 5.0% increase in FY 2023 to 12.4 trillion yen

(Medium term)
- The adverse fee schedule revision in FY 2024 and slowing increase in latter-stage elderly will lead to slowing market growth. The FY 2027 market is projected to be 13.5 trillion yen, growing at 2.7% annually
- The shortage of human resources will remain chronic, with concern growing about insufficient people to support the Long-term Care Insurance System

II. Competitive environment

- The operators' revenue has declined due to the COVID-19 pandemic, which together with cost increases due to inflation are putting pressure on business profitability. The number of bankruptcies in 2022 is forecast to reach an all-time high
- Major operators which lead industry reorganization will absorb cost increases by expanding their business scale
- In the medium- to long-term, initiatives toward front-line DX etc. are necessary for improvements of both the operators' productivity and the users' outcome (maintenance and improvement of condition) which policy is incentivizing

III. Risks and opportunities

<Risks>
- Fee schedule revisions are likely to tighten further, exacerbating the profitability situation
- Services revision for users of support- and low-care-level is being discussed, and they may not be covered by the insurance system in the future
- Many small-scale operators providing varied services in different communities are dispersed in the market, leading to issues with formulating strategies for policy compliance, considering actions, and establishing management structures

<Opportunities>
- Services for users of support- and low-care-level being removed from the insurance system presents a good opportunity for nursing care operators to enter the market for services outside insurance coverage which respond to those users' requirements, such as monitoring and help with housework. However, an issue is how to resolve users' impression of heavy costs compared to services covered by insurance
- The B2B service market supporting nursing-care operators' efforts aimed at outcome and productivity improvement is growing, presenting a good opportunity

IV. Analyst's view (1)

(Creation of a B2B service market)
- Nursing care operators and healthcare service companies offer B2B services tailored to nursing care sector
- The SOMPO group, a leading operator, offers a wide range of services including support for starting business. Looking ahead, they may work to build the corporate group through solutions offerings without relying on M&A

IV. Analyst's view (2)

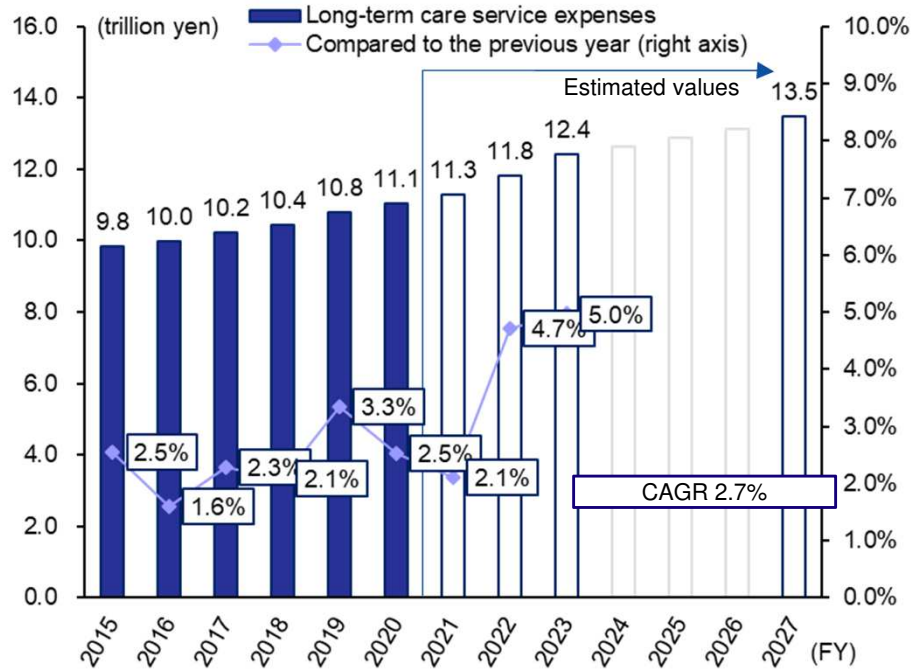
(Paid nursing homes operated by new business entrants)
- Operators of terminal care-style homes specializing in end-of-life or chronic phase cares are forecast to accelerate opening of their facilities
- There are also examples of companies expanding from home-visit pharmacies to paid nursing homes. Offering both medical and nursing care services means also being able to receive payments from the Health Care (medical care) Insurance System

Source: Compiled by Mizuho Bank Industry Research Department

Demand: Projected to increase 5.0% on the previous fiscal year to 12.4 trillion yen in FY 2023, and 13.5 trillion yen in FY 2027

- With the baby boomers entering the latter-stage elderly phase from 2022 to 2023 - when needs for nursing care are high - the consequent rapid increase in service users and growing payment per user are forecast to drive high growth in the Long-term Care Insurance Market
- Even with some people using the Long-term Care Service have refrained from using services due to the COVID-19 pandemic, the FY 2022 market is projected to grow 4.7% on the previous fiscal year to 11.8 trillion yen, and then 5.0% on the previous fiscal year to 12.4 trillion yen in FY 2023
- With the fee schedule revision in 2024 - which is anticipated to be adverse - and slowing increase in latter-stage elderly, market growth is also projected to decelerate. The FY 2027 market is forecast to be 13.5 trillion yen, growing at 2.7% annually from FY 2022

Medium-term forecast nursing care demand in Japan

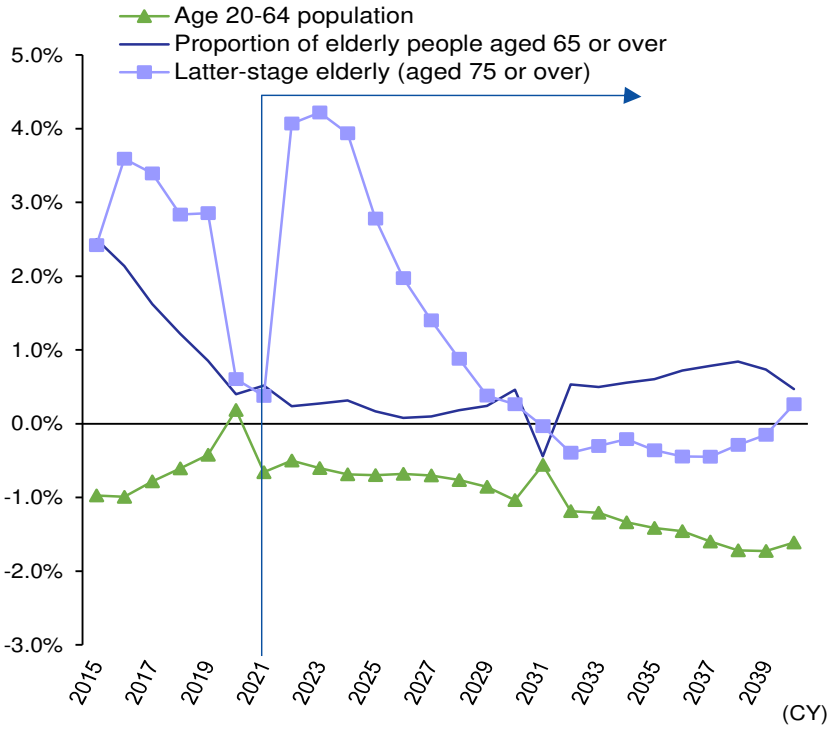


Note 1: The benefits of Long-term Care Service System include co-payments, high-cost long-term care service expenses, etc. FY 2021 values are estimates of actual figures. FY 2022 values onwards are predictions by the Mizuho Bank Industry Research Department

Note 2: People refraining from the Long-term Care Service due to the COVID-19 pandemic is estimated to have had a -0.4% impact on FY 2021 to 2022 figures

Source: Compiled by Mizuho Bank Industry Research Department based on Ministry of Health, Labour and Welfare materials

Forecast growth rate of elderly population and latter-stage elderly population



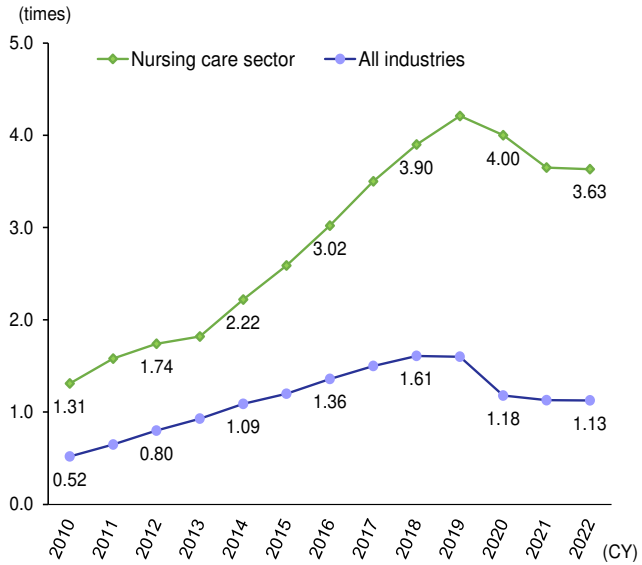
Source: Compiled by Mizuho Bank Industry Research Department based on "Population Estimates" from the Ministry of Internal Affairs and Communications and "Japan Population Projections" from the National Institute of Population and Social Security Research

Supply: The Shortage of Human Resources Will Remain Chronic, with Concern Growing about Insufficient People to Support Financial Resources for Maintaining the Long-term Care Insurance System

- The active opening rate to job applicants in the nursing care sector is significantly above the all-industries average, and the shortage of human resources remains chronic
  - The survey (note) has shown that approximately 10% of social welfare facility for the elderly requiring long-term care (special nursing home for the elderly) are limiting new resident numbers due to the shortage of staff

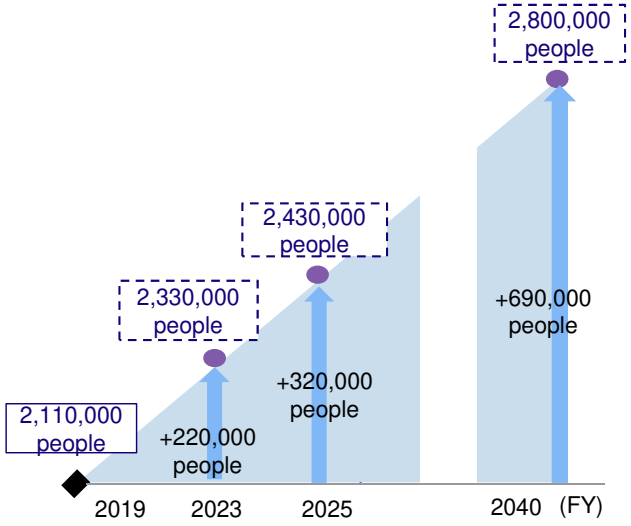
  Note: Welfare And Medical Service Agency Incorporated Administrative Agency, "Results of the FY 2018 Survey about Nursing Care Human Resources"
- The Ministry of Health, Labour and Welfare estimates that, compared to FY 2019, an additional 320,000 nursing care workers will be necessary in FY 2025 and an additional 690,000 workers in FY 2040. In the social security field, the necessary number of workers in the health and welfare sector is also forecast to increase. However, the declining working-age population after FY 2025 is forecast to cause a rapid decrease in the available human resources, leading to concern growing not only about workers but also there being insufficient people to support financial resources for maintaining the Long-term Care Insurance System

Trends in the active opening rate to job applicants



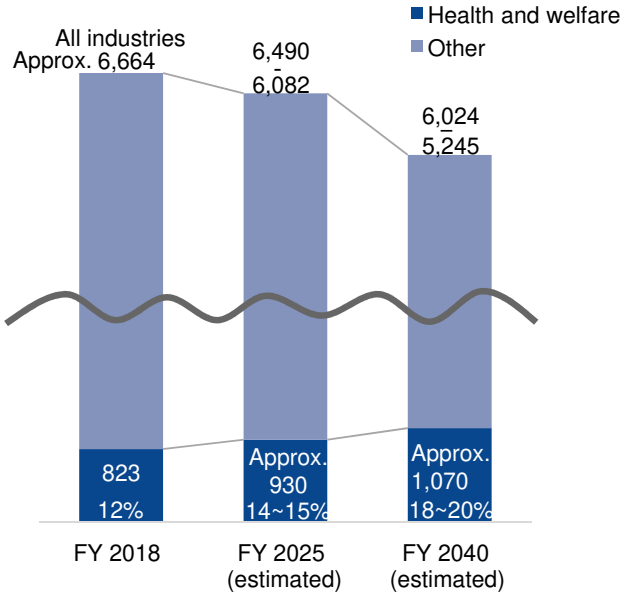
Note: 2022 uses the average value from Jan. to Sept.
Source: Compiled by Mizuho Bank Industry Research Department based on Ministry of Health, Labour and Welfare materials

Necessary nursing care worker numbers



Note: Figures are estimates. Total number of necessary nursing care employees estimated by prefectural governments based on the forecast nursing care service volume in the Care Insurance Business Plan (FY 2021 to FY2023) etc.
Source: Compiled by Mizuho Bank Industry Research Department based on Ministry of Health, Labour and Welfare materials

Future outlook on number of workers (10,000 people)



Source: Compiled by Mizuho Bank Industry Research Department based on materials from the "Compilation of the Center for Social Security and Work Style Reforms Toward 2040," Ministry of Health, Labour and Welfare, etc.

The COVID-19 Pandemic and Inflation are Causing a Deteriorating Business Environment, with the Number of Bankruptcies in 2022 Forecast to Reach an All-Time High

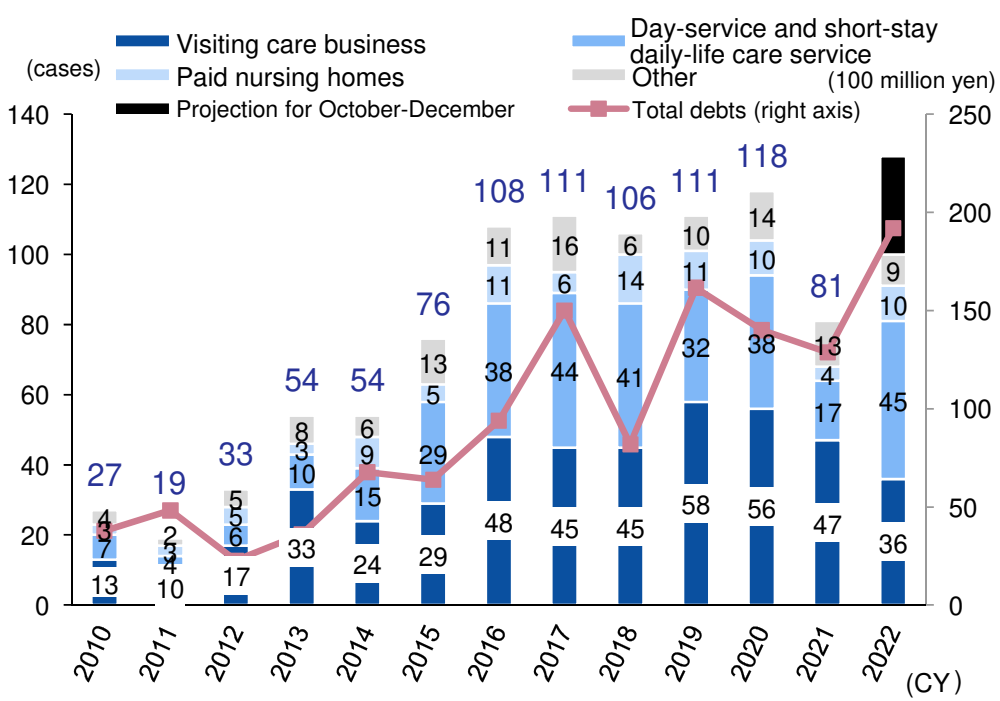
- On top of decreased revenue caused by refraining from using the Long-term Care Service due to the COVID-19 pandemic as well as shrinking infection countermeasure support, inflation is also putting pressure on business profitability
  - Fee schedule of the Long-term Care Service are at a government-set price including utilities and meal costs, and passing on price increase to users is not possible. From September 2022, the national government has provided support worth around 600 billion yen, but the measures lack flexibility and dynamism
- Since 2021, establishing a BCP structure to plan for the event of infectious disease or natural disaster has become compulsory for nursing care operators. The staff workshops and practical training as well as management organization strengthening will be a further burden on operators
- The number of bankruptcies in 2022 - particularly operators of visiting care service and day-service - is forecast to reach an all-time high

The current business environment is deteriorating

Falling revenue caused by pandemic and shrinking government's support	• 29.3% of intensive-care retirement homes forecast at least a 5% decrease in revenue on the previous year for the period between April and September 2022 (as of September 2022)Note 1 • The 0.1% favorable treatment in fee schedule implemented as a special measure in April 2021 was terminated in September the same year. Support measures currently in place are being downscaled such as being limited to certain service operators
Inflation	• Fee schedule includes facility utilities costs, user meals, fuel costs for user vehicle transfers, etc. Passing on price increases to users is not possible. Utilities costs for residential services such as fee-based retirement homes are paid for by users (not covered by insurance), so passing on price increases is possible • In September 2022, the national government established the Electricity, Gas, And Food Price Increase Targeted Support Regional Grant Program, worth around 600 billion yen. To be delivered through prefectural and local governments, these support measures lack flexibility and dynamism
Burden of compulsory BCP formulation	• As part of the 2021 fee schedule revision, all nursing care operators are required to establish and convene by the end of March 2024 a committee to formulate guidelines and plans as well as hold workshops and practical training aimed at business continuity in the event of infectious disease or natural disaster. The proportion of health and welfare sector operators which have formulated a business continuity plan (BCP) is 22.2%, which is low compared to the average across all industries of 41.8%(Note 2), causing a new burden for many operators

Note 1: Welfare And Medical Service Agency Incorporated Administrative Agency, "Overview of Social Welfare Corporation Management Trends Survey" (October 7, 2022)
Note 2: Cabinet Office, "Survey of Corporate Business Continuity and Disaster Initiatives" (March 2020)
Source: Compiled by Mizuho Bank Industry Research Department based on Welfare and Medical Service Agency Incorporated Administrative Agency and Cabinet Office materials

Trends in elderly welfare and nursing care business number of bankruptcies



Note: The number of bankruptcies by September 2022 reached an all-time high of 100 compared to the same month in previous years, and is forecast to also reach an all-time high on an annual basis
Source: Compiled by Mizuho Bank Industry Research Department based on data released by Tokyo Shoko Research

Although Major Operators' FY 2022 Business Results Forecast Higher Income, Recovery in Mid- to High-Priced Homes is Lagging

- Industry reorganization revolving around the major operators is advancing in the nursing care sector. As well as expanding their business size through M&A and opening new facilities to achieve economies of scale, each of them are increasing their initiatives focusing on mid- to high-care-level users, who are placed in a top category in fee schedule. Doing so helps them absorb the impact of inflation and decreased revenue due to the COVID-19 pandemic, leading to forecasts of higher income in FY 2022
- Looking at the utilization rate of paid nursing homes - a mainstay business - low- to medium-priced homes are returning to pre-COVID levels. However, medium- to high-priced homes are struggling to attract residents due to the reduction in services such as recreation and interaction between residents - one of their key points of difference - leaving the utilization rate mired in a slump. These trends are creating a disparity between operators

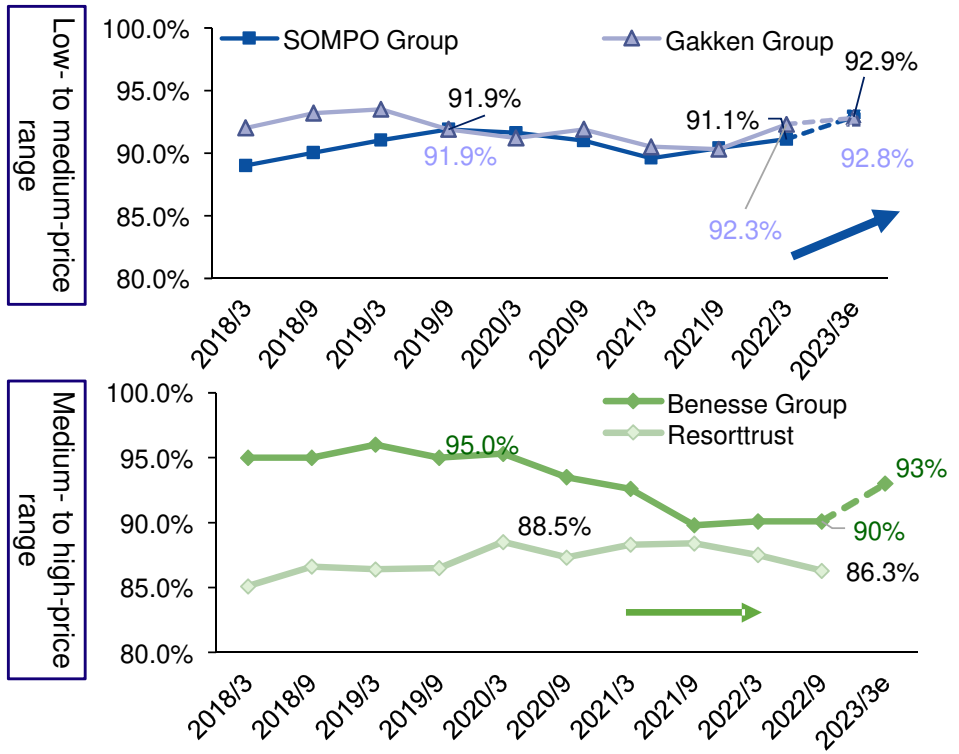
Financial situation of major operators (segment basis)

(units: million yen)

Ranking	Company name	FY 2020		FY 2021		FY 2022 (forecast)	
		Sales	Operating profit/loss Profit margin	Sales	Operating profit/loss Profit margin	Sales	Operating profit/loss Profit margin
1	SOMPO Holdings*	131,862	9570 7.3%	136,116	10990 8.1%	151,100	10,800 7.1%
2	Benesse Holdings*	123,807	10393 8.4%	127,397	8013 6.3%	134,100	6,700 5.0%
3	Secom*	71,624	4104 5.7%	74,575	5661 7.6%	75,600	5,500 7.3%
4	Gakken Holdings (Note 2)	60,582	3478 5.7%	66,470	3490 5.3%	69,860	3,850 5.5%
5	Saint-Care Holding Corporation*	45,910	2806 6.1%	48,877	2866 5.9%	53,000	3,200 6.0%
6	Solasto	42,303	2,033 4.8%	47,602	2,575 5.4%	51,200	3,550 6.9%
7	Resorttrust*	40,022	6341 15.8%	42,432	5736 13.5%	44,260	5,960 13.5%

Note 1: Figures marked * are on a segment basis
Note 2: Total of elderly housing and group homes for the elderly with dementia businesses within the healthcare and nursing domain segment
Source: Compiled by Mizuho Bank Industry Research Department based on materials published by the respective companies

Trends in utilization rate among major paid nursing home operators

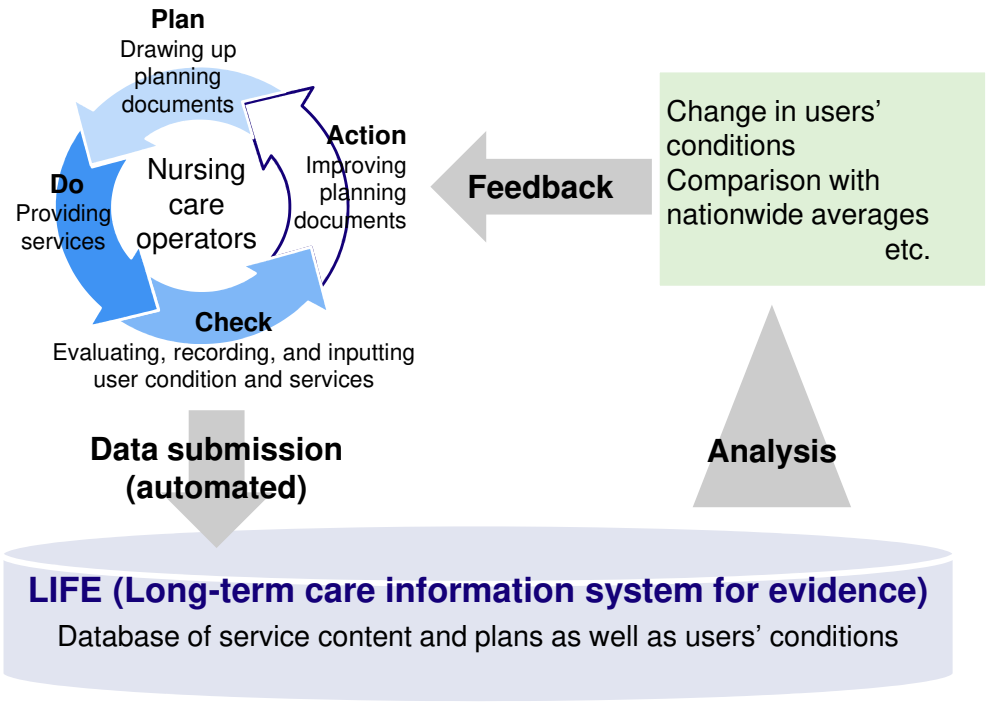


Note: The Gakken Group estimated figures for March 2023 are the planned figures announced in August 2022 for September 2022
Source: Compiled by Mizuho Bank Industry Research Department based on materials published by the respective companies

Initiatives toward Front-Line DX etc. are Necessary for Improvements in Productivity and Outcomes

- As birthrate decline and aging society is progressing and social security benefit payments expected to grow, the national government is - with the broader aim of ensuring the sustainability of the Long-term Care Insurance System - promoting the establishment of service provision structures based on data to deliver better outcomes such as maintenance and improvement of users' conditions. Since 2021, the Ministry of Health, Labour and Welfare is constructing database through encouraging all operators via preferential fee schedule to provide data about users' conditions etc.
- Toward 2040, it is also advancing policy incentives to both secure human resources and improve front-line productivity through the use of technology
- Operators need to move away from the "hands-on care" style of nursing care and take initiatives toward front-line DX etc. to improve productivity and outcomes

Policy incentives for outcome improvements using data



Source: Compiled by Mizuho Bank Industry Research Department based on Ministry of Health, Labour and Welfare materials

Policy direction for securing human resources and improving productivity

Securing human resources	- Promotion of qualified care workers to the managerial posts - Utilization of elderly people in the community - Acceptance, settlement, and support for obtaining qualifications for human resources from overseas
Utilizing technology	- (Direct work) Utilization of sensors and ICT devices in nursing care such as monitoring, toileting, and mobility/transfer - (Indirect work) Utilization of tablets and microphone headsets for the recording and sharing of information
Task sharing and task shifting	- Work definition of specialized and qualified staff and task sharing/task shifting with non-specialized staff - Outsourcing etc.

Aiming for 5% hourly service provision improvement by 2040

Moving some direct work such as monitoring online may also be discussed

Source: Compiled by Mizuho Bank Industry Research Department based on Digital Agency and Ministry of Health, Labour and Welfare materials

Fee Schedule Revisions are Likely to Tighten Further, a Good Opportunity for Strengthening Initiatives to Expand Businesses Outside Insurance Coverage

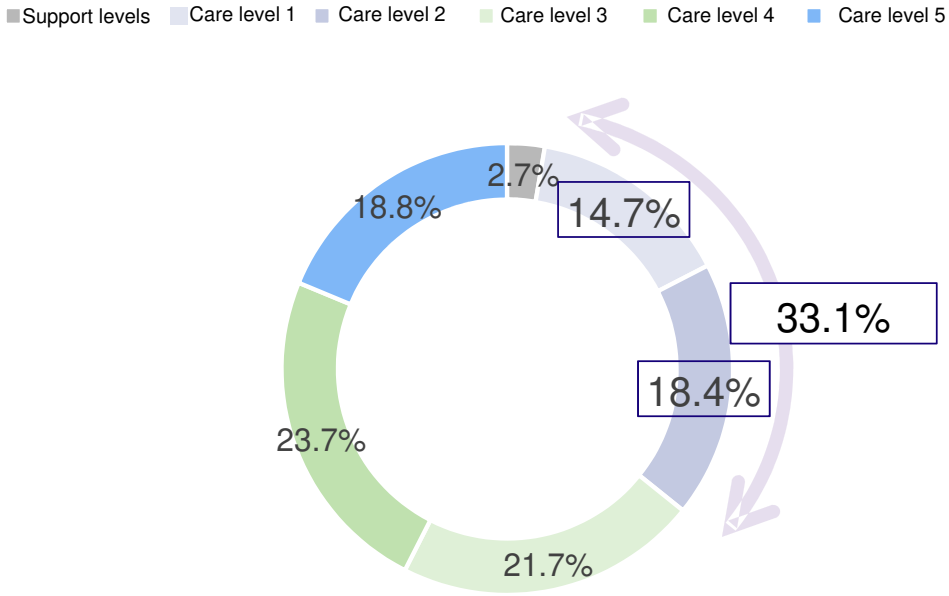
- While the fee schedule revisions in recent years have been repeatedly small but positive, their content has been demanding - such as requiring improved wages and conditions for nursing care staff as well as improved quality of response for mid- to high-care-level users and medical requirements - leading to an adverse profitability situation **Analyst's view (2)**
- Looking at the breakdown of benefits of the Long-term Care Service System by care-levels, low-care-level users at care levels 1 and 2 account for 1/3 of the total. Aiming to ensure the sustainability of the Long-term Care Service System, the national government is continuing to discuss services for support- and low-care-level users, which may result in them losing insurance coverage in the future. Nursing care operators face good opportunities for leveraging their know-how of services covered by insurance to expand into services outside insurance coverage which respond to support- and low-care-level users' requirements, such as monitoring and help with housework. However, one issue is how to resolve users' impression of heavy costs compared to services covered by public insurance, which are available by paying only 10%-30% of the total cost

Fee schedule revision trends

Fiscal Year	Revision rate	Of which, improved wages and conditions	Excluding improved wages and conditions
2003	-2.3%	—	-2.3%
2005	-1.9%	—	-1.9%
2006	-0.5%	—	-0.5%
2009	3.0%	3.0%	0.0%
2012	1.2%	2.0%	-0.8%
2014	0.63%(Note)	—	0.63%
2015	-2.27%	1.65%	-3.92%
2017	1.14%	1.14%	0.00%
2018	0.54%	—	0.54%
2019	2.13%	1.67%	0.46%
2021	0.70%	—	0.70%
2022	1.13%	1.13%	0.00%

Note: Response to the higher consumption tax rate
Source: Compiled by Mizuho Bank Industry Research Department based on Ministry of Health, Labour and Welfare materials and various media reports

Breakdown of benefits of the Long-term Care Service System by care-levels (FY 2020)



Source: Compiled by Mizuho Bank Industry Research Department based on Ministry of Health, Labour and Welfare materials

Good Opportunities Exist in the Growing B2B Service Market supporting Government Compliance by Small- and Medium-Sized Operators

- The demand for community-based and labor-clustering service provision has led to the existence of many small-scale operators providing varied services in different communities, causing issues with each of formulating strategies for policy compliance, considering actions, and establishing management structures by operators
  - The average revenue per facility is typically around 30 million yen for home-visiting service operators, 70 million yen for day service operators, and under 300 million yen for paid nursing home operators
  - As the top ten companies by market share have less than 5% share in in-home service operators as well as less than 7% in paid nursing homes and facilities covered by the Long-term Care Insurance System, a low concentration is seen among leading players
- The B2B service market supporting achievement of user's outcome and operators' productivity improvements is growing, presenting a good opportunity

Analyst's view (1)

Average revenue and profit margin per facility

	Services	Revenue (million yen)	Profit margin (%)
Visiting care services	Visiting care	31.7	2.6
	Home-visit bathing	34.5	3.6
	Home-visit nursing	32.6	4.4
Day care services	Day care	66.3	3.2
Facility services	Social welfare facility for the elderly requiring care (special nursing home for the elderly)	324.7	1.6
	Health service facility for the elderly care	420.9	2.4
	Long-term nursing care facilities	376.1	5.2
Residential	Paid nursing care homes	265.7	3.0

Note 1: Includes both incorporated medical institutions and social welfare corporations
Note 2: Revenue includes both subsidies and usage fees from outside nursing care insurance
Note 3: Profit margin is calculated by {revenue – expenditures [(salaries + depreciation + outsourcing costs etc.) – interest on borrowings - extraordinary losses]}/sales
Note 4: Paid nursing homes show the figures for daily life care for persons admitted to a designated facility

Source: Compiled by Mizuho Bank Industry Research Department based on Ministry of Health, Labour and Welfare materials

Top ten companies of in-home operations (based on the number of locations)

	Name of operator	Number of locations	Market share
1	Nichii Group	2,623	1.4%
2	Tsukui Group	874	0.5%
3	Saint-Care Group	771	0.4%
4	SOMPO Group	701	0.4%
5	Earthsupport	631	0.3%
6	Unimat Group	516	0.3%
7	Solasto Group	489	0.3%
8	Tokushukai Group	429	0.2%
9	Saiseikai Group	386	0.2%
10	Koyama Medical and Welfare Group	380	0.2%
	Total	7800	4.2%

Source: Compiled by Mizuho Bank Industry Research Department based on Tamura Planning & Operating materials

Top ten companies in paid nursing homes and facilities (based on resident capacity)

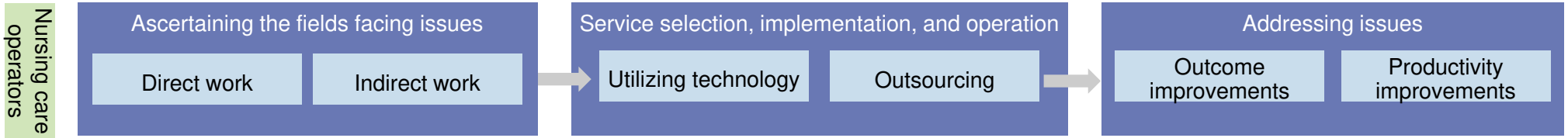
	Name of operator	Resident capacity (1,000 people)	Market share
1	SOMPO Group	29	1.3%
2	Benesse Style Care	20	0.9%
3	Gakken Group	17	0.8%
4	Nichii Group	15	0.7%
5	Kawashima Corporation	14	0.6%
6	Souseikai Group	13	0.6%
7	Best Life	12	0.5%
8	Koyama Medical and Welfare Group	12	0.5%
9	Aoikai Group	9	0.4%
10	Kinoshita Nursing Care	8	0.4%
	Total	148	6.6%

Note: Nichii Group is on a basis of beds
Source: Compiled by Mizuho Bank Industry Research Department based on "Elderly Residence Newspaper" (August 3 and 10, 2022 issues) and Tamura Planning & Operating materials

A B2B Service Market Dedicated to Nursing Care Operators is Emerging

- A B2B service market is emerging which ascertains the state of small- and medium-sized operators (business scale, staff IT literacy, issues which need to be addressed, etc.), provides consulting which supports selection, implementation, and running of appropriate services, and supports staff training and dispatch as well as ICT transition
  - The SOMPO group provides a wide range of services, from support for the starting business of new entrant operators to front-line improvement of existing operators. Its presence in the sector is increasing. Looking ahead, they may work to build the company group through solutions offerings without relying on M&A

Major service providers guiding the addressing the issues facing nursing care operators



Guiding

Service providers

Players/fields	Management and operation consulting	Staff training, dispatch, and recruitment	Supporting ICT transition	Purchasing support etc.,	
SOMPO group Nursing care operator	○	○	○	○	Since 2020, it has commercialized operation services which together handles opening support, consulting (some aspects without charge), and multiple types of work
SMS (Note) (healthcare services)	○	○	○	○	Starting from human resources introduction work, they have strengthened their platform and are now providing over 40 services to just under 40,000 operators
Konica Minolta Group (IT solutions)	○	○	○	○	Since 2019, they have provided homes, facilities, etc. with solutions and rollouts based on detailed front-line implementation support
Social Welfare Corporation Zenkoukai (nursing care operator)		○	○		They have strengthened their R&D functions, developing operations apps with excellent UI and UX, rolling them out together with staff IT literacy improvement programs

Note: Tokyo Stock Exchange Prime Market 2175
Source: Compiled by Mizuho Bank Industry Research Department based on publicly-available materials

New Operators are Rolling Out Business Models Specializing in People Using the Long-term Care Services with High Medical Needs

- Operators specializing in hospice-style homes for end-of-life or chronic phase cares are expanding their business size and forecast to accelerate their facilities opening in the future
  - Hospice-style homes serve people using the Long-term Care Services with high medical service needs such as end-stage cancer patients, providing medical and nursing services and nursing care services in one facility. This approach has low risk related to negative fee schedule revisions. The barriers to entry are high, such as needing linkages with medical institutions which are strong in in-home medical services and establishing a recruitment and training structure for nursing staff. However, leading operators have overcome these issues through strong involvement by doctors and nurses working at their managerial position
  - HYUGA PRIMARY CARE, which is rolling out home-visit pharmacies and B2B services for them, is entering the paid nursing home sector. Starting from pharmacies, it is targeting care service users with high medical needs, building a business model which can receive benefits not only of Long-term Care Service System but also Health Care (medical care) Insurance System. Looking ahead, it may provide management know-how through its B2B services to support the rollout by other companies

Strong hospice-style home operators

companies	Amvis Holdings	Japan Hospice Holdings	CUC Hospice
Listing	2019 (Tokyo Stock Exchange Standard Market 7071)	2019 (Tokyo Stock Exchange Growth Market 7061)	-
Brands	Ishinkan	Family Hospice Inc., Nursing Home Holdings etc.	Hospice Care at Home
Revenue/ Operating profit	(September 2022) 23.07 billion yen/ 6.13 billion yen	(December 2021) 6.02 billion yen/ 0.6 billion yen	-
Number of bases(Note)	61	33	27
Number of bases Medium-term revenue targets	127 bases 52.3 billion yen (2025)	60 bases 17.0 billion yen (2025)	-

Note: Number of bases is as at the end of October 2022
Source: Compiled by Mizuho Bank Industry Research Department based on materials published by the respective companies

Overview of HYUGA PRIMARY CARE's(Note) paid nursing homes

Targeting users with high medical needs

- Nursing care service users of middle- and high-care-level with high medical needs
- Moderate to severe dementia, end-stage cancer, and ALS patients

Providing one-stop medical and nursing services, and nursing care services

- Nurses are always on site. Provides pharmaceutical guidance and management by pharmacists
- Nurses are always doing the rounds 24 hours a day, 365 day a year

Can also receive benefits of Health Care Insurance System

- Can also receive pharmaceutical dispensing benefits of Health Care Insurance System

Increasing competitiveness through growing size

- Receiving economies of scale by growing past the 100-bed mark

May support rollouts through its B2B services

(Other companies) Home-visit pharmacies

Note: Listed in 2021, Tokyo Stock Exchange Growth Market 7133
Source: Compiled by Mizuho Bank Industry Research Department based on publicly- announced materials

5. Chemicals

Collaboration with third parties capable of realizing environmental value and reducing environmental costs, and refinement of specialty chemicals will be key

I. Trends in Supply and Demand

(Short Term)
- Global: The outlook calls for sluggish growth in response to the global economic slowdown to 187 million tons (+2.4% year over year).
- Domestic demand: 4,592 thousand tons (+0.6% y-o-y) is expected as economic activities return to normal.

(Medium Term)
- Global: Expected to reach 210 million tons (+2.8% p.a.) in 2027, with growth driven by increasing demand in emerging economies such as China and India.
- Domestic demand: While on track for a gradual recovery to 4,678 thousand tons (+0.5% p.a.), demand will not return to pre-pandemic levels.

II. Competitive Environment

- Large-scale projects to build new and add on to existing facilities will continue up to around 2023, mainly in Asia and the U.S., and the competitive environment will be fierce. While the situation will improve after, the supply-demand balance is expected to remain loose compared with before COVID-19, even in 2027.
- Development of a wide variety of production technologies is under way worldwide. Future technological innovation has the potential to change the competitive landscape. Chemical companies will need to formulate new supply strategies using new technologies.

III. Risks and Opportunities

<Risks>
- Until 2024, China's ethylene production capacity is expected to increase faster than demand growth. At any rate, its import quotas are expected to be reduced for the next two years, and combined with large plants starting up in other Asian countries, competition among countries with sizeable China-bound export volumes, including Japan, is heating up.
- While China has not revealed any large-scale plans to boost its production capacity after 2025, it will be necessary to keep an eye on the progress of projects in the country.

<Opportunities>
- Momentum toward adopting materials with low environmental impact is rising among companies in downstream industries, who are announcing emissions reduction targets, including Scope 3 emissions. Capturing and responding to changes in downstream users' needs may be a future business opportunity for chemical companies.

IV. Analyst's View (1)

(Making environmental value concrete and reducing environmental costs)
- As making environmental value concrete is a strategy for differentiation, it will be important to visualize the eco-friendliness of materials by obtaining certification, etc.
- Supply costs are expected to rise due to environmental measures, and to keep these costs down, collaboration between companies, industries, research institutes, academia etc. will be vital.
- Overseas, BASF in Germany and INEOS in the UK have begun construction of the demonstration plant. Strategies for differentiation by pursuing environmental edge is a necessary perspective for Japanese companies as well.

IV. Analyst's View (2)

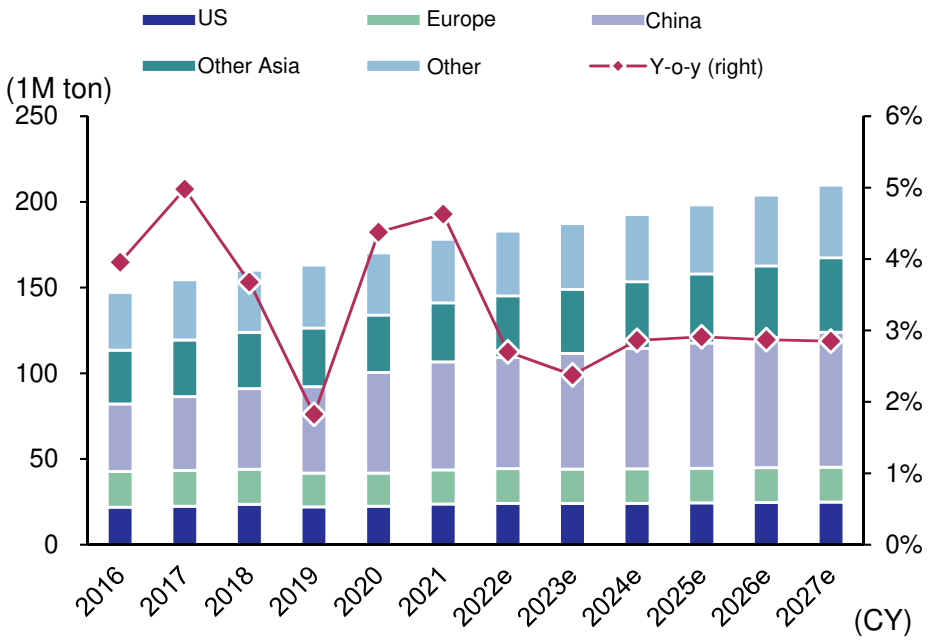
(Pursuing cutting-edge fields in specialty chemicals by refining competitiveness)
- Japanese chemical companies boast multiple high-profile products. They need to continue to refine their competitiveness by identifying the areas where they can demonstrate their company's added value and where they hold a competitive advantage.
- For example, companies that manufacture photoresist, a type of semiconductor material, can maintain a leading presence in the cutting-edge field by continuing to improve their competitiveness, such as through alignment with consumers and related companies.

Source: Compiled by Mizuho Bank Industry Research Department

While growth in global demand will stagnate in the short term, in the medium term it will bounce back to grow at a rate of about 3% per year

- Global ethylene equivalent demand is expected to reach 183 million tons in 2022 (up y-o-y by 2.7%) and 187 million tons in 2023 (+2.4% y-o-y). In the medium term, annual growth of approximately 3% is expected, with global demand in 2027 forecasted to amount to 210 million tons.
  - In the short term, growth is expected to slow due to the sluggish global economy, beset by rampant inflation worldwide and monetary tightening in Europe and the US. In the medium term, growth in demand is forecast to rebound to around 3% per year, underpinned by increased demand in China, which is set to maintain an annual growth rate of 4% despite a slowdown in the rate of its growth, along with increasing demand in Vietnam, India, and other emerging markets.

Medium-term outlook for global ethylene equivalent demand



Note 1: Figures for 2022 onwards are IRD forecasts.
Note 2: Europe = Belgium, France, Germany, Greece, Italy, the Netherlands, Spain, the UK, Portugal, Denmark, Austria, Switzerland, Finland, Norway, and Sweden. Other Asia = South Korea, Taiwan, Indonesia, Malaysia, Vietnam, Thailand, Singapore, the Philippines, Australia, and India.
Source: Compiled by Mizuho Bank Industry Research Department based on various published information.

Key points for the outlook

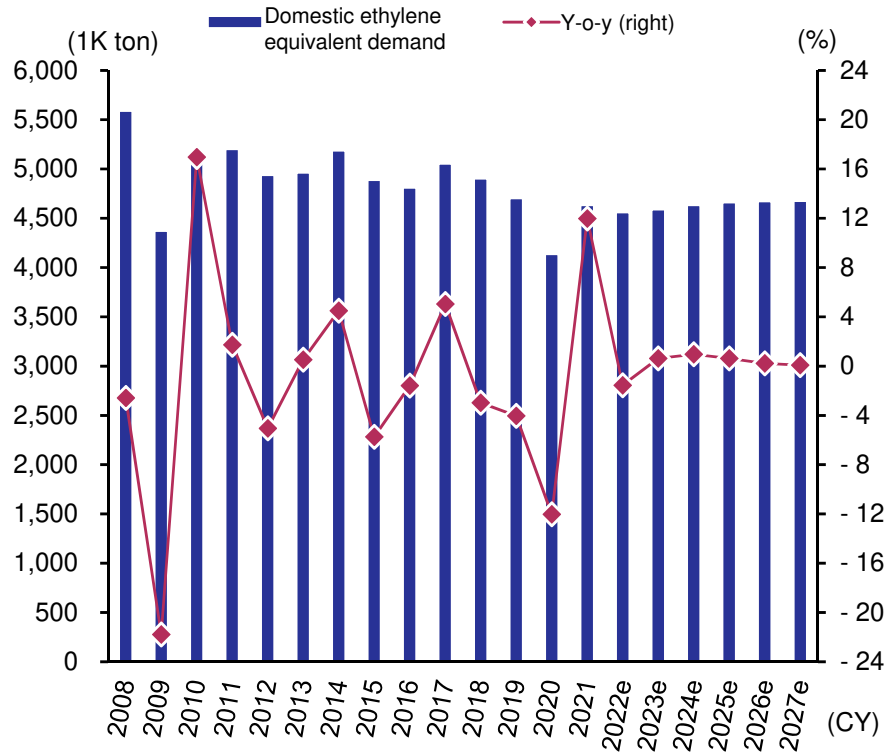
(1K ton)	2022 (Est.)	2023 (Forcst)	2027 (Forcst)	CAGR 2022-2027	Key points
US	24,154	24,060	24,939	-	Impact from inflation will materialize in the near term, but growth is expected in the medium term on the back of increasing population, etc.
	+1.7%	-0.4%	+1.0%	+0.6%	
Europe	20,277	20,120	20,358	-	Low growth is expected in the near term with inflation and war in Ukraine, and less demand for virgin materials in the medium term due to the spread of recycling
	+2.6%	-0.5%	+0.5%	+0.1%	
China	64,768	67,457	78,670	-	While zero-Covid is expected to be eased in the near term, the pace of growth in demand will slow in the medium term as the Chinese economy matures
	+2.8%	+4.2%	+3.7%	+4.0%	
Other Asia	36,032	37,356	43,398	-	Growth in demand in mature economies such as Korea and Taiwan will be limited, but demand is expected to grow in Vietnam, India, etc.
	+4.9%	+3.7%	+3.8%	+3.8%	
Global	182,922	187,272	209,741	-	The trend of recovery from the pandemic-induced slump in demand is expected to continue. Impact from ceasing use of plastics will be negligible in the period for this outlook.
	+2.7%	+2.4%	+2.9%	+2.8%	

Source: Compiled by Mizuho Bank Industry Research Department based on various published information.

Domestic demand will swing back to a recovery, but is not expected to reach pre-pandemic levels

- With lackluster consumption and other factors to blame, ethylene equivalent demand in Japan for 2022 is expected to amount to 4,564 thousand tons (down y-o-y by 1.6%) and 4,592 thousand tons in 2023 (up y-o-y 0.6%). In the medium term, annual growth of 0.5% is expected, reaching 4,678 thousand tons in 2027.
  - Domestic demand is expected to increase due to higher demand for consumer goods, as durable goods production will normalize in the short to medium term thanks to the resolution of supply chain disruptions and constraints on semiconductor supply, along with a rebound in inbound consumption. However, due to Japan's shrinking population, domestic ethylene equivalent demand in 2027 is not expected to reach the level it was at prior to the pandemic in 2019.

Medium-term outlook for domestic ethylene equivalent demand



Note: Figures for 2022 onwards are IRD forecasts.
Source: Compiled by Mizuho Bank Industry Research Department based on The Heavy & Chemical Industries News Agency and other materials

Key points for the outlook

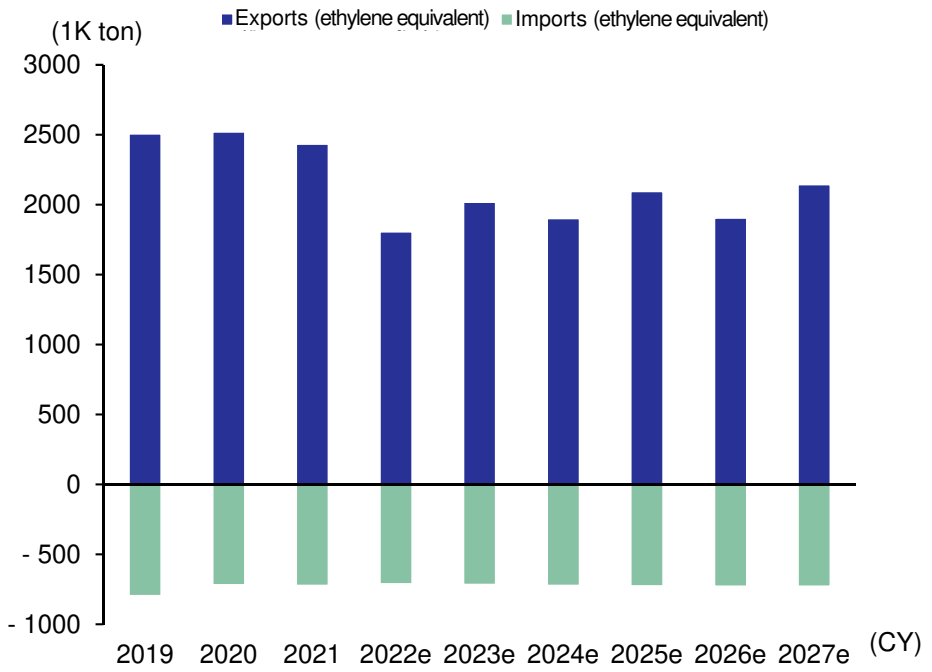
(1K ton)	2022 (Est.)	2023 (Forcst)	2027 (Forcst)	CAGR 2022-2027	Key points
Equivalent demand	4,564	4,592	4,678	-	While rebounds in inbound demand and auto production will drive growth, it is not expected to reach pre-pandemic, 2019 levels
	-1.6%	+0.6%	+0.1%	+0.5%	
Equivalent exports	1,810	2,022	2,148	-	Excluding effects of periodic repairs, exports will decrease in the near term due to building of large new plants overseas. Exports will start to increase in 2014, when the supply-demand balance is expected to improve
	-25.7%	+11.7%	+12.5%	+3.5%	
Equivalent imports	714	719	732	-	The trend of recovery from the pandemic-induced slump in demand is expected to continue, leading to moderate growth
	-1.6%	+0.6%	+0.1%	+0.5%	
Domestic production	5,660	5,895	6,094	-	While recovery from the pandemic will continue, the decline in exports due to large overseas plants being built will weigh heavily on production
	-10.8%	+4.2%	+4.1%	+1.5%	
Production capacity	6,421	6,808	6,808	-	Production capacity will drop in 2022 and 2026, which coincide with periodic repairs by domestic companies
	-4.3%	+6.0%	+6.0%	+1.2%	
Facility operating rate	88.1%	86.6%	89.5%	-	Aside from years that coincide with periodic repairs by domestic companies, expected to run just under 90% in the short to medium term

Source: Compiled by Mizuho Bank Industry Research Department based on The Heavy & Chemical Industries News Agency and other materials

With a rapid recovery in exports unlikely, operating rates will fall by 5-6% from pre-pandemic levels

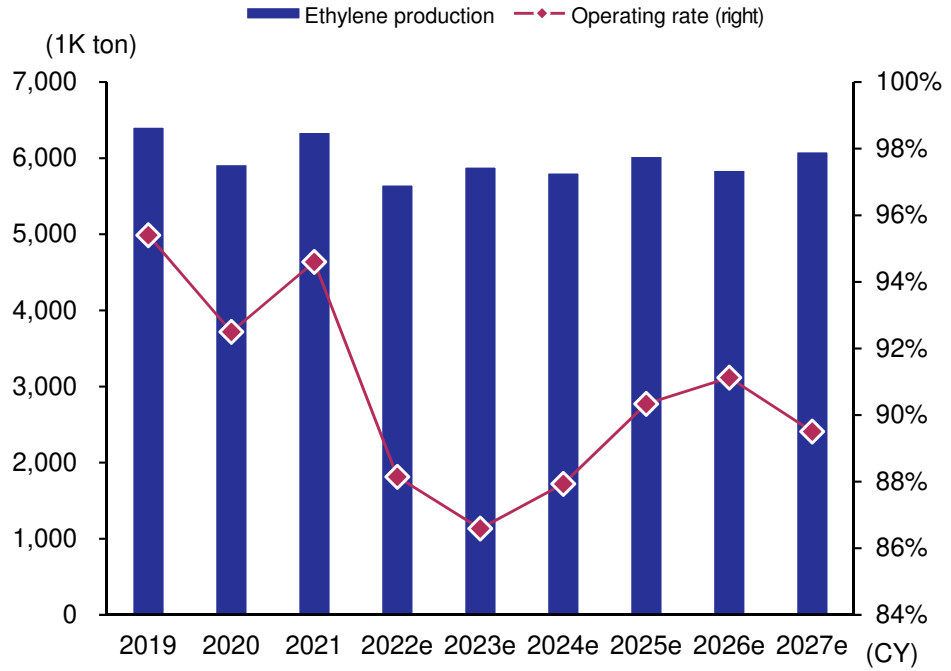
- Ethylene equivalent exports are expected to be 1,810 thousand tons in 2022 (down 25.7% y-o-y), 2,022 thousand tons in 2023 (+11.7% y-o-y), and 2,148 thousand tons in 2027 (+3.5% p.a.). Imports of the same are expected to reach 732 thousand tons in 2027 (+0.1% p.a.).
  - Although the global supply and demand situation is unlikely to improve in 2023, ethylene equivalent exports are expected to increase over the previous year due to the lack of concentrated periodic repairs that dented exports in 2022. In the medium term, exports will be on a recovery trend due to improving global supply and demand, but are not expected to return to pre-pandemic levels.
- Domestic production (operating rate) is forecasted to be 5,660 thousand tons (88.1%) in 2022, 5,895 thousand tons (86.6%) in 2023, and 6,094 thousand tons (89.5%) in 2027.
  - As a result of the drop-off in domestic demand and export volume, operating rates from 2022 onward will be lower than the 2019 operating rate by around 5-6%.

Medium-term outlook for exports and imports



Note: Figures for 2022 onwards are IRD forecasts.
Source: Compiled by Mizuho Bank Industry Research Department based on The Heavy & Chemical Industries News Agency and other materials

Medium-term outlook for domestic production

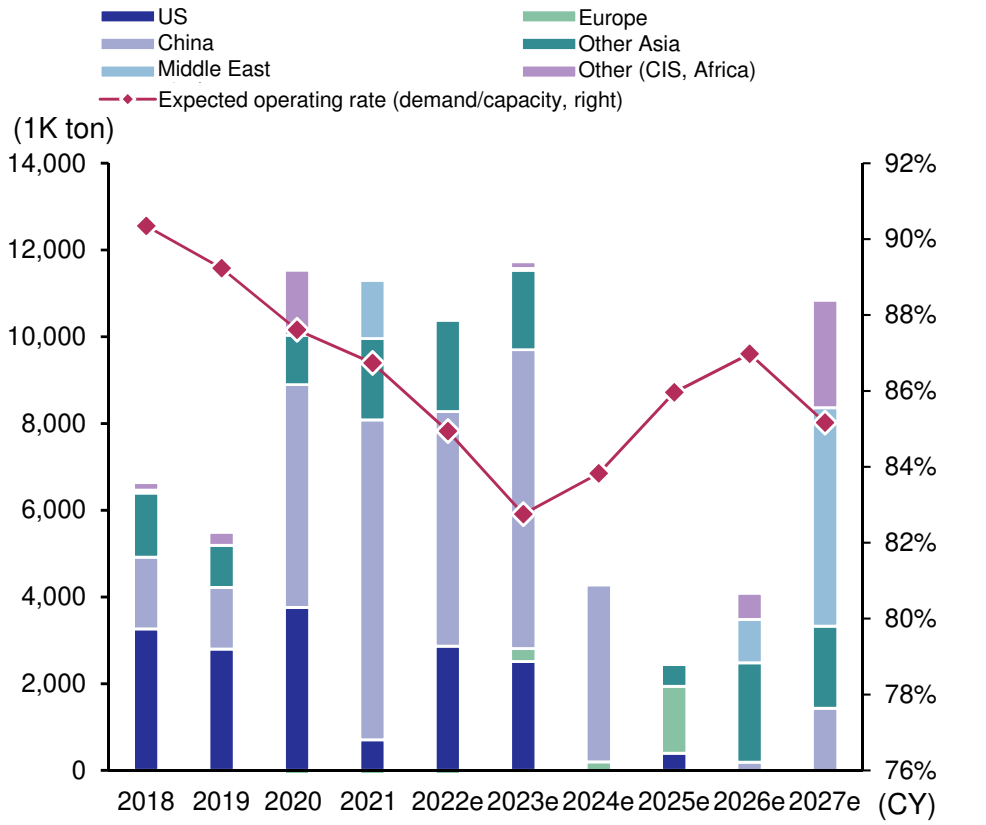


Note: Figures for 2022 onwards are IRD forecasts.
Source: Compiled by Mizuho Bank Industry Research Department based on The Heavy & Chemical Industries News Agency and other materials

The business environment is set to improve from 2024 onwards, but the balance of supply and demand will continue to be loose

- The global supply and demand balance will continue to ease until around 2023 due to the impact of large-scale new facilities being built in China and other countries. Until around 2026, the rate at which new facilities are built will settle down and improvement is expected, but supply and demand levels will remain loose compared to before the pandemic.
  - While China and the US account for the majority of plans for building new or extending existing facilities through 2026, there are also plans for large-scale new facilities in other parts of Asia and the Middle East, namely Long Son Petrochemicals (Vietnam; 1 million tons) and Gachsaran (Iran; 1 million tons).

Global outlook for new building/expansion plans and expected operating rates



Note: Figures for 2022 onwards are IRD forecasts.
Source: Compiled by Mizuho Bank Industry Research Department based on various published information.

Selected large-scale projects

Start-up	Company	Location	(1K tons)
2022	Sinopec Zhenhai Refining & Chemical	China	1,200
2022	Gulf Coast Growth Ventures (JV with ExxonMobil & SABIC)	US	1,756
2023	Long Son Petrochemicals	Vietnam	1,000
2023	CNPC/PDVSA Guangdong Petrochemical	China	1,200
2023	Sinopec Hainan Refining and Chemical	China	1,000
2023	Shell Chemical	US	1,500
2023	Shenghong Petrochemical	China	1,400
2024	ExxonMobil Chemical	China	1,600
2026	Gachsaran	Iran	1,000

Source: Compiled by Mizuho Bank Industry Research Department based on various published information.

With a wide variety of production technologies now being developed, future technological innovation could potentially change the competitive landscape

- Development of various production technologies with environmentally-friendly materials is concurrently under way in Japan and worldwide. This hints to the possibility of technological innovation changing the competitive environment.
  - The comparative advantages of each technology in terms of cost competitiveness and life cycle assessment (LCA) are expected to become clear after future testing and development.
  - It will be necessary to formulate new supply strategies using these new technologies that also take into account the scope for upgrading existing facilities (degree of aging, possibility of improving operational efficiency by shared operations with other companies or industries, etc.). Analyst's View (1)

Supply routes for environmentally-friendly materials (feedstock conversion, categorized by whether naphtha cracking is used)

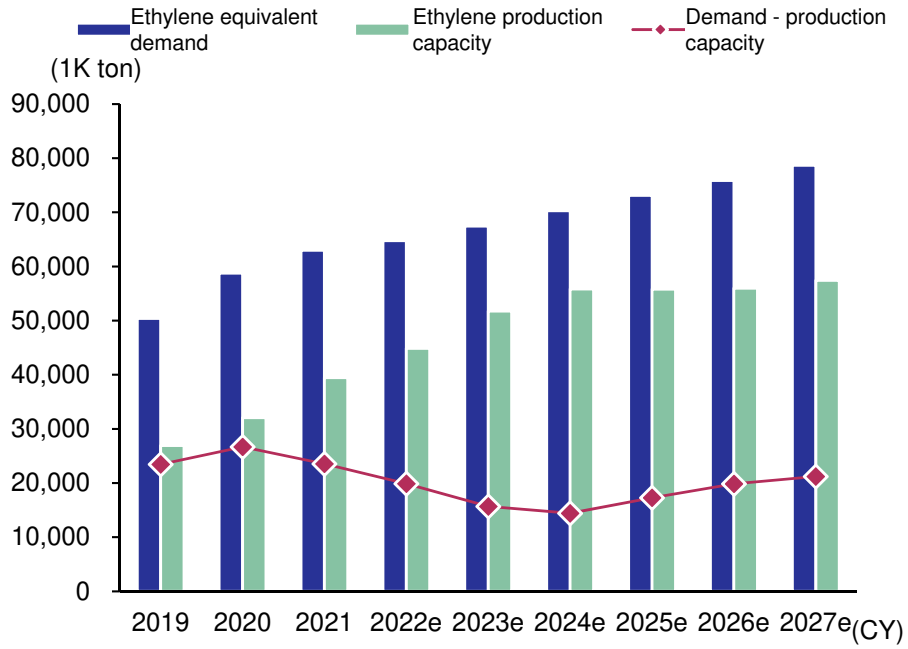
Use of naphtha cracking Y/N	Technological themes involved in feedstock conversion		Overview	Remarks
Environmentally-friendly supply method using a naphtha cracker	Recycle	**Pyrolysis (to produce oils)**	• Thermal conversion of mixed plastics into oil, which is then recycled as cracker feedstock	Need to compare with pyrolysis (to produce olefins) process (cost, LCA)
	Bio	**Bio-naphtha**	• Recycling of bio-naphtha as cracker feedstock	Need to compare with processes that do not go through cracking such as bioethanol-derived ethylene, chemicals derived from microbes, etc. (cost, availability of materials, LCA)
	CO2 + H2	**Synthetic naphtha**	• Use of CO2 and H2-derived synthetic naphtha as cracker feedstock	Need to compare cost, etc. with process for producing chemicals from CO2-derived alcohols
Need to compare cost, LCA etc.				
Environmentally-friendly supply method not using a naphtha cracker	Recycle	**Pyrolysis (direct olefin conversion), depolymerization, material recycling**	• Chemical and material recycling that does not go through a naphtha cracking process, such as direct conversion of mixed plastics into olefins, monomerization of PET, PS, PMMA, etc.	The trend is toward significantly expanding pyrolysis due to the limitations of adaptive plastics for depolymerization and material recycling. In that case, will need to compare with pyrolysis (to produce oils) (cost, LCA, etc.)
	Bio	**Production of chemicals using bioethanol, smart cells, etc.**	• Ethylene derived from bioethanol, chemicals that use microbes (chemical manufacturing via smart cells), etc.	Need to compare with bio-naphtha + cracker process (cost, availability of materials, LCA)
	CO2 + H2	**Production of chemicals from CO2-derived alcohols, etc.**	• Chemicals produced from CO2-derived alcohols (methanol derived from green hydrogen + MTO* and engineering plastic materials such as PC that use CO2)	Need to compare with synthetic naphtha + cracker (cost, LCA)

Note: Methanol to olefins, a method of converting methanol to olefin hydrocarbons.
Source: Compiled by Mizuho Bank Industry Research Department

China, Japan's largest export destination, becoming self-sufficient poses risks of a steep fall in export volume and a slowdown in plant operations

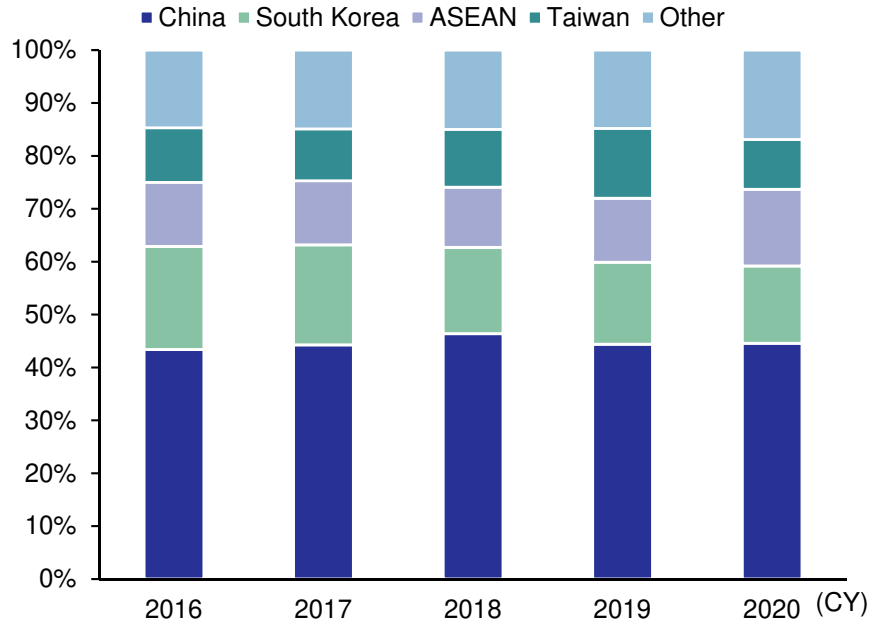
- Demand for ethylene equivalent in China is forecasted to be 64,768 thousand tons in 2022 (up y-o-y by 2.8%), and 67,457 thousand tons in 2023 (+4.2% y-o-y). In the medium term, annual growth of 4.0% is expected, reaching 78,670 thousand tons in 2027. Meanwhile, China's ethylene production capacity is expected to be 44,882 thousand tons in 2022 (+13.7% y-o-y), 51,770 thousand tons in 2023 (+15.3% y-o-y), and 57,447 thousand tons in 2027.
  - Through 2024, China's ethylene production capacity is expected to expand at a much faster rate than its growth in demand. On top of reduced import quotas for the next two years, the additional factor of large plants starting operations in other Asian countries is expected to trigger fierce competition among the countries with large export volumes to China, including Japan.
  - While China has not announced any large-scale plans to boost production capacity after 2025, it will be necessary to keep a close eye on the progress of relevant projects in China, as any additional plans for new facility-building being implemented are anticipated to put further downward pressure on exports and operating rates.

Outlook for ethylene equivalent demand in China



Note: Figures for 2022 onwards are IRD forecasts.
Source: Compiled by Mizuho Bank Industry Research Department based on various published information.

Trends in Japan's ethylene equivalent export destinations



Source: Compiled by Mizuho Bank Industry Research Department based on Japan Petrochemical Industry Association, *Current Status of the Petrochemical Industry*

Response to downstream users' needs for environmentally-friendly materials as a future business opportunity

- In addition to announcing emissions reductions targets, including Scope 3 emissions, there have been cases of downstream users asking their suppliers to take specific actions, and the adoption of materials with a lower environmental impact, such as bio and recycled materials, is under way.
- Capturing these changes in downstream users' needs may be a future business opportunity. Analyst's View (1)

Downstream users' policies

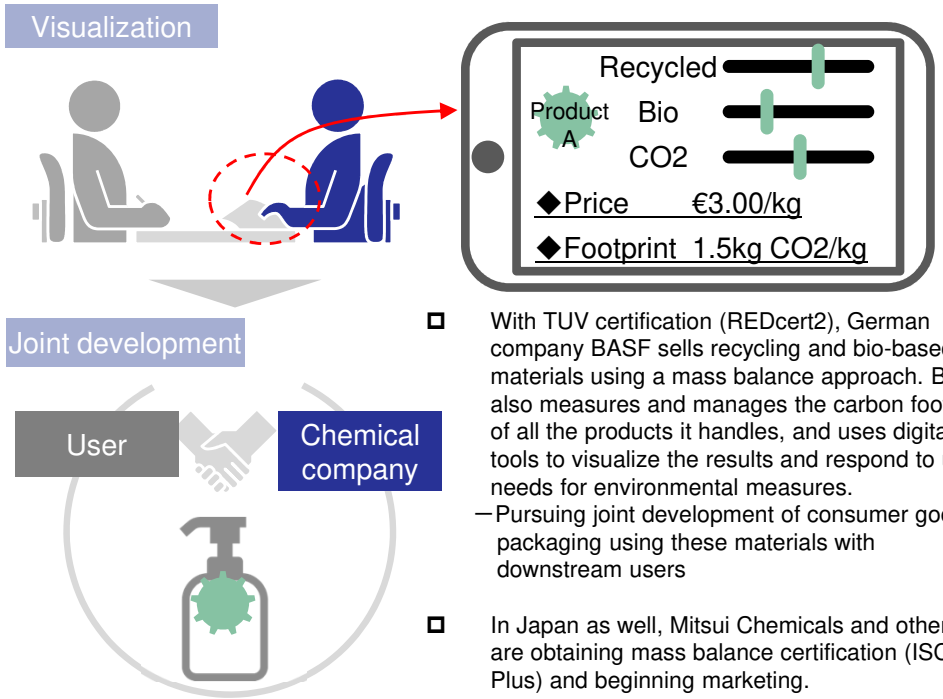
	CO2 / Scope 3 emissions	Bio and recycled materials
Retail	■ AEON Group: Calculating suppliers' CO2 emissions with a high degree of accuracy and advocating for formulating a specific reduction plan for the entire supply chain. ■ J. Front Retailing: Held a briefing for its business partners in April 2022 and asked for emissions measurement and reduction.	■ AEON Group: Pursuing use of biomass for private-brand film and ink. ■ FamilyMart: In April 2022, changed part of the film for its rice ball snacks to one that uses biomaterials.
Food	■ Kirin Holdings: Obtained SBT net zero certification in August 2022 (target is to reduce Scope 3 emissions by 30% by fiscal 2030 compared to fiscal 2019, and then to net zero in 2050). ■ Asahi Group: Will reduce Scope 3 emissions by 30% from 2015 by 2030. ■ Suntory: Will reduce Scope 3 emissions by 30% from 2019 by 2030.	■ Nissin Food: Announced in June 2019 that it was switching the containers for its cup noodles to the biomass ECO cup. ■ Suntory: JV with US firm Anellotech to develop 100% plant-based PET bottles, currently working on a project for commercialization.
Construction and real estate	■ Mitsubishi Estate Co.: Obtained SBT net zero certification in July 2022 (target is to reduce Scope 3 emissions by 50% or more compared to fiscal 2019 by fiscal 2030). ■ Tokyu Construction: In February 2022, developed a tool that can instantly calculate the CO2 emissions of construction materials with a high degree of accuracy	■ Tokyu Land Corporation: Announced that it would proactively utilize waste recycling and environmentally-friendly construction materials in its environmentally-advanced condominiums.
Automotive	■ Toyota: In June 2021, asked its suppliers to reduce CO2 emissions by 3% over the previous year. ■ Honda: In November 2021, asked its suppliers to reduce CO2 emissions by 4% a year from fiscal 2019 and to achieve net-zero emissions 2050.	■ Toyota, Mazda: Adopted DURABIO, a bioplastic being produced by Mitsubishi Chemical. ■ Nissan: Began using ECO CIRCLE Plantfiber, a bio-polyester fiber developed by Teijin, for auto interiors.
Electronics	■ Apple: Has asked its suppliers to use 100% renewable energy for electric power by 2030. Has also asked suppliers to provide annual reports on emissions reduction related to their manufacturing of products. ■ Microsoft: Announced that CO2 emissions reduction will be a key point it considers in its supply chain purchasing process.	■ Ricoh: Is collaborating with materials manufacturers to develop new products, aiming to increase the use of bioplastics in its multifunctional printers. ■ Konica Minolta: Aiming for net-zero CO2 emissions from multifunctional printer plastics in 2030 by developing technologies that use waste materials as high-performance materials and that use biomass.

Source: Compiled by Mizuho Bank Industry Research Department based on various published information.

To use changes in the business environment as business opportunities, making environmental value concrete and reducing the cost of environmental measures will be necessary

- When supplying environmentally-friendly materials, for which the relative merits of their physical properties are difficult to judge, making their environmental value concrete is an important strategy for differentiation. Using approaches such as obtaining third-party certification to visualize and propose the eco-friendliness of materials (the carbon footprint and ratio of recycled and bio-based materials) is key.
  - To go a step further, by joining forces with a customer to co-develop a product using those materials and develop a market for it ahead of others, chemical companies can establish a competitive edge.
- As it becomes necessary for each company to take environmental measures, supply costs for the market as a whole will go up. By keeping their supply costs lower than their peers in the process of transition, including the cost of environmental measures, chemical companies can create new advantages.

Initiatives to turn downstream users' changing needs into business opportunities

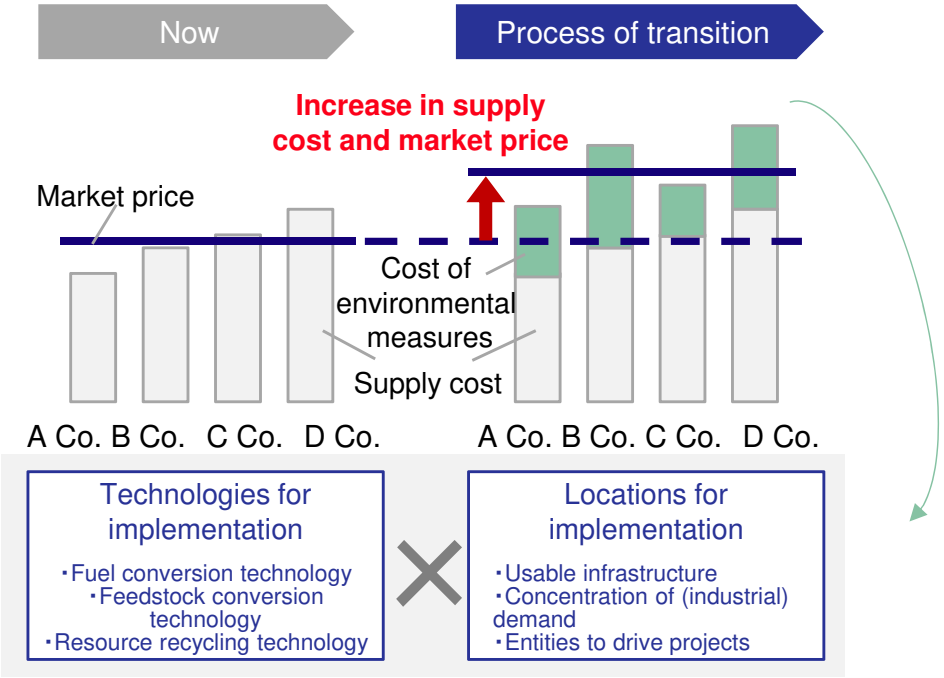


- With TUV certification (REDcert2), German company BASF sells recycling and bio-based materials using a mass balance approach. BASF also measures and manages the carbon footprint of all the products it handles, and uses digital tools to visualize the results and respond to user needs for environmental measures.
  - Pursuing joint development of consumer goods packaging using these materials with downstream users
- In Japan as well, Mitsui Chemicals and others are obtaining mass balance certification (ISCC Plus) and beginning marketing.

Visualize the environmental value of materials, differentiate through joint development of proposals and products

Source: Compiled by Mizuho Bank Industry Research Department

Initiatives necessary as the cost curve changes due to environmental measures



Create cost advantages through economically rational environmental measures

Source: Compiled by Mizuho Bank Industry Research Department

Transition of the petrochemical industry: Collaboration between companies, industries, and with third parties such as academia

- Collaboration between companies and industries will be crucial in order to execute an economically rational transition and to establish a competitive edge. Moreover, we surmise that collaborating with third parties such as research institutes and academia will be effective for acquiring the driving force to achieve these goals.

Collaboration necessary for executing the optimal transition strategy

1 Collaborate with other companies and other industries to establish a system for implementing the transition

Individual company → Collaboration within industry → Collaboration with other industries

	Chemical company	Chemical company	Oil refineries	Steel manufacturing	Power generation
Fuel conversion	Develop fuel (ammonia) conversion technology for naphtha crackers		Tank repurposing, etc.	Coal-fired mixed combustion, ammonia co-firing	LNG co-firing, hydrogen-only firing
	Joint procurement and utilization of ammonia, development of tank-sharing infrastructure, etc.				
Feedstock conversion			Synthetic fuel manufacturing, etc.	Hydrogen reduction steelmaking, etc.	
	CO2 use as feedstock (reaction with hydrogen)				
Resource recycling	Develop chemical recycling technology (to convert waste plastics into oil)		Refining and fuel oil conversion of waste plastics	Utilization of waste plastics in blast furnaces for oil conversion	
	Joint procurement and utilization of waste plastics				
Capacity optimization	Establish a resilient production structure that does not rely on exports				

2 Collaborate with third parties to obtain driving force for the transition

Research institutions, academia

- Research institutes such as those at academic societies and universities and academia are facilitating collaboration to achieve transition by developing an objective picture of the ideal form of collaboration among companies and industries.
  - (Yamaguchi prefecture) The Japan Society for Chemical Engineers also participates in the Shuhan Council for Promoting Industrial Complex Decarbonization, which supports collaboration between companies and industries.

Local and national government, financial institutions

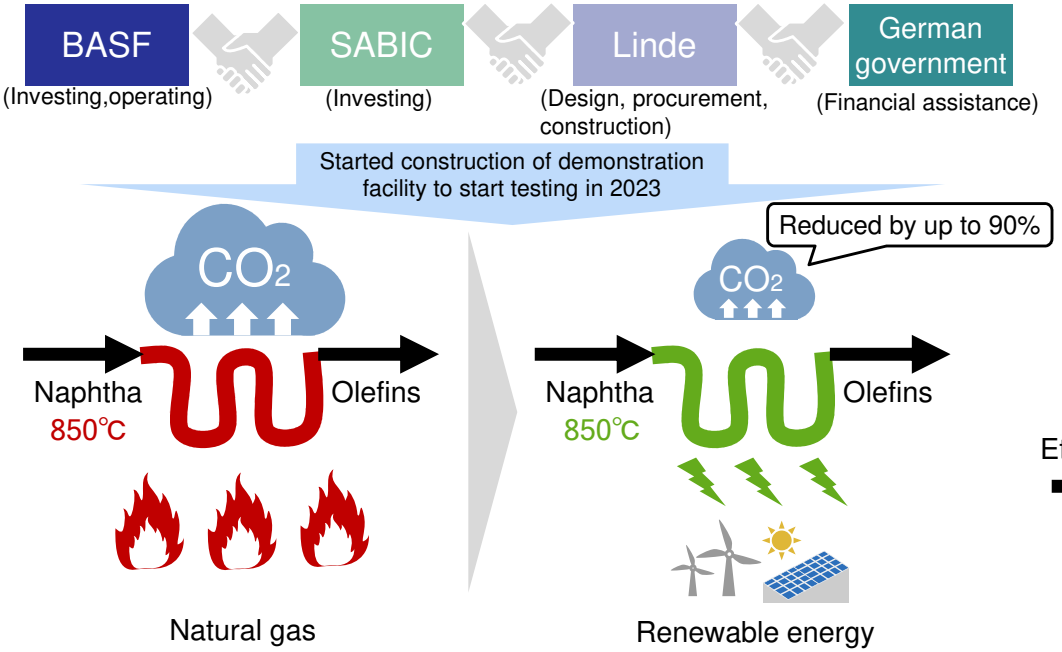
- Support for transition is being provided by municipal governments and the national government via rulemaking, subsidies, etc.
- Financial support for transition is being provided by financial institutions

Source: Compiled by Mizuho Bank Industry Research Department

Moves by overseas chemical companies: Strategies for differentiation by pursuing environmental measures are a necessary perspective for Japanese companies as well

- BASF (Germany), SABIC (Saudi Arabia), and Linde (UK) announced a partnership to jointly develop an electrically-heated steam cracker (pyrolytic) furnace, and have begun construction of a demonstration facility to start testing in 2023.
  - The electric furnace could reduce CO2 emissions by up to 90% compared to conventional gas-heated furnaces, and the partners plan to license the technology once it is established.
- British company INEOS has begun construction of an ethane cracker furnace in Antwerp, Belgium, aiming to launch operations in 2026.
  - Collaborating with the local port authority as appropriate, INEOS plans to slash emissions by switching to hydrogen as the heat source, using renewable energy for electric power, and CCUS.
- European chemical companies' moves to differentiate themselves by pursuing environmental measures, as opposed to US and Chinese companies which have advantages in terms of their raw materials procurement capabilities, is a useful strategy for Japanese chemical companies to consider, as they lack advantages in terms of raw materials similarly to European companies.

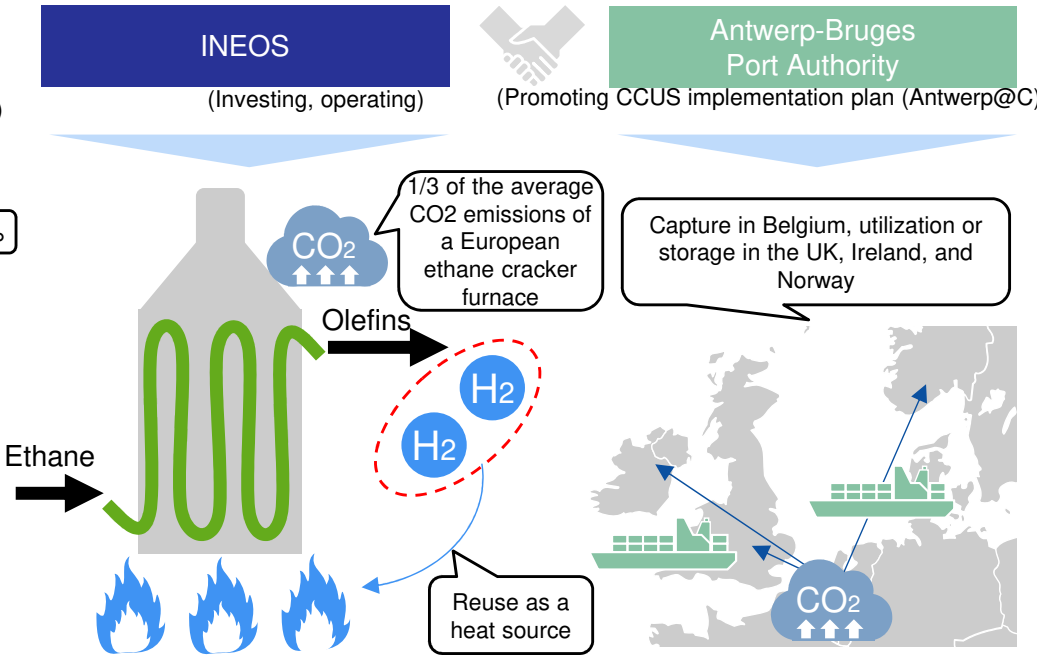
BASF & partners initiative (electric steam cracker furnace)



Plan to license the technology once it is established

Source: Compiled by Mizuho Bank Industry Research Department based on BASF IR materials.

INEOS initiative (new type of ethane cracker furnace in Antwerp)



Collaborating with the port authority and using renewable energy and CCUS to reduce emissions

Source: Compiled by Mizuho Bank Industry Research Department based on various published information.

Specialty chemicals: Maintain a leading presence in cutting-edge fields by refining competitiveness

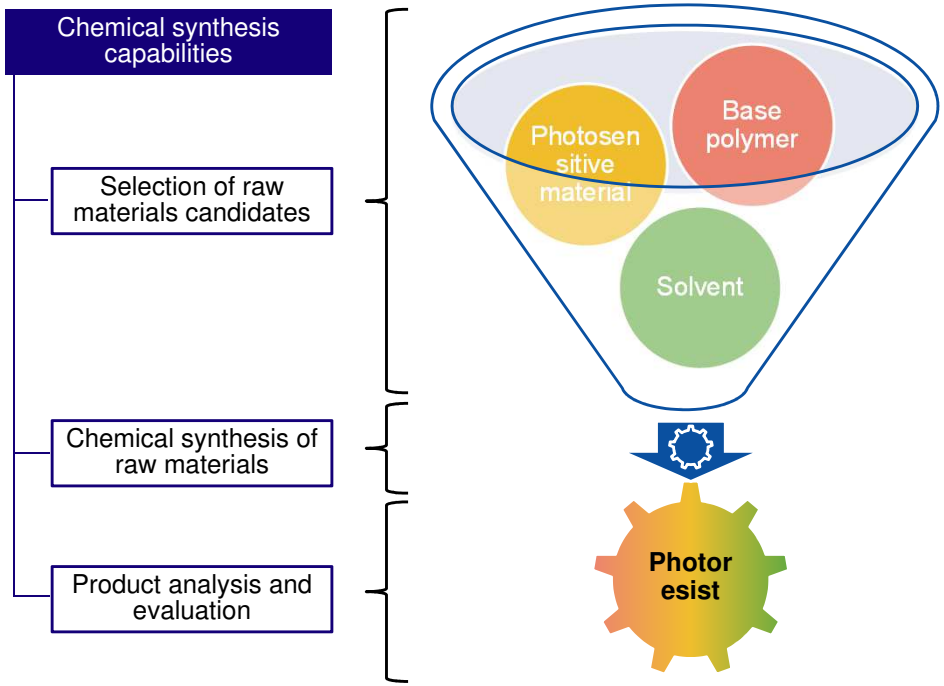
- Japanese chemical companies boast multiple products in the fields of electronic materials and mobility that are well-known worldwide.
- Each company will need to continue to refine their competitiveness by identifying the areas where they can demonstrate their company's added value and the areas where they hold a competitive advantage.
  - For example, in order to improve the sensitivity, resolution, and roughness of photoresist film, a high level of chemical synthesis capabilities (selection of the base polymer, etc., chemical synthesis of the raw materials, and analysis and evaluation of the finished product) is necessary. Japanese photoresist manufacturers can maintain their leading presence in this cutting-edge field by continuing to refine their chemical synthesis capabilities through alignment with consumers and related companies and other approaches.

Products for which Japanese chemical manufacturers have a high profile

Major market	Products		Companies (Japanese alphabetical order)
Semiconductors	Silicon wafers	Substrate used for semiconductors	SUMCO, Shin-Etsu Chemical
	Photoresist	Light-sensitive material used to form patterns on semiconductors	JSR, Sumitomo Chemical, Tokyo Ohka Kogyo, etc.
	Epoxy sealant	Sealant to protect semiconductors from light, heat, moisture, dust, etc.	Showa Denko, Sumitomo Bakelite, etc.
Displays	Polarizers	Optical film that confines the oscillations of light to a particular direction	Sumitomo Chemical, Nitto Denko
LiBs	Separators	Membrane that separates the cathode and anode and prevents overheating or ignition	Asahi Kasei, Toray, etc.
	Anodes (active material)	Materials that absorb and release lithium ions to determine capacity (mainly carbon materials)	Showa Denko, Mitsubishi Chemical etc.
Mobility	Carbon fiber (CFRP)	High-strength, high modulus of elasticity synthetic fiber	Teijin, Toray, Mitsubishi Chemical
	PP compounds	Resin compounds used for bumpers, instrument panels, etc.	Mitsui Chemicals, Sumitomo Chemical, Mitsubishi Chemical etc.

Source: Compiled by Mizuho Bank Industry Research Department

Example of continuing to refine competitiveness: Photoresist



Maintain a leading presence by continuing to refine competitiveness through alignment with consumers and related companies, etc.

Source: Compiled by Mizuho Bank Industry Research Department based on various published information.

6. Oil

Both decarbonization and growth must go hand in hand in responding to declining demand

I. Supply and demand trends

(Short-term)
- Global demand is expected to recover from the impact of COVID-19, with YoY growth of +3.1% in 2022 and +2.4% YoY in 2023.
- Demand in Japan is expected to return to a downward trend, down 0.9% YoY in 2022 and down 1.1% YoY 2023.

(Medium term)
- Global demand is expected to grow at an annual rate of +1.1%, driven by Asia
- Demand in Japan is expected to continue trending downward, with an annual rate of -1.6%

II. Competitive environment

(Short-term)
- The government is currently providing support for petroleum products through a subsidy to mitigate drastic fluctuations in oil prices.

(Medium term)
- Oil wholesalers are required to make refining processes and products carbon neutral to reduce CO2 emissions.
- It will be difficult for a company to do either of these things on its own. Industrial complex that promote advanced initiatives related to decarbonization may gain high competitiveness in the future.

III. Risks & opportunities

<Risks>
- Further progress in decarbonization initiatives (improvement in fuel efficiency and phasing out of fossil fuels) in the consumer sector will accelerate the pace of decline in oil demand.
- If the expansion of refining capacity, which has been temporarily stalled in Asia due to the spread of COVID-19, proceeds at a high pace, competition in overseas markets is expected to intensify, making it increasingly difficult for Japanese companies to capture overseas demand.

<Opportunities>
- CO2 emission reductions will bring economic benefits and the need for emission reductions is expected to increase in countries where carbon pricing has been introduced.
- Customer needs are expected to range from emissions measurements and visualization to reduction of CO2 emissions and use of credit, creating opportunities for emissions reduction solutions as a business to cover the decline in oil demand.

IV. Analyst's view (1)

(Capacity reduction while ensuring stable supply)
- ENEOS and Seibu Oil's refining capacity cuts are expected to reduce Japan's overall capacity by 370,000 b/d by 2027.
- With demand in Japan declining, we estimate that an additional 510,000 bpd of capacity reduction would be required to achieve a 90% capacity utilization rate.
- However, it is necessary to take measures to prevent significant capacity reductions that would undermine resilience.

IV. Analyst's view (2)

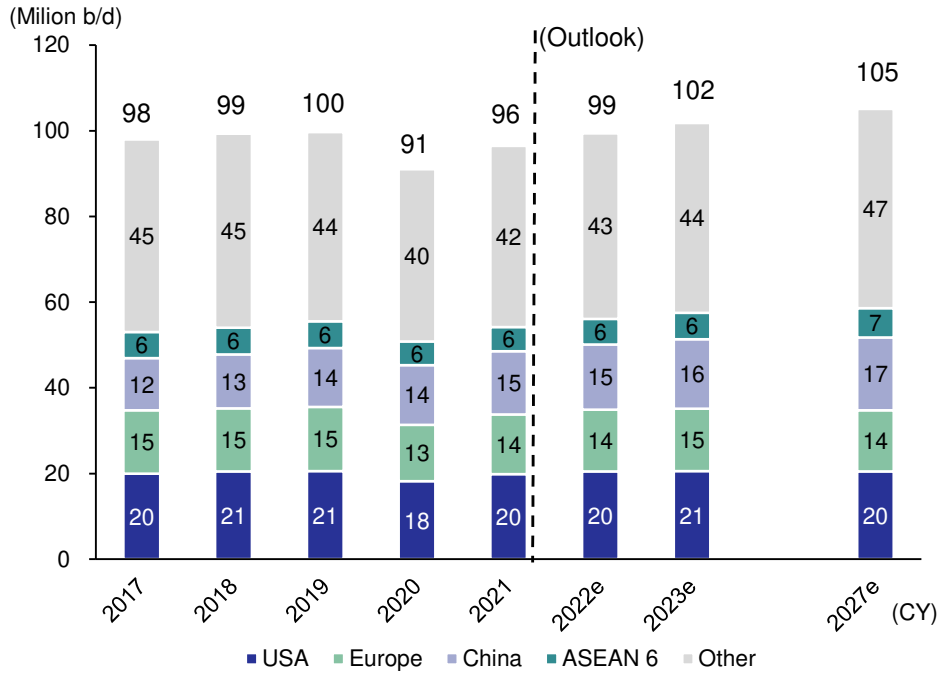
(Balancing decarbonisation and growth)
- Exporters plan to take on carbon-neutral energy supplies.
- In the renewable energy field, they plan to capture the market by making large investments and participating in bids for offshore wind generation projects.
- Project concepts have also been announced for hydrogen and ammonia, SAF and CCS.
- In the hydrogen, ammonia, and SAF fields, which are still in their infancy, there is room for companies to invest and procure together in order to expand the market.

Source: Compiled by Mizuho Bank Industry Research Department

[Global Demand] Demand continues to increase, particularly in China and ASEAN countries

- Global oil demand is expected to recover in the short term from the decline mainly in demand for transportation and travel associated with the spread of COVID-19, and is forecast to increase by 3.1% YoY in 2022 and by 2.4% YoY in 2023.
- Demand in developed countries such as the U.S. and in Europe is expected to level off, demand for oil in China, ASEAN 6, and elsewhere will increase, and global demand is forecast to grow at an annual rate of 1.1% by 2027.

Medium-term outlook for global oil demand



Note 1: Forecasts by Mizuho Bank Industry Research Division for 2022 and beyond.
Note 2: ASEAN 6 consists of Indonesia, Malaysia, the Philippines, Thailand, Vietnam, and Singapore.
Source: Compiled by Mizuho Bank Industry Research Division based on BP data, IEA data, EIA data, and others.

Forecast highlights

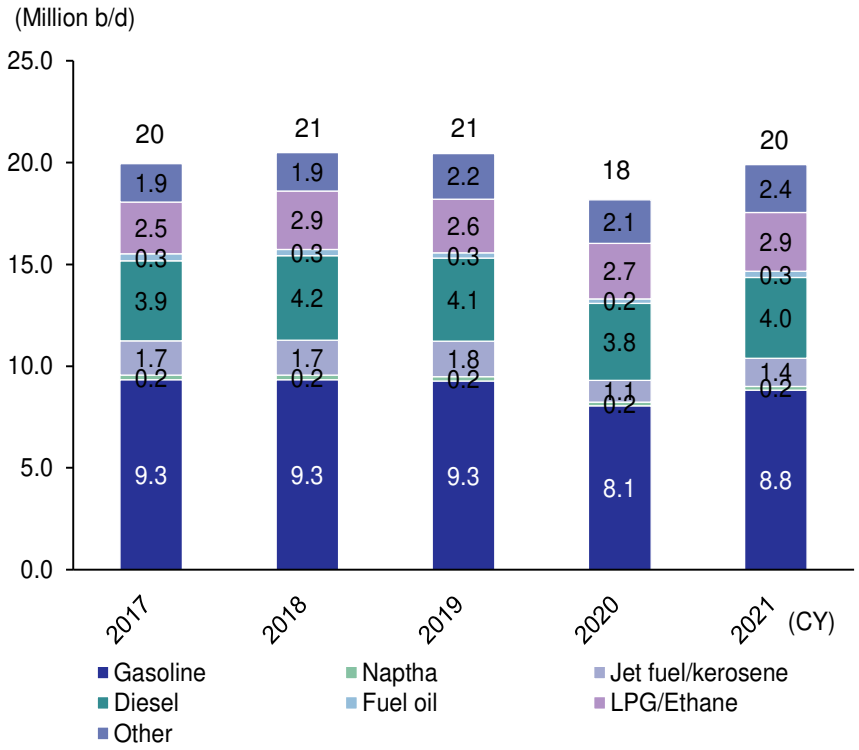
USA	• In the short term, demand for gasoline and diesel oil will continue to recover from the drop in demand due to the impact of the novel coronavirus, but demand for both gasoline and diesel oil has plateaued due to the impact of the shift to more fuel-efficient automobiles. • Demand for fuel oil is expected to start declining by 2027.
Europe	• In the short term, demand will continue to recover from the decline due to the impact of novel coronavirus, but in the medium term, demand is expected to return to the current downward trend, affected by factors such as improved fuel efficiency.
China	• Growth in demand slowed slightly in the short term as policies to prevent the spread of COVID-19 restricted movement. • Demand for fuel oil is expected to expand in line with economic growth through 2027, driving growth in global demand.
ASEAN 6	• Energy consumption is expected to expand against a backdrop of economic growth in the 4% range and population growth. Demand for gasoline and diesel oil in particular is also expected to increase.

Source: Compiled by Mizuho Bank Industry Research Department

Demand in developed countries has plateaued, while demand is expanding in emerging countries

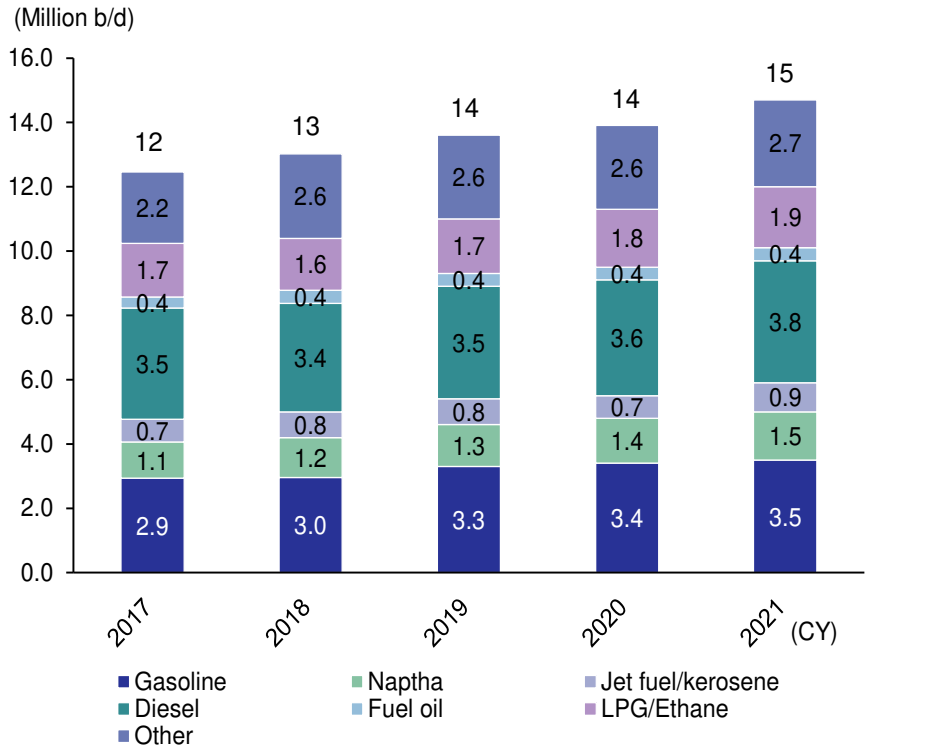
- Trends in oil demand differ depending on the economic conditions of individual countries, and there are differences even between the U.S. and China, which are oil-rich countries.
- In the U.S., although the economy has temporarily recovered from the impact of COVID-19, growth in demand for transportation has peaked, and overall demand is expected to peak out.
- Growth in demand in China for gasoline and naphtha is particularly strong, and overall demand is also solid.

Demand by oil type in the U.S.



Source: Compiled by Mizuho Bank Industry Research Division based on data from IEA, Oil, etc.

Demand by oil type in China

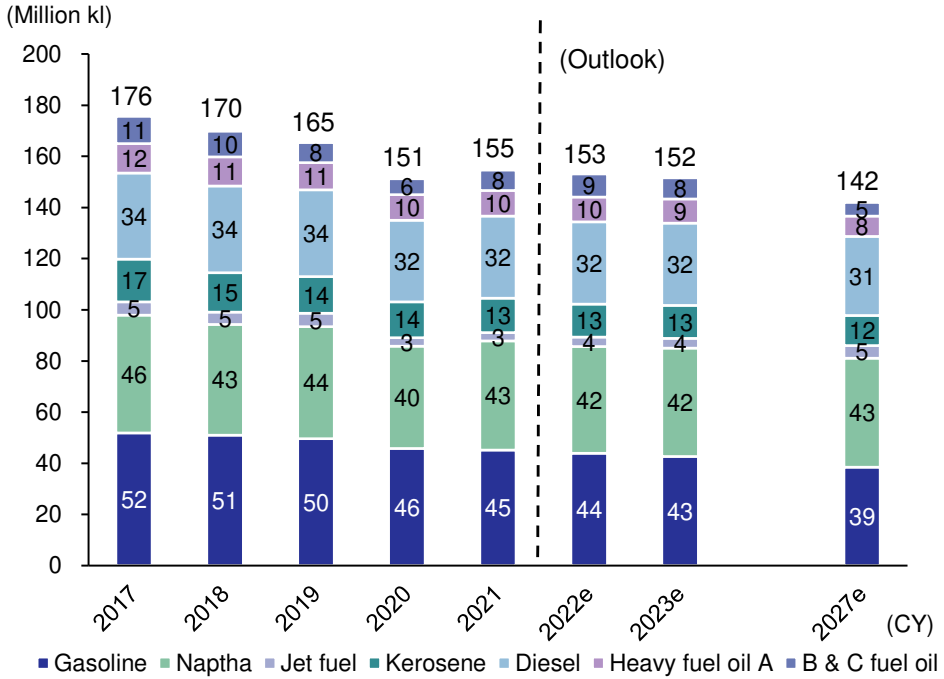


Source: Compiled by Mizuho Bank Industry Research Division based on data from IEA, Oil, etc.

[Domestic demand] Demand continues to decline due to improvements in fuel efficiency and phasing out of fossil fuels

- Demand in Japan for oil is forecast to decline by 1.0% YoY in 2022 and by 0.9% YoY in 2023. Demand is expected to continue to decline thereafter, falling 1.5% per year to 2027.
- Demand for gasoline and diesel oil is expected to decrease due to a decline in the number of automobiles owned and improved fuel efficiency. Demand for naphtha will decrease due to lower production of petrochemical products. Demand for jet fuel is expected to pick up due to recovery in passenger demand. Demand for kerosene and heavy fuel oil is expected to decline due to electrification and phasing out of fossil fuels.

Medium-term outlook for domestic oil demand



Note 1: Forecasts by Mizuho Bank Industry Research Division for 2022 and beyond.
Source: Compiled by Mizuho Bank Industry Research Division based on data from the Petroleum Association of Japan.

Forecast highlights

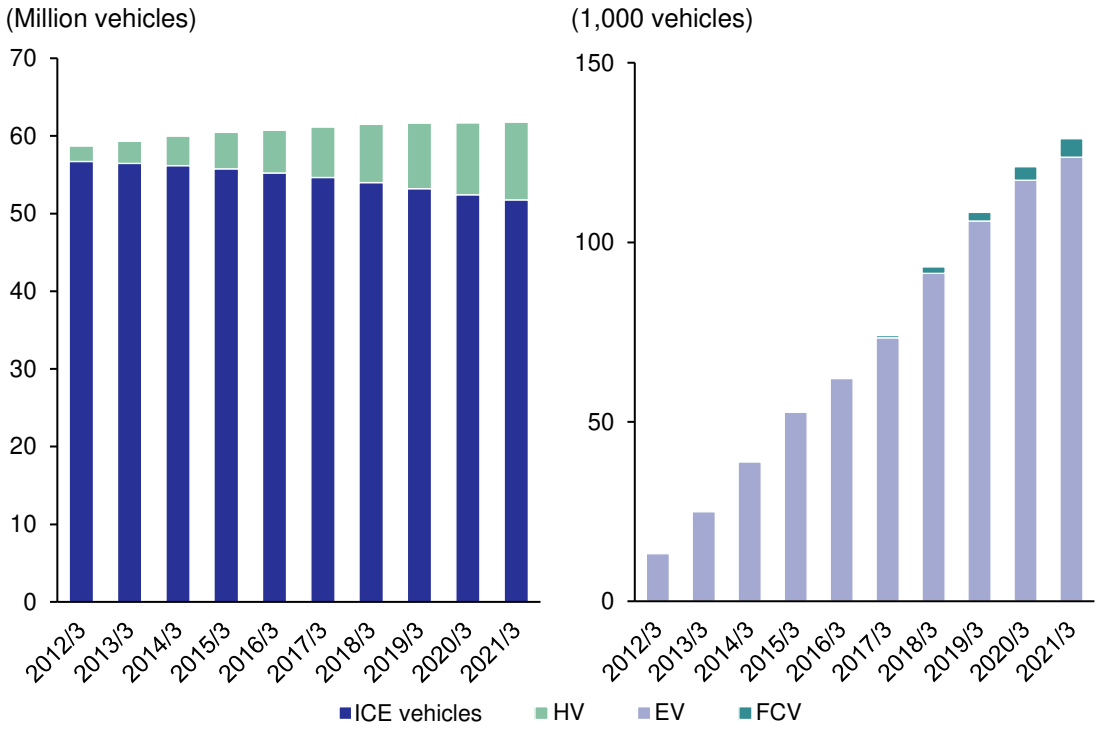
Gasoline	• Demand will decline due to a decrease in the number of passenger vehicles due to demographic changes and improved fuel efficiency.
Naptha	• Demand will decline due to lower production against a backdrop of falling petrochemical product exports.
Jet fuel	• Demand to pick up as passenger demand recovers. • Demand for liquid fuels with high energy densities is expected to continue in this difficult-to-electrify sector.
Kerosene	• Demand is expected to continue to decline in the residential sector, the main source of demand, due to a decrease in the number of households as a result of demographic changes and progress in electrification of the low-temperature heating demand sector.
Diesel	• Demand for diesel is expected to decline at a smaller rate than for gasoline, supported by logistics demand, although fuel efficiency improvements will put downward pressure on demand for diesel.
Fuel oil	• In the industrial heat demand sector, the phasing out of fossil fuels will lower demand. • In power generation applications, demand temporarily increased due to the operation of oil-fired thermal power plants in response to the electricity supply-demand crunch, but demand is expected to decline to previous levels as supply and demand conditions normalize.

Source: Compiled by Mizuho Bank Industry Research Department

Oil demand for transportation being pushed down by the electrification of automobiles and improved fuel efficiency

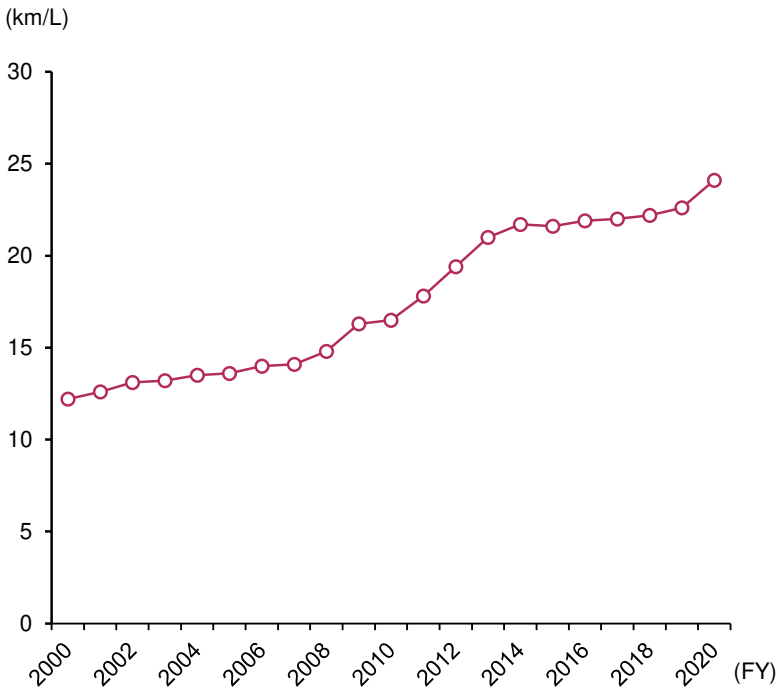
- EVs and improved fuel efficiency will affect oil demand for transportation, which accounts for a large proportion of oil.
- The penetration of EVs and FCVs among passenger cars on a fleet basis is currently limited and unlikely to have a significant impact in the short- to medium-term.
  - However, it should be noted that the sale of new passenger cars with internal combustion engines will be banned in 2035.
- Fuel economy of gasoline passenger cars continued to improve, by about 46% between 2010 and 2020.

Number of passenger vehicles owned in Japan by powertrain



Note: EV: electric vehicle, FCV: fuel cell vehicle
Source: Compiled by Mizuho Bank Industry Research Division based on data from the Automobile Inspection & Registration Information Association.

Trends in fuel economy of gasoline passenger vehicles

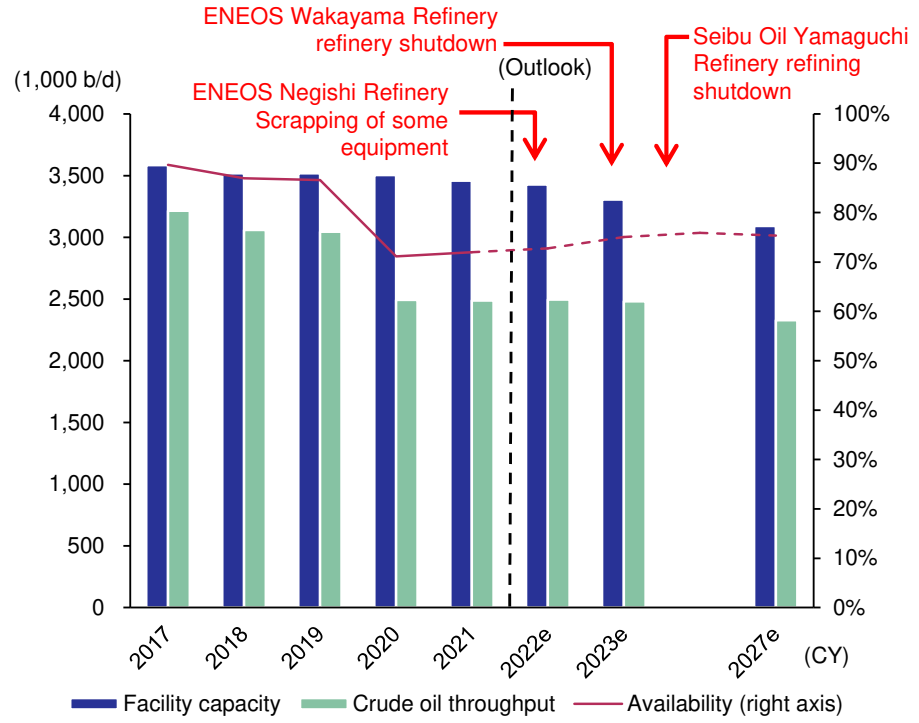


Source: Compiled by Mizuho Bank Industry Research Division based on Ministry of Land, Infrastructure, Transport and Tourism data.

[Production, Exports and Imports] Production volume and operating rate are expected to decline in line with a drop in demand in Japan

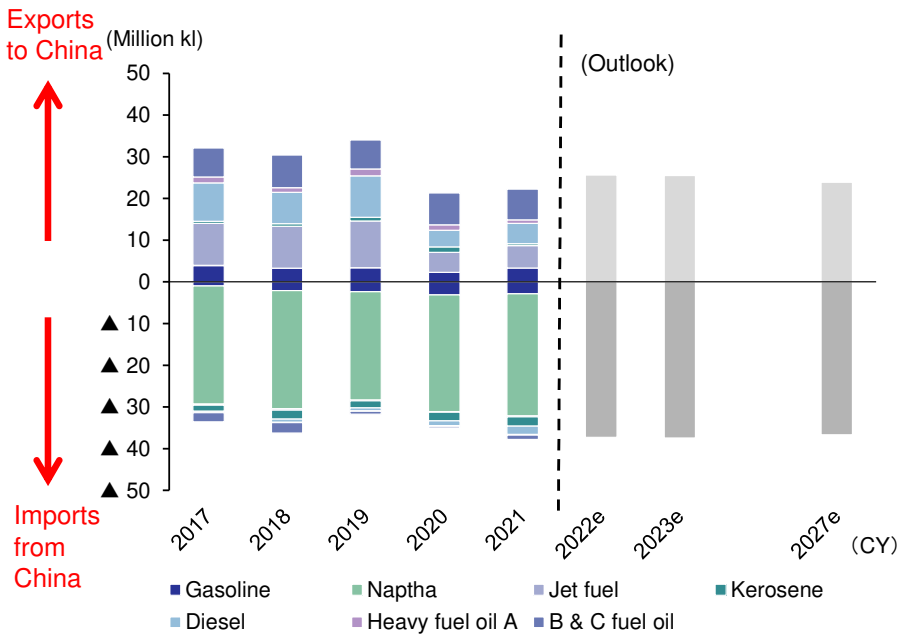
- Japanese fuel oil producers are producing fuel oil to meet domestic demand and are expected to reduce production volume in response to declining domestic demand.
  - Refining capacity at Japnese refineries is scheduled to be curtailed, and the operating rate is expected to remain in the mid-70% range. Analyst's view (1)
- In the medium term, fuel oil production is expected to decline in line with falling demand in Japan, and export volumes are also expected to trend downward.
- Naphtha will account for the bulk of imports, but domestic petrochemical production is expected to remain mostly flat over the medium term, and imports are also expected to remain flat.

Medium-term outlook for domestic production



Note 1: Forecasts by Mizuho Bank Industry Research Division for 2022 and beyond.
Source: Compiled by Mizuho Bank Industry Research Division based on data from the Agency for Natural Resources and Energy

Medium-term outlook for exports and imports



Note 1: Forecasts by Mizuho Bank Industry Research Division for 2022 and beyond.
Compiled by Mizuho Bank Industry Research Division based on data from the Petroleum Association of Japan and other sources.

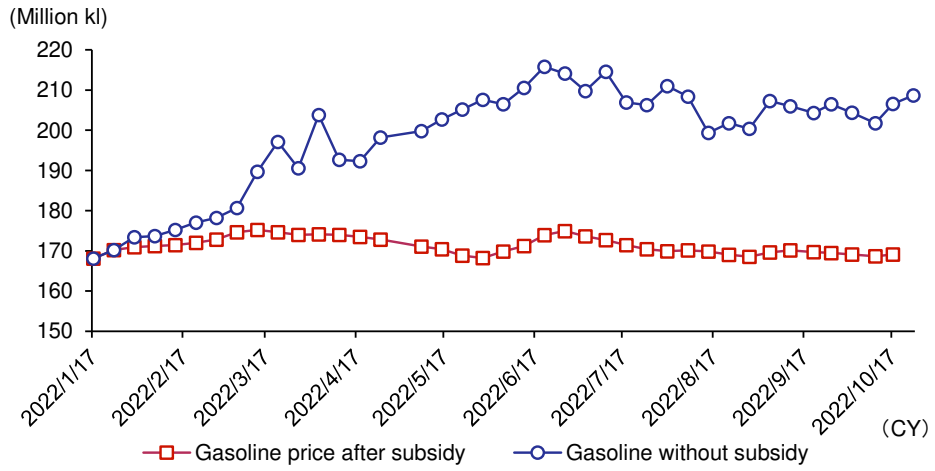
[Policy Trends] Support for petroleum products is currently underpinning demand

- Under the current circumstances, the government has been supporting oil demand through subsidies to mitigate the drastic change in oil price.
- The subsidies to mitigate the drastic changes in oil price are a limited-time measure, and if the subsidies are reduced in the future when oil price remains high and the yen weak, this could be a factor in lowering demand.
  - The impact on small-scale refiners and regional service station operators will be particularly large, and there are concerns that the existing fuel supply system will be difficult to maintain.

Policies to support oil demand

Case Study: Subsidies to mitigate dramatic change in the price of fuel oil

✓ Subsidy to control the wholesale price of fuel oil to counter soaring crude oil prices, thereby curbing the sharp rise in retail prices.



Subsidies keep prices down and support demand for fuel oil

Source: Compiled by Mizuho Bank Industry Research Division based on the website of the Agency for Natural Resources and Energy

Competitive environment after the end of subsidies to mitigate drastic changes in fuel oil prices

If high crude oil prices and a weak yen persists

↓

Reduce and end subsidies to mitigate drastic changes in the price of fuel oil

↓

Retail price of fuel oil soars

↓

Decline in demand for fuel oil accelerated due to shift to other energies

↓

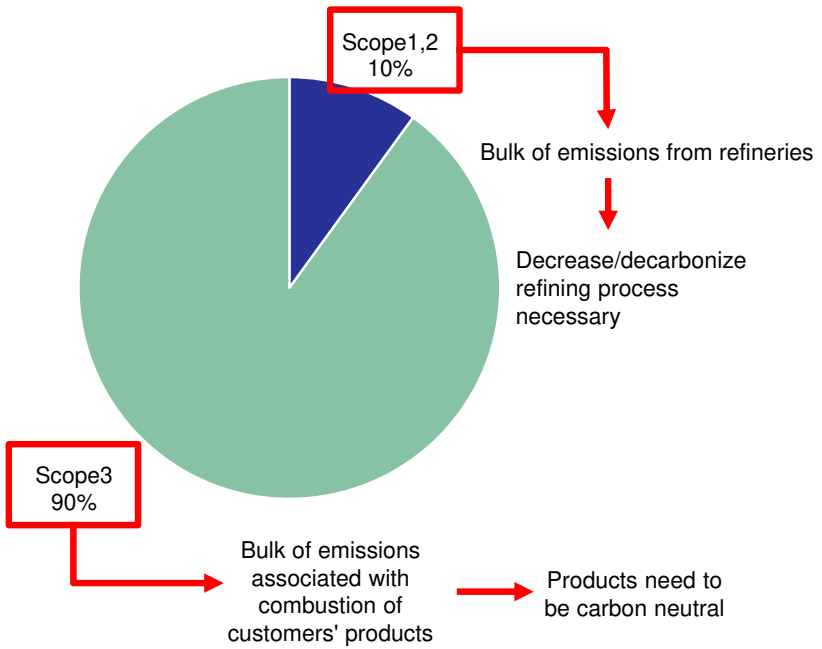
Concern that it will be difficult for relatively small-scale refiners and local SS operators to maintain their businesses

Note: SS refers to to a service station or gas station
Source: Compiled by Mizuho Bank Industry Research Department

[Changes in the Competitive Environment] Need to involve industrial complexes to promote decarbonization in order to enhance competitiveness

- CO_2 emissions from oil wholesalers are mostly from refineries and customers' product consumption.
  - Lowering emissions will require reducing and decarbonized refining processes and the carbon neutrality of products.
- It is difficult for any of these actors to take these initiatives on their own, and it is necessary to involve the entire oil complex, including refineries, where many CO_2 -emitting industries are concentrated.
  - Oil complexes with advanced decarbonization initiatives and pioneering initiatives could become highly competitive in the future.

Structure of CO_2 emissions of oil wholesalers



Source: Compiled by Mizuho Bank Industry Research Division based on company websites.

Potential for inter-industry collaboration to make industrial complexes carbon neutral

Inter-industry collaboration potential		Action items
1.	Joint procurement and use of **hydrogen and ammonia**	• Use of hydrogen as power generation fuel for gas turbines • Coal co-firing/single-firing facility power generation of ammonia, use in naphtha crackers
2.	**Joint collection and uses of CO2**	• Synthetic methane production by methanation • Synthetic fuel production
3.	Joint procurement and use of **biomass raw materials**	• Biofuel production • Biomass power generation
4.	Joint procurement and use of **waste plastic**	• Chemical recycling of waste plastic • Rubber recycling
5.	Strengthen efforts to **conserve energy and resources**	• Use of by-product hydrogen • Use of off-gas methane and hydrogen • Use of steam and waste heat
6.	Joint implementation of **CCUS**	• Use of CCUS at thermal power plants (including EOR) • CO2 sequestration

Source: Compiled by Mizuho Bank Industry Research Division based on "Discussion Paper on the Realization of Carbon Neutral Petrochemical Complexes" from the Agency for Natural Resources and Energy.

[Risk] Acceleration of decline in Domestic demand and further intensification of competition in overseas markets

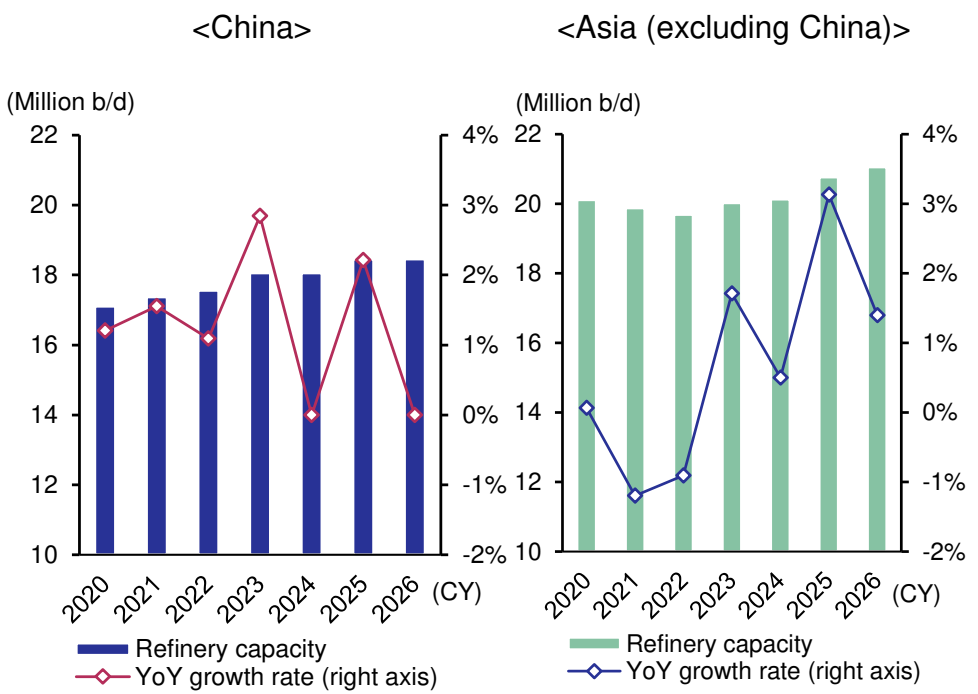
- There is a risk that the pace of decline in demand for oil will further accelerate if the fuel oil industry continues to pursue further fuel efficiency improvements and phasing out of fossil fuels to decarbonize.
- In Asia, there are plans to increase refining capacity, which had been frozen due to the impact of COVID-19, but if capacity expansion accelerates as demand picks up, competition in overseas markets will intensify and Japanese companies will have an increasingly difficult time capturing overseas demand.
- Profitability of oil business of oil wholesalers may deteriorate due to the above factors.

Accelerated decline in demand due to decarbonisation of industries using fuel oil

	Regulations to be implemented to reduce emissions	Corporate initiatives
Automotive Industry	✓ Sale of internal combustion engine vehicles banned after 2035 (passenger vehicles)	✓ Promote electrification, such as EVs and FCVs ✓ Develop synthetic fuels
Aviation Industry	✓ No increase in total emissions after 2020 ✓ Achieve virtually zero CO_2 emissions by 2050	✓ Use of SAF ✓ Improved fuel efficiency through introduction of new aircraft and improved operation methods
Shipping Industry	✓ Reduce total emissions by 50% by 2050 compared to 2008 levels ✓ Zero CO_2 emissions by 2100	✓ Introduce LNG-fueled and ammonia-fueled ships

Note: SAF: Sustainable aviation fuel
Source: Compiled by Mizuho Bank Industry Research Division based on various sources

Increased competition in overseas markets due to expansion of refining capacity in Asia



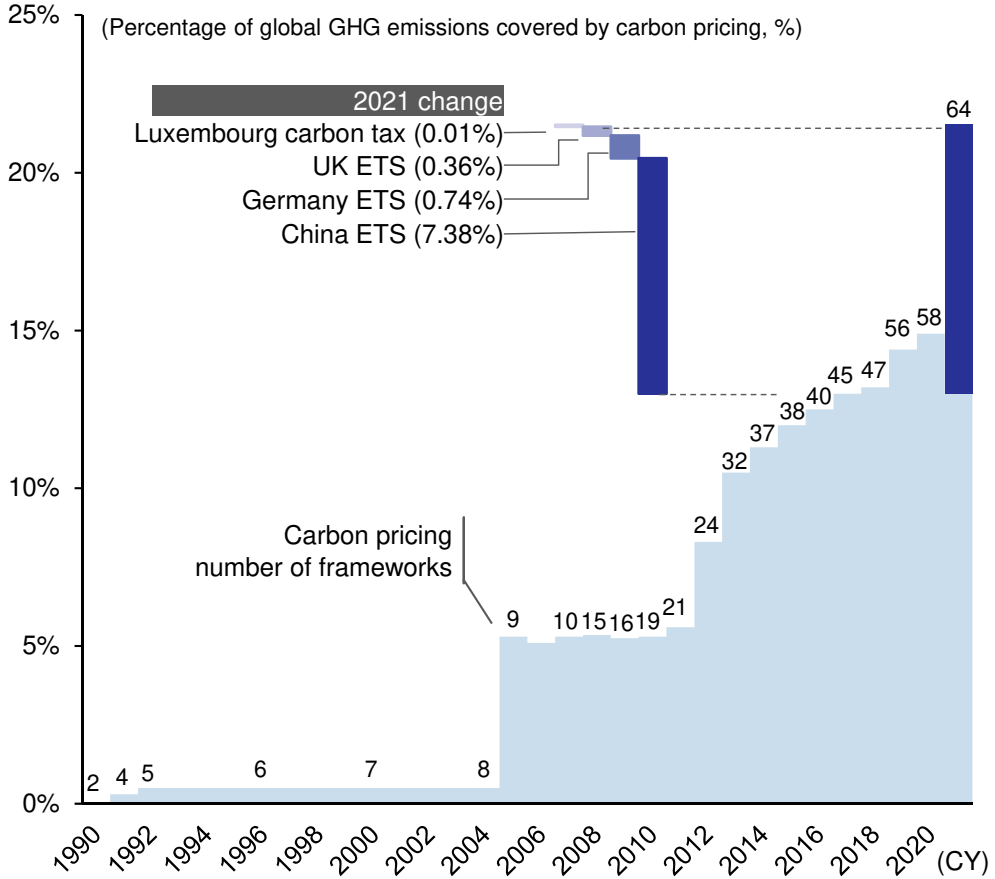
Source: Compiled by Mizuho Bank Industry Research Division based on data from IEA, Oil 2020 and Oil 2021

[Opportunity] Growing need for solutions to reduce emissions

- Reducing CO_2 emissions will bring economic benefits and the need to reduce emissions is expected to increase in countries where carbon pricing has been introduced.
- Customer needs are expected to range from emissions measurements and visualization to reduction of CO2 emissions and use of credit, creating opportunities for emissions reduction solutions as a business to cover the decline in oil demand.

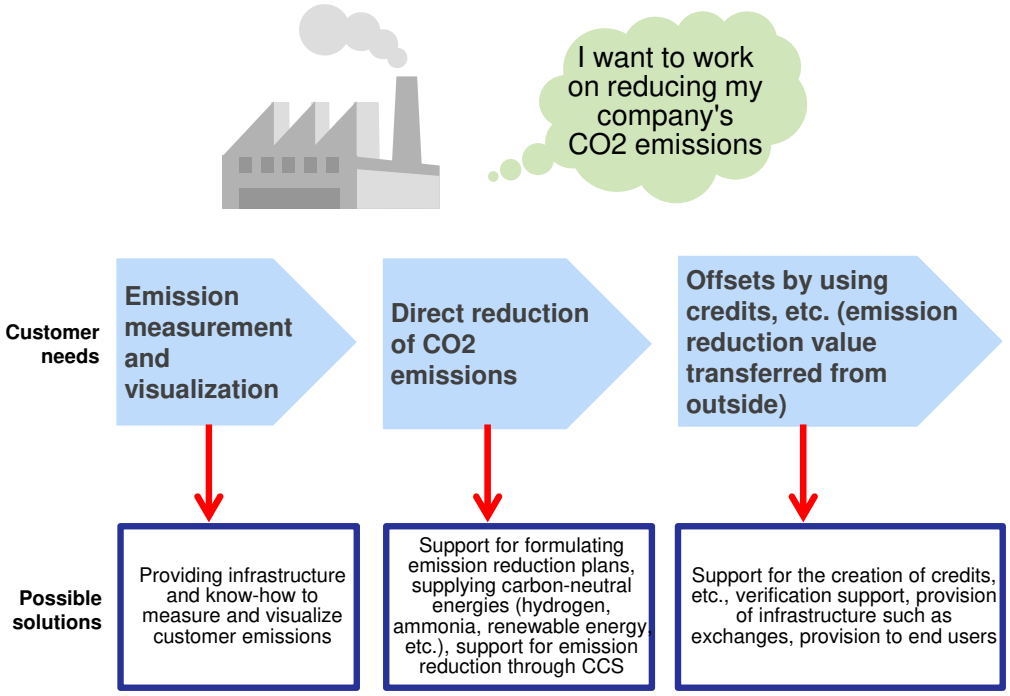
Analyst's view (2)

Percentage of GHG emissions subject to carbon pricing



Source: Compiled by Mizuho Bank Industry Research Division based on World Bank, State and Trends of Carbon Pricing 2021.

Customer needs for CO_2 reduction and anticipated services to be provided

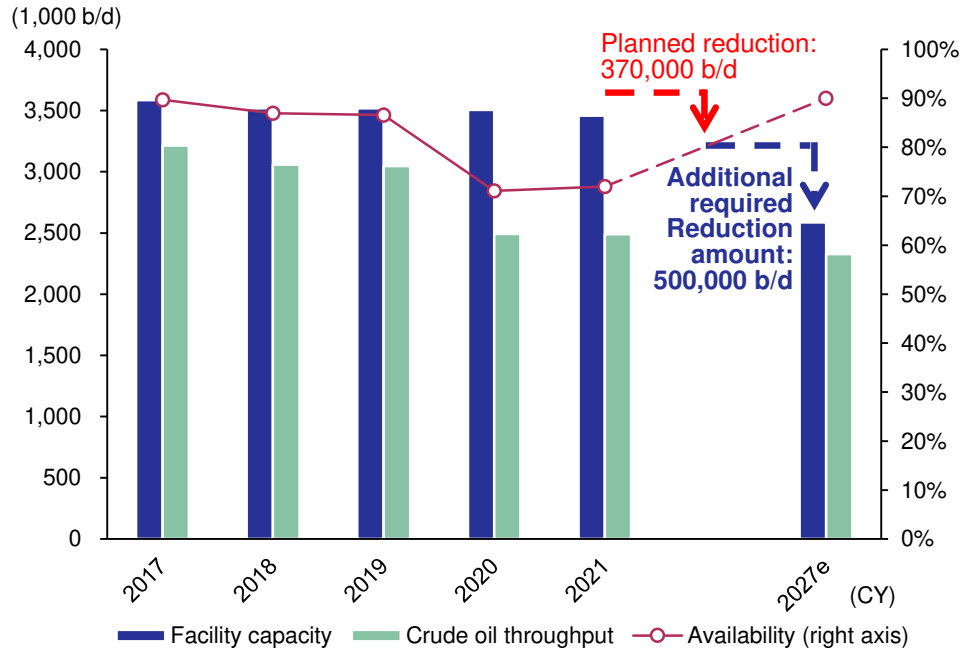


Source: Compiled by Mizuho Bank Industry Research Department

Phased reduction of refining capacity is necessary while maintaining resilience

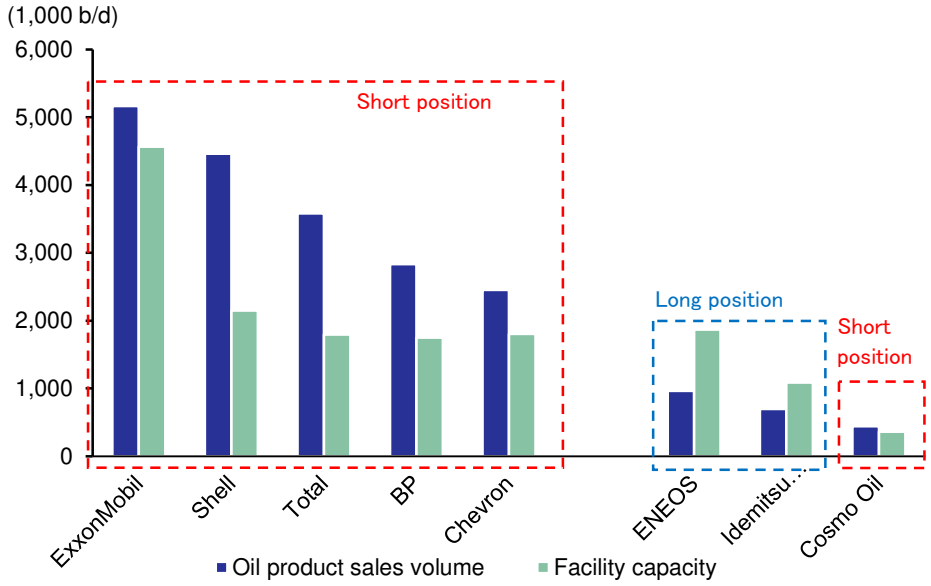
- Oil refining operations will inevitably be scaled back in line with declining domestic demand, necessitating a reduction in refining capacity.
  - Capacity reduction of 370,000 b/d by 2027 in Japan as a result of partial facility shutdown at ENEOS Negishi Refinery, refinery shutdown at Wakayama Refinery, and shutdown of refining functions at Seibu Oil's Yamaguchi Refinery
  - However, to achieve 90% capacity utilization in 2027, an additional 500 thousand b/d capacity reduction is estimated to be necessary.
- U.S. and European majors have established a short position structure with low refining capacity relative to petroleum product sales volume and maintain high utilization rates.
  - In Japan, there is a possibility that refining capacity will be drastically reduced when the main objective is to maintain the capacity utilization rate. From the perspective of resilience, care should be taken not to reduce capacity more than necessary, and there is also the option of maintaining capacity through policy support.

Additional refining capacity reduction required



Source: Compiled by Mizuho Bank Industry Research Division based on data from the Petroleum Association of Japan and other sources.

Short position strategy for Majors



Source: Compiled by Mizuho Bank Industry Research Division based on publicly available data from each company.

Balancing decarbonization and growth - Carbon neutral energy and CCS initiatives

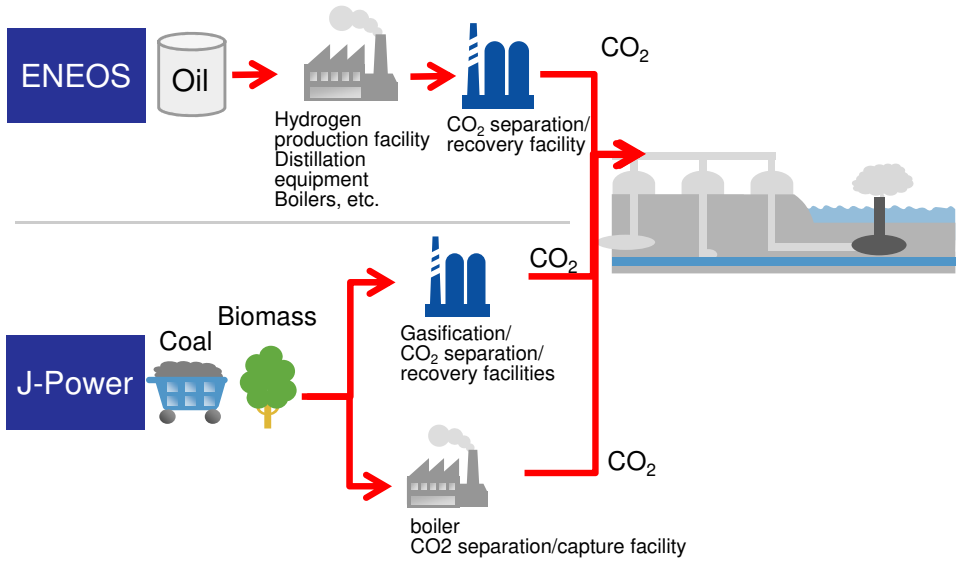
- Plans for it to have a role in supplying carbon-neutral energy as an alternative to fossil fuels to meet the declining demand for oil.
  - In the renewable energy field, plan to capture the market by making large investments and participating in bids for offshore wind generation projects.
  - Although hydrogen, ammonia, and SAF projects have yet to see large investments, a number of project concepts have been announced, and competition is expected to intensify from the late 2020s to 2030.
  - In the hydrogen, ammonia and SAF sectors, where the market is still in its early stages of formation, there is room for companies to invest and procure together in order to expand the market.
- ENEOS is working on its CCS business in cooperation with J-POWER to reduce CO_2 emissions at its own company and other companies.
  - Aim to reduce CO_2 emissions by 16 million tons by 2050 through CCS, etc.

Recent carbon-neutral energy initiatives by oil wholesalers

Company	Renewable energy	Hydrogen/ Ammonia	SAF
ENEOS	• Acquired Japan Renewable Energy for 200 billion yen	• Hydrogen ST operation • Considering imports from the Middle East, Australia, Southeast Asia, etc.	• Studying SAF production at Negishi Refinery
Idemitsu Kosan	• Working on geothermal power generation in Akita and offshore wind power generation in Norway	• Established an ammonia center in Shunan	• Studying production of SAF derived from bio-ethanol
Cosmo Energy HD	• Has Cosmo Eco Power under its umbrella and is strong in wind power generation	• Imports blue ammonia from Middle East • Concluded an MOU with Iwatani Corporation on hydrogen business	• Studying SAF production from waste cooking oil

Source: Compiled by Mizuho Bank Industry Research Division based on publicly available materials from each company.

CCS project by ENEOS



Source: Compiled by Mizuho Bank Industry Research Division based on company press releases.

7. City gas

Transition needs expand demand for city gas, but LNG procurement risks are becoming more serious

I. Supply and demand trends

(Short-term)
- Demand for natural gas in major global economies is expected to decline by -0.3% due to the economic slowdown in Europe and the U.S., in addition to policy measures to curb gas demand in Europe.
- Demand for gas in Japan is forecast to increase by 0.5% due to an increase in industrial demand, despite a decrease in commercial and residential demand.

(Medium term)
- Demand for natural gas in major global economies is expected to expand at an average annual rate of +0.4% due to demand growth in China and ASEAN, despite a decline in Europe.
- Demand for gas gas in Japan is expected to increase at an average annual rate of +0.6%, with expansion in industrial use outpacing declines in commercial and residential use.

II. Competitive environment

(Short-term)
- Intensifying competition triggered by the liberalization of the retail gas market appears to be coming to an end.
- Procurement portfolio (PF) and supply problems are affecting profitability of city gas businesses.

(Medium term)
- As the LNG supply and demand environment tightens further due to the situation in Ukraine, companies with long-term stable procurement systems will have an advantage.

III. Risks & opportunities

<Risks>
- Difficulties in securing LNG due to unscheduled supply disruptions in addition to reduced supply from Russia.
- Volatility in the LNG market is increasing and there is a risk of price hikes given the tight supply-demand environment. Continued price hikes and high volatility over the medium to long term could hinder the shift of fossil fuel use to LNG.

<Opportunities>
- Continued demand for industrial heat to switch from coal and oil to natural gas.
- It is important to create a foothold for the future shift to CN fuels by steadily reducing CO_2 emissions through a shift to city gas and natural gas.

IV. Analyst's view (1)

(Reduction of LNG procurement risk is essential)
- Reduction of LNG procurement risk is required to stabilize cash flow of existing businesses.
- Focus on efforts to enhance risk management in addition to diversifying procurement PF and collaborating among multiple companies.

IV. Analyst's view (2)

(The key to CN is methanation)
- The application of methanation in society to enable the effective use of existing infrastructure is key for the CN of city gas companies.
- There has been steady progress in technological development and demonstration, but government support and the establishment of environmental value are urgent issues.

IV. Analyst's view (3)

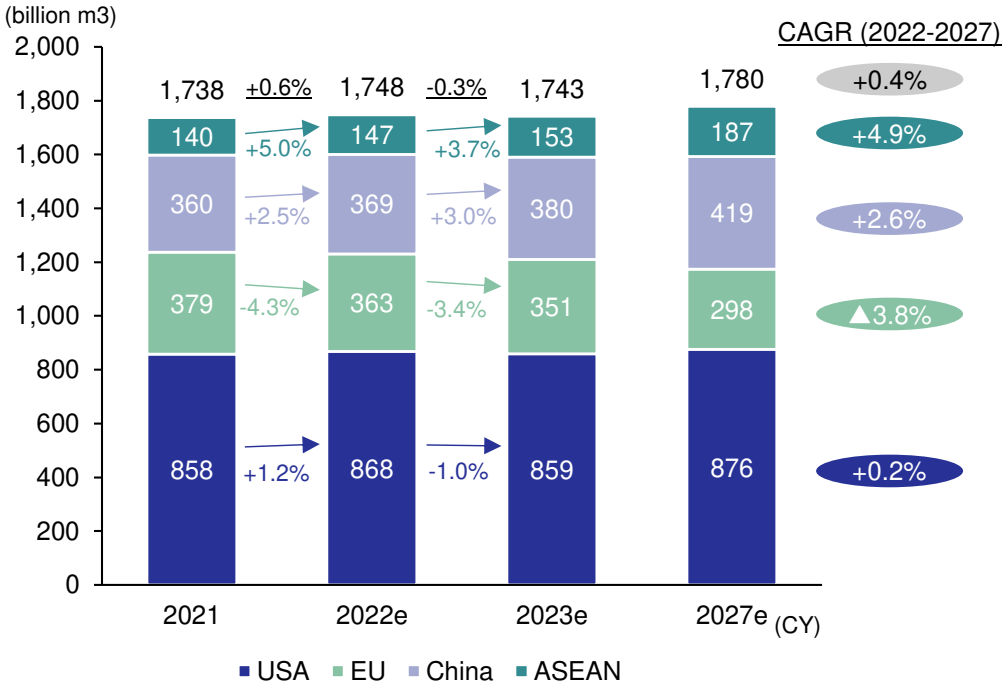
(Digital transformation initiatives by regional city gas companies)
- The decline in population in the future and the number of companies is more pronounced in rural areas than in metropolitan areas.
- Expectation that local city gas companies will make progress in their efforts to contribute to solving regional issues and develop new businesses through digital transformation.

Source: Compiled by Mizuho Bank Industry Research Department

Global natural gas demand forecast slightly lower in 2023, but increasing in the medium term

- Demand for natural gas in major global economies is forecast to be +0.6% higher YoY in 2022 and -0.3% lower YoY in 2023.
  - In 2023, demand will increase in line with economic recovery in China and ASEAN, while demand will decrease in the U.S. and Europe due to economic recession. Policy-based control of gas demand will be a factor pushing down demand.
- Demand in Europe is expected to continue to decline through 2027, while demand in the U.S., China, and ASEAN is expected to expand at an average annual rate of +0.4% due to growth in demand there.

Medium-term outlook for global natural gas demand



Note 1: Forecasts for 2022 and beyond by Mizuho Bank Industry Research Division.
Note 2: Values for Europe are the sum of demand in Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Portugal, Slovakia, Slovenia, and Spain. The value for ASEAN is the sum of demand in India, Malaysia, Thailand, the Philippines, and Vietnam.
Source: Compiled by Mizuho Bank, Industry Research Division based on materials from IEA, *World Energy Balances 2022*, BP, *Statistical Review of World Energy 2022*, IEA, *Natural Gas Information Statistics*,and other materials.

Major factors in the increase/decrease in natural gas demand

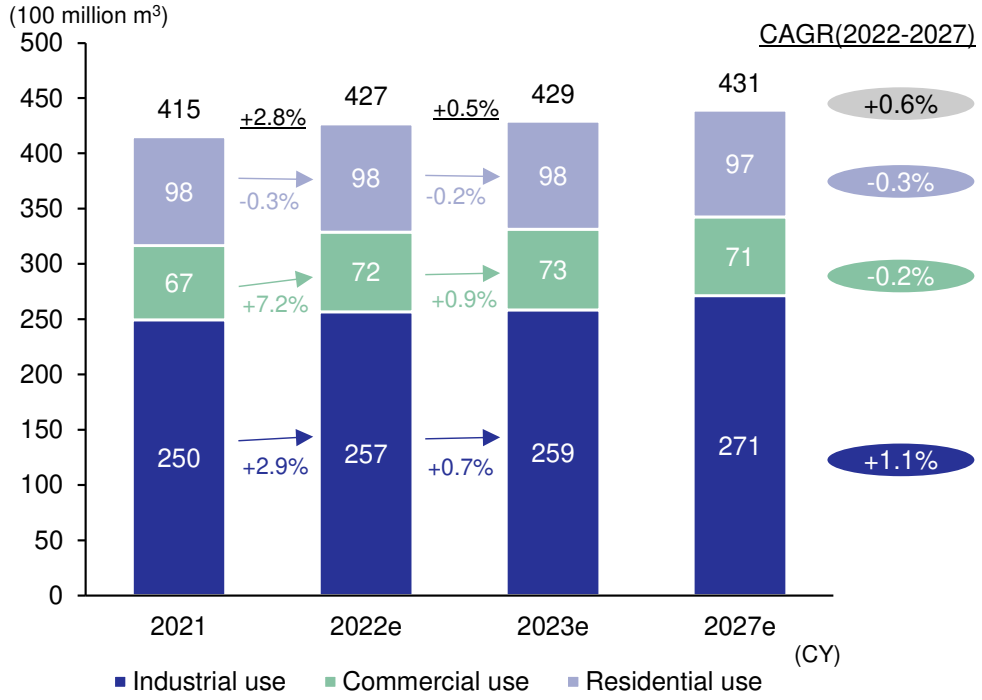
USA	■ Increase by +1.2% YoY in 2022 due to slower economic growth. ■ Forecast -1.0% YoY in 2023 due to economic slowdown. ■ Increasing trend with moderate economic growth through 2027.
Europe	■ Expected to decrease -4.3% YoY in 2022 due to the strong impact of the decline from REPowerEU and other policy pressure to curb demand for gas. ■ Expected to decrease -3.4% YoY in 2023 due to economic slowdown and continued policy pressure to curb demand for gas. ■ Gas demand will continue to decline through 2027 as policy measures continue to curb demand for gas.
China	■ +2.5% YoY in 2022 due to slower economic growth. ■ Forecast +3.0% YoY in 2023 due to the gradual lifting of the zero-COVID policy. ■ Demand growth will continue to increase through 2027, but the pace of demand growth will slow as the pace of economic growth slows.
ASEAN	■ Increase in 2022 at +5.0% YoY due to economic recovery. ■ Demand is expected to continue to increase in line with strong economic growth from 2023 onwards.

Source: Compiled by Mizuho Bank Industry Research Department.

Demand for residential and commercial city gas in Japan declined, but outpaced by increase in industrial use

- Demand for city gas in Japan is forecast to increase by +2.8% YoY in 2022 due to economic recovery. In 2023, demand is expected to increase by +0.5% YoY due to a lull in the recovery.
- Demand for residential use will remain virtually flat through 2027. Demand for commercial use is expected to decline, but industrial use, which accounts for about 60% of total demand, is expected to increase at an annual rate of +0.6%.
  - Demand for industrial use will increase due to progress in fuel conversion from other fossil fuels.
  - Demand will decrease for commercial and residential use due to progress in energy conservation and electrification.

Medium-term outlook for domestic city gas demand



Note: Forecasts for 2022 and beyond by Mizuho Bank Industry Research Division.
Source: Compiled by Mizuho Bank Industry Research Department based on the Ministry of Economy, Trade and Industry's "Monthly Gas Business Statistics" ,"Comprehensive Energy Statistics.", and other materials.

Major factors in the increase/decrease in domestic city gas demand

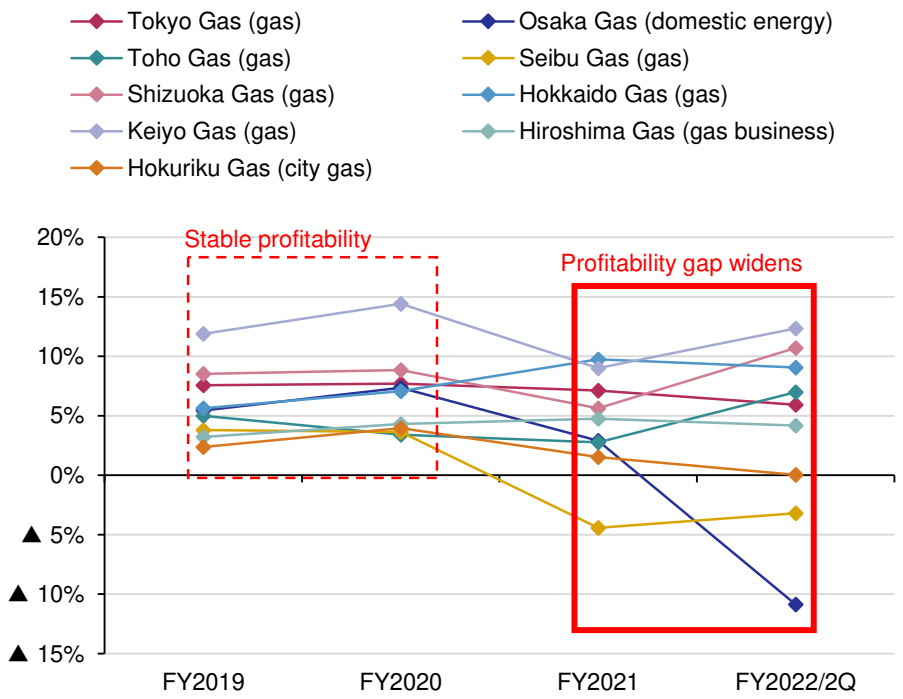
Indistrial use	■ In 2022, the economy will continue to pick up and demand will increase +2.9% YoY. ■ Economic recovery to pause in 2023 and expected to grow +0.7% YoY. ■ Demand growth is expected to continue through 2027, driven by economic growth and the need to transition toward decarbonization.
Commerical use	■ +7.2% increase in 2022 YoY due to economic recovery. ■ Economic recovery to pause in 2023, expected increase of +0.9% YoY ■ Demand forecast to continue to decline through 2027 due to progress in energy conservation and electrification.
Residential use	■ In 2022, the market will remain virtually flat at -0.3% YoY due to a partial drop in demand from the impact of staying at home and progress in energy conservation and electrification. ■ Demand is forecast to continue to decline through 2027 due to continued progress in energy conservation and electrification.

Source: Compiled by Mizuho Bank Industry Research Department.

LNG procurement capability affects profitability of city gas business

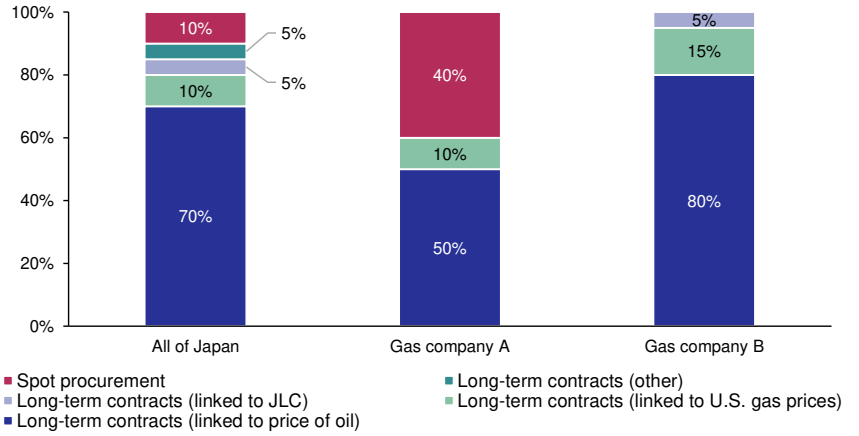
- Cost of city gas company feedstock fluctuates with crude oil and gas prices. The gap in profitability of each company's city gas-related segment has widened recently due to the impact of trends in individual LNG off-take projects and procurement portfolios.
  - Osaka Gas posted a loss in FY2022 due to supply problems in Freeport, U.S.A.
- Differences in procurement capabilities may further widen the gap in profitability in the future, as some companies, especially those with a large proportion of long-term contracts linked to crude oil prices, are able to procure more economically compared to the JLC (Japan LNG average import price).

Trend in the profit margin of the city gas-related segment



Note: Text in parentheses are segment names.
Due to segment change, Osaka Gas adopted "Domestic Energy/Gas" segment for FY2019.
Source: Compiled by Mizuho Bank Industry Research Division based on IR materials from each company.

Relationship between JLC and company gas procurement (image)



[Assumption]	Procurement price (including conversion)
Linked to oil price	16 $/mmbtu
U.S. gas price	17 $/mmbtu
JLC	20 $/mmbtu
Other	18 $/mmbtu
Spot	50 $/mmbtu

[Calculation] $/mmbtu	All of Japan	Gas company A	Gas company B
Average procurement cost	**20**	**30**	**16**
Raw material cost adjustment income (≒JLC)	20	20	20
Raw material cost adjusted income - average procurement cost	**0**	**-10**	**3**

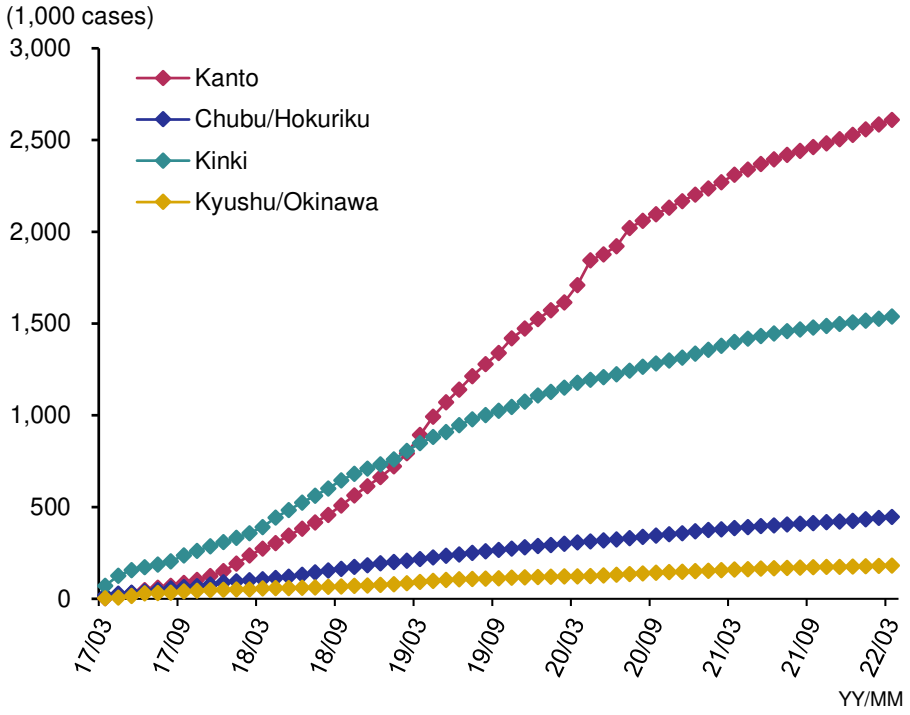
Income <Cost Income> Cost

Source: Compiled by Mizuho Bank Industry Research Department.

Lull in the intensification of competition triggered by liberalization

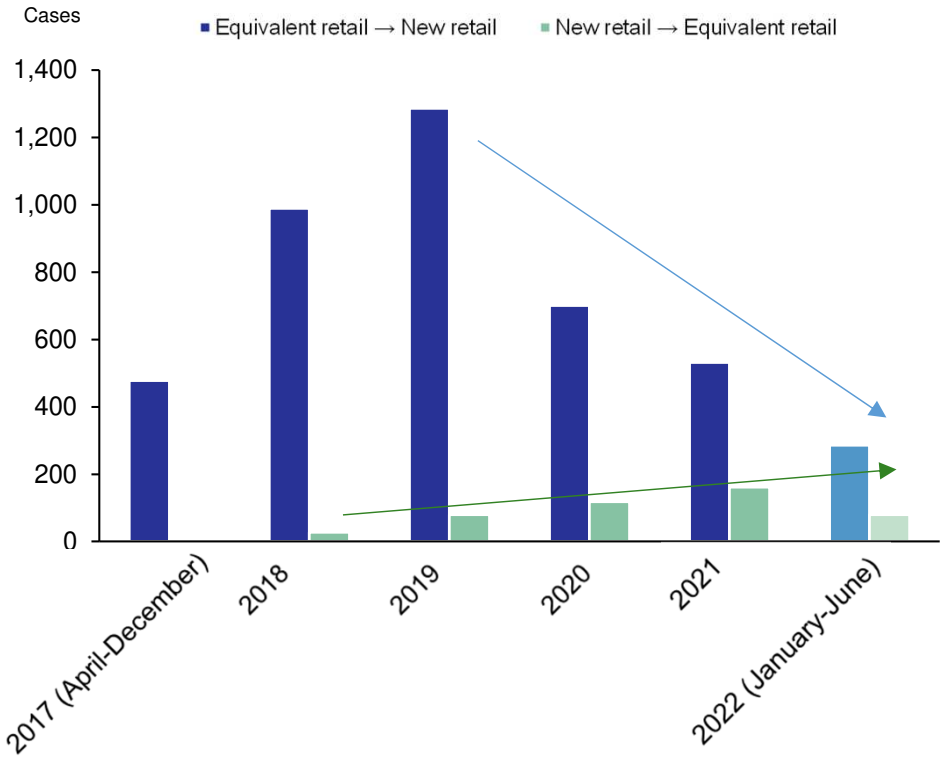
- Gas system reform has been completed with the separation of pipelines in April 2022.
- There were 4.77 million cases of switching during the first five years after the deregulation of retail city gas, accounting for about 18.9% of all households, but there are signs of a lull in the intensifying competition triggered by the deregulation as there is a return to equivalent gas retailers (businesses that had been licensed for general gas business and community gas business as of March 2017).

Number of applications to switch



Source: Compiled by Mizuho Bank Industry Research Division based on materials from the Ministry of Economy Trade and Industry and Electricity and Gas Market Surveillance Commission.

Changes in the number of equivalent retail and new retail contract changes

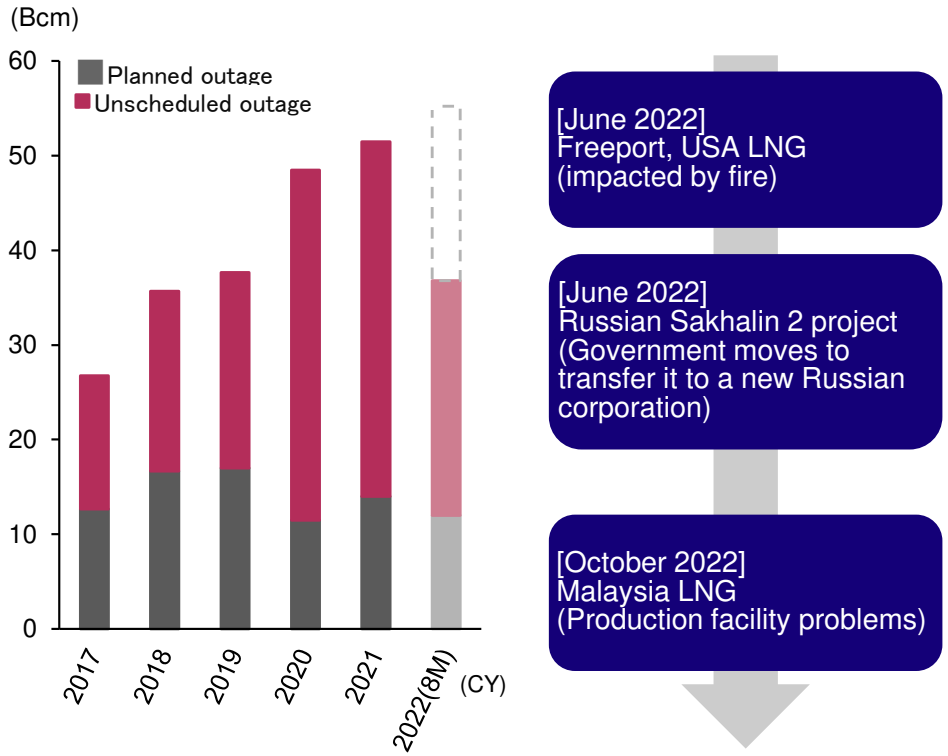


Source: Compiled by Mizuho Bank Industry Research Division based on materials from the Electricity and Gas Market Surveillance Commission.

[Risk] Unscheduled LNG supply disruptions increase, adding to supply and demand crunch

- Difficulties in securing LNG due to unscheduled supply disruptions, in addition to reduced supply from Russia.
  - European gas inventories are expected to be able to avoid bottoming out this winter, but concerns over supply and demand tensions next winter will increase depending on the pace of the recovery of demand in China and other factors amid the continued decline in gas supplies from Russia to Europe.
- Increased volatility in the LNG market under the tight supply and demand environment and the risk of price hikes. Analyst's view (1)
  - Continued price hikes and high volatility over the medium to long term could hinder the phasing out of fossil fuels to use LNG.

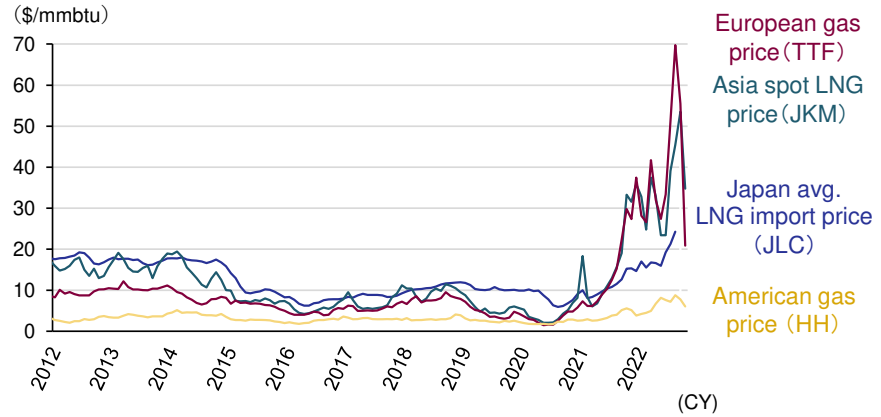
Trends in LNG supply disruptions (global) and events of recent supply concerns (Japan-related)



Source: Compiled by Mizuho Bank Industry Research Division based on data from the IEA and media reports.

LNG price trends and estimate of additional costs for alternative procurement through spot procurement

Trend in LNG prices



Additional cost estimate for alternative procurement by spot procurement

Replacement cost of 1 cargo (approx. 65,000 tons)		Exchange rate ($/yen) 120 yen	140 yen	160 yen
Spot price	$30/mmbtu	+4.8 billion yen	+5.7 billion yen	+6.5 billion yen
	$60/mmbtu	+16.3 billion yen	+19.0 billion yen	+21.7 billion yen
	$90/mmbtu	+27.7 billion yen	+32.3 billion yen	+37.0 billion yen

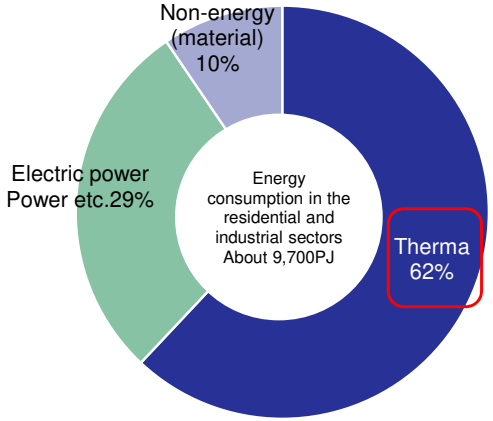
Note: Calculated using JLC price (September 2010) estimated from JCC price to compare the cost of spot procurement with that of procurement based on long-term crude oil price-linked contracts.
Source: Compiled by Mizuho Bank Industry Research Division based on Refinitiv, EIA, and other data.

[Opportunity] Demand for phase out of fossil fuels in the industrial sector is expected to grow on the back of CN initiatives

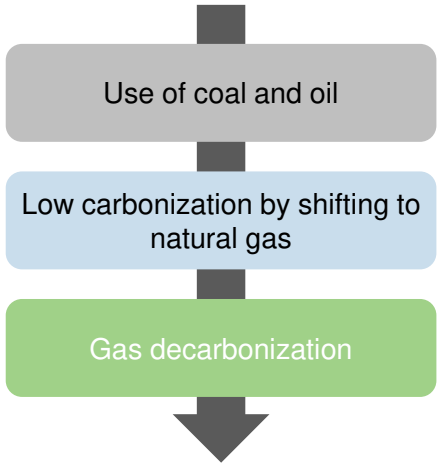
- In order to reduce and decarbonize heat demand, it is important to switch from coal and oil to natural gas, which has the lowest CO_2 emissions of all fossil fuels, as a reliable means of reducing CO_2 emissions on the demand side.
- However, it is understood that the transition to gas is only a low-carbon measure, and that the future direction is to aim for CN through the decarbonization of gas, such as the use of e-methane (Note) and hydrogen. Analyst's view (2)

Efforts to reduce and decarbonize heat demand

Energy consumption in residential and industrial sectors

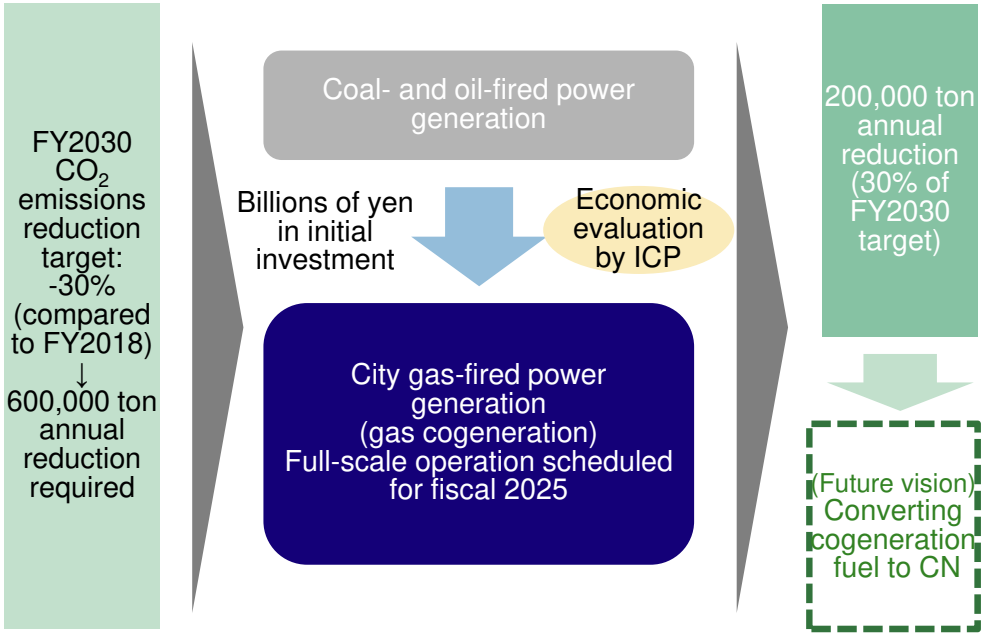


Direction toward CN conversion of heat demand



Reduction potential of approx. 19 million tons of CO_2

Example of fossil fuel phae out (Teijin/in-house power generation facility at Matsuyama Plant: announced in October 2022)



Ahead of other Japanese chemical fiber manufacturers that use coal as a fuel for power generation, they aim to "completely transition from coal" as a fuel for power generation.

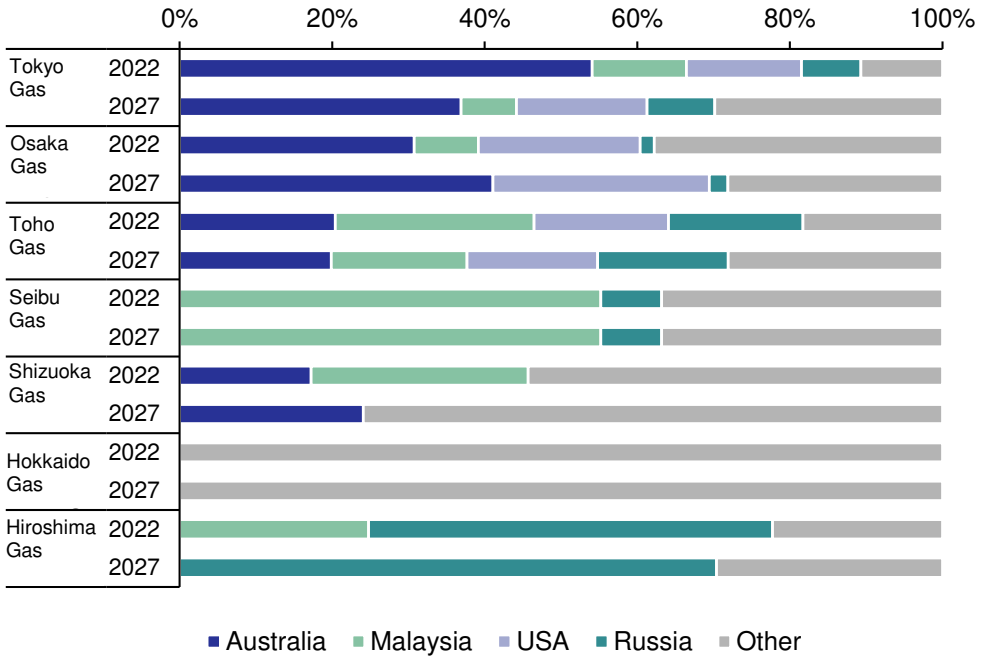
Note: e-methane: Synthetic methane produced from non-fossil energy sources such as green hydrogen. The uniform name for methane in Japan.
Source: Compiled by Mizuho Bank Industry Research Division based on Ministry of Economy, Trade and Industry data and Japan Gas Association data.

Source: Compiled by Mizuho Bank Industry Research Division based on Teijin IR materials.

[Existing fields] Maintain a close watch on measures to secure stable procurement and trends in the advancement of risk management

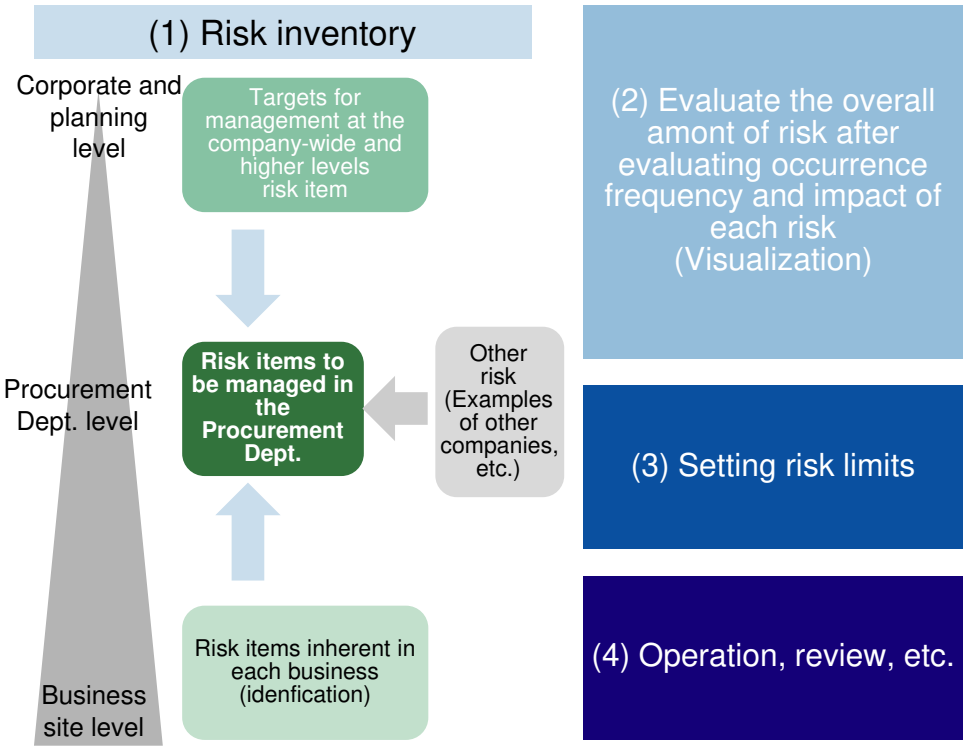
- Expectations for progress in various studies for stable procurement through diversification of LNG procurement portfolios and collaboration among multiple companies, especially for companies with high dependence on specific countries and projects.
  - Procurement discussions may be difficult against the backdrop of concerns about future declines in demand for gas in response to LNG suppliers' long-term offtake requests.
- As mentioned above, the sophistication of risk management, such as inventorying and visualizing procurement-related risks, is an option that can be taken at a time when unprecedented costs may arise when alternative procurement occurs.

Breakdown of long-term LNG contracts at each company



Note: Calculations do not take into account new contracts or contract renewals.
Source: Compiled by Mizuho Bank Industry Research Division based on JOGMEC "Natural Gas and LNG Data Hub 2022," and IR materials of each company.

Initiatives to enhance risk management (Example)



Source: Compiled by Mizuho Bank Industry Research Department.

[New fields] Application of methanation in society is key in CN for gas companies

- If hydrogen from renewable energy sources and recovered CO2 are used in the production of e-methane (synthesis method: methanation), CO2 emissions can be virtually eliminated by offsetting CO2 emissions and recovered CO2. This is also attracting attention as a means of decarbonizing city gas because it can make effective use of existing LNG and city gas infrastructures.
- Tokyo Gas, Osaka Gas, and others are taking the lead in promoting the spread of methanation through technological development and verification, but it is understood that high priority issues for its application in society are cost support during the introduction phase and the establishment of environmental value.

Positioning of methanation in city gas companies

	Advantages	Main issues	Amount required to replace existing city gas
e-methane	• Can use existing infrastructure (storage and transportation) • Large allowable mixing ratio, large low-carbon effect	• CCS and methanation processes are required, and the production cost of hydrogen is high.	30.9 million tons
Hydrogen	• No CCS or methanation process is required, and production cost is lower than that of e-methane. • Contribution to creation of hydrogen demand	• Allowable mixing ratio is limited and low carbon effect small • Investment is required by the customer if a hydrogen mixing ratio other than the specified ratio is pursued. • New investment in hydrogen infrastructure (transport and storage) required.	12.11 million tons

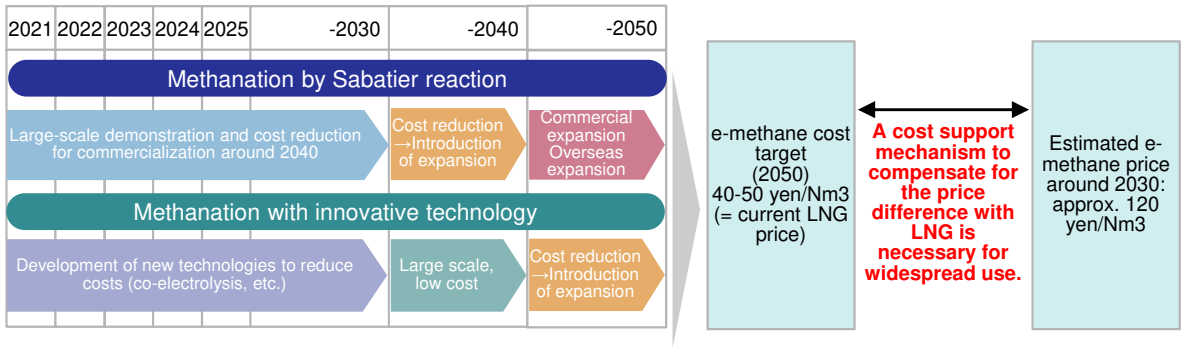
→Since increasing the hydrogen mixing ratio by making additional investments such as increasing the number of pipelines in stages is fraught with uncertainty, policy is to focus on e-methane, which allows to make the most of existing assets.

Source: Compiled by Mizuho Bank Industry Research Division based on Agency for Natural Resources and Energy, "Summary of Gas Business Production Statistics," and other sources.

Main issues for applying methanation in society

Issue 1: How cost support should be provided?

[Excerpt from *Green Growth Strategy Roadmap*]



Issue 2: Establish environmental value

1. **National and international institutional arrangements**
2. **Organizing CO2 attribution**
3. **Arrangement of e-methane environmental value assessment and trading methods**

→ Define methanation as contributing to CN

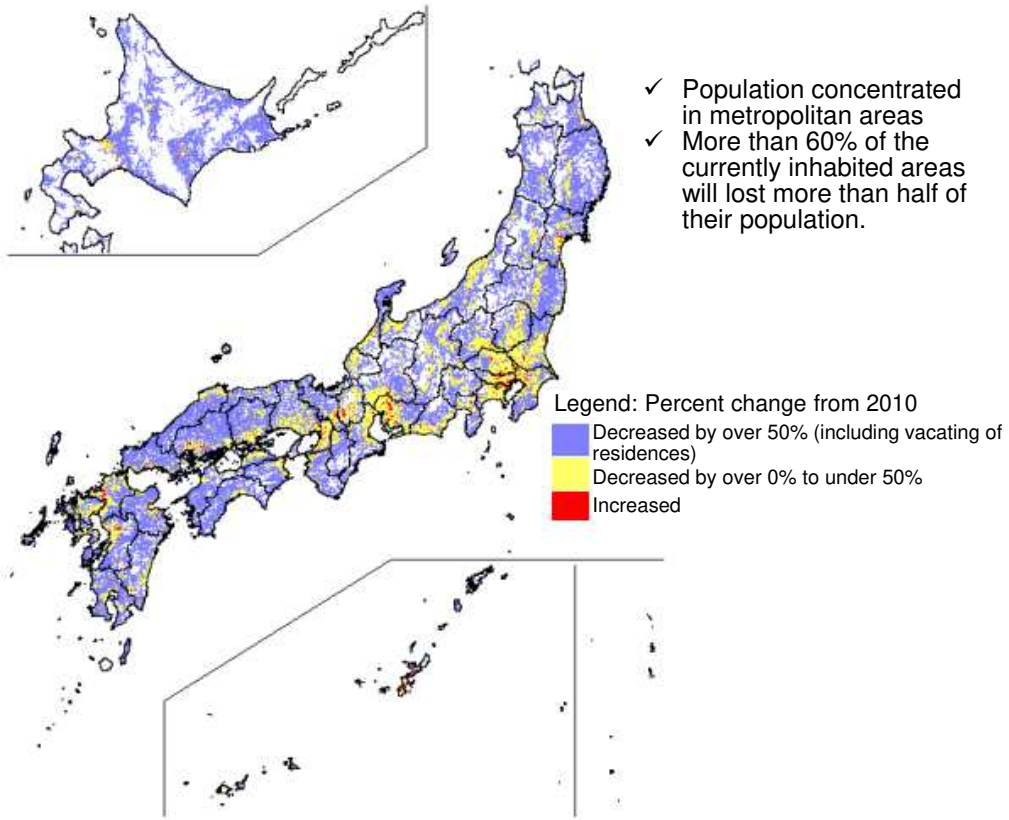
→ Establish a framework in which e-methane leads to reduction of CO2 emissions by companies

Source: Compiled by Mizuho Bank Industry Research Division based on Ministry of Economy, Trade and Industry data.

[Other Fields] Expectations for two-pronged management of local city gas companies through digital transformation

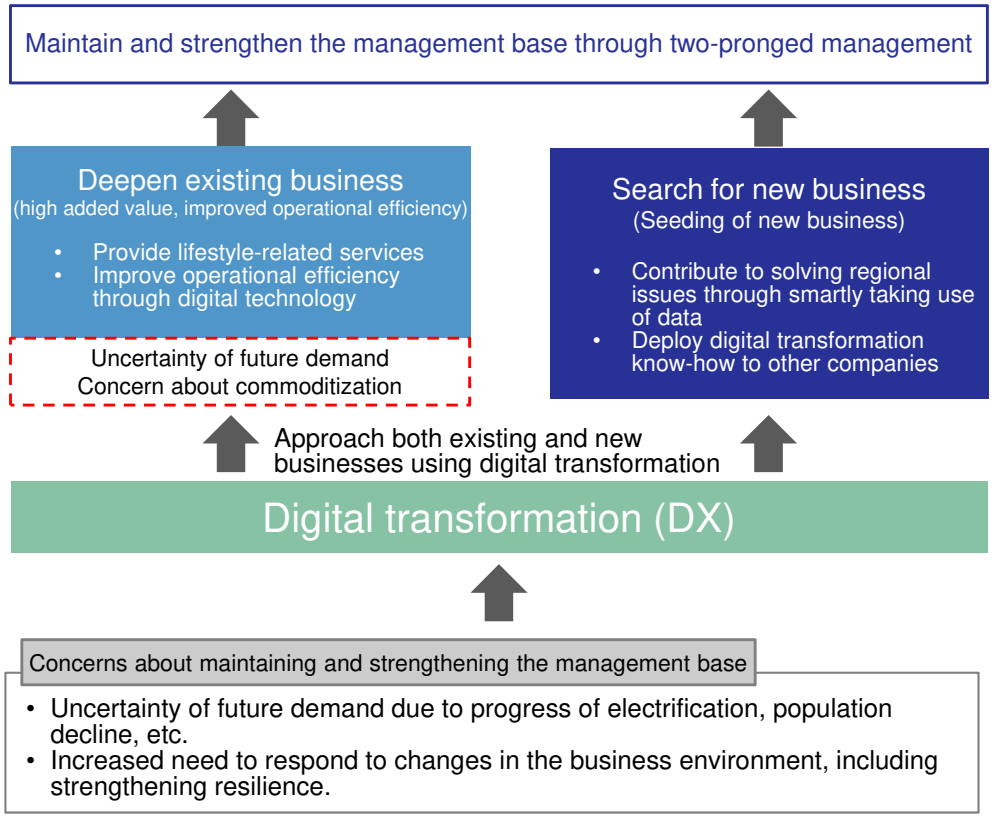
- The decline in population and the number of companies in the future is more pronounced in rural areas than in metropolitan areas, and the impact on local city gas companies will be significant.
- For regional city gas companies to maintain and strengthen their management foundations in the face of a changing business environment and an increasing number of issues to be addressed, it will be effective not only to improve operational efficiency through the use of digital technology, which is currently being implemented, but also to seed the creation of new business models by using data to help solve regional issues.

Population Change in 2050 with 2010 as baseline



Source: Reprinted from the Ministry of Land, Infrastructure, Transport and Tourism‘s “Grand Design of National Spatial Development towards 2050."

Importance of digital transformation for local city gas companies



Source: Compiled by Mizuho Bank Industry Research Department.

8. Electric Power

While the electric power industry is in a severe business environment, decarbonization has been accelerating

I. Trends in Supply and Demand

(Short Term)
- Although the electricity demand in the EU and US has declined, the global growth rate reached 1.3% on the back of increased demand in ASEAN and China.
- In Japan, demand for electricity will taper off slightly by 0.1% due to stagnant economic growth and progress in energy saving measures.

(Medium Term)
- The global demand will expand at an annualized rate of 1.6%, as a result of continuous growth in ASEAN and China as well as demand recovery in the EU and US. The share of renewables will increase in the energy mix.
- Electricity demand in Japan will decrease slightly by -0.2% due to the progress in energy saving in many sectors and the shrinking of the number of households. The share of renewables and nuclear power will increase in the energy mix.

II. Competitive Environment

(Short Term)
- Soaring fuel prices are driving up energy market prices, resulting in the withdrawal and market share decline of some new electricity companies.

(Medium Term)
- Policies are expected to be developed to resolve the challenges the electricity system is facing such as insufficient supply capacity. In addition to power generation and retail, players from other industries are expected to enter the electric power market in order to balance supply and demand.

III. Risks and Opportunities

<Risks>
- As a result of the time lag in the price adjustment system and the impact of exceeding the ceiling on such adjustments due to soaring fuel prices, five of Japan's top ten electric power companies posted ordinary loss in the fiscal year ending of March 2022.
- All ten companies hit the adjustment ceiling for passing on the higher fuel prices, and unless they apply to the government to raise regulated rates, the burden on Japan's electricity providers will be heavier.
- Trends in fuel prices are a key factor affecting the earnings of electric power companies.

<Opportunities>
- Restarting the operation of nuclear power plants amid high fuel prices and weak Japanese yen will boost the effects of savings on fuel costs for LNG thermal power generation.
- The costs saved are expected to be allocated to investments in domestic renewables energy development, overseas projects, and the transition from thermal power generation.
- Renewables alone will not be able to satisfy the electricity demand in ASEAN, which is expected to continue to grow, and support for the transition of increasing thermal power generation is necessary.

IV. Analyst's View (1)

(Direction for the electric power retail business)
- Review the rate structure, including applying to the government to raise the low-voltage regulated rate.
- Establish a risk management system including quantitative risk assessment.

V. Analyst's View (2)

(Direction for renewable energy development)
- In Japan, boosting renewables development capabilities by forming alliances and joint renewables development with customers to acquire the customers with strong demand for renewable energy.
- Overseas, participation in renewable energy development projects in ASEAN, surging electricity demand capture along with contribution to decarbonization.

VI. Analyst's View (3)

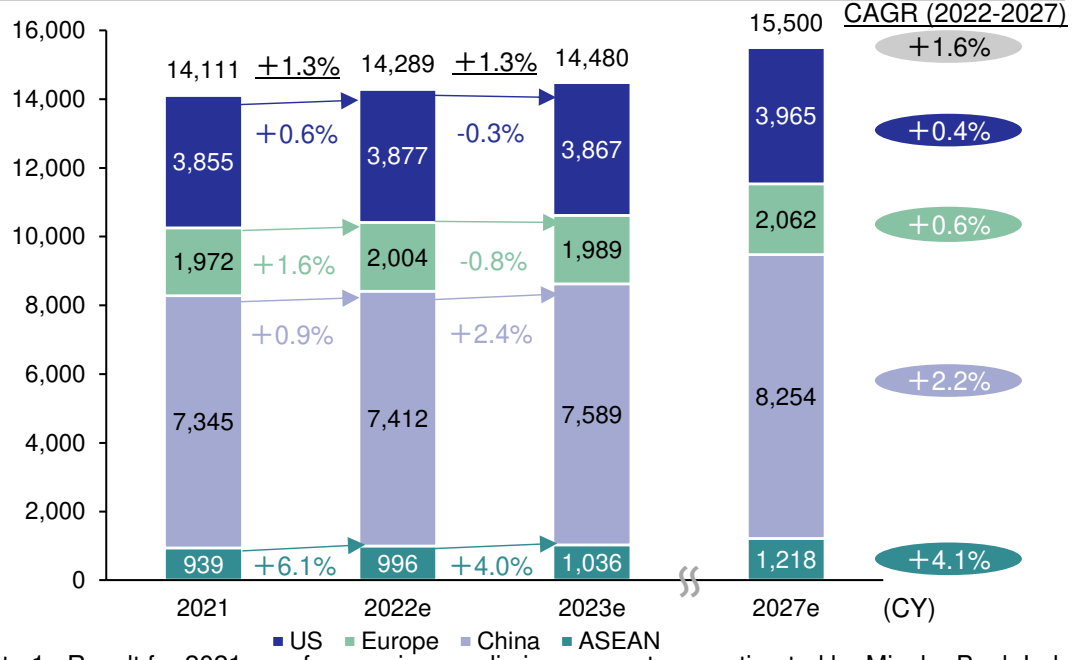
(Building hydrogen and ammonia supply chains)
- Build hydrogen and ammonia supply chains in cooperation with Japanese and foreign players towards the transition from thermal power generation.
- Efforts from overseas procurement and fuel production, to transport and storage, to receiving and utilization are being backed by government policies and in cooperation with other industries and governments.

Source: Compiled by Mizuho Bank Industry Research Department

Despite temporary stagnation of demand in Europe and the US, the medium-term outlook for global electricity demand is positive

- The growth rate of global electricity demand in 2022 and 2023 is the same (1.3% y-o-y).
  - Due to economic stagnation in the US and Europe in 2022 due to inflation and rate hikes, electricity demand for both regions is expected to increase slightly over the previous year, and decline in 2023 as a result of recession. Analyst's View (2)
  - The growth rate of electricity demand in China will drop due to slowdown in China's economic growth. In ASEAN, meanwhile, electricity demand has been expected to grow continuously since 2022, because of the region's robust economic growth.
- The CAGR of global electricity demand (2022-2027) is forecast to be 1.6%, as the Europe and US economies are also expected to recover until 2027.

Medium-term outlook for global electricity demand



Main factors behind increase/decrease in electricity demand in each country or region

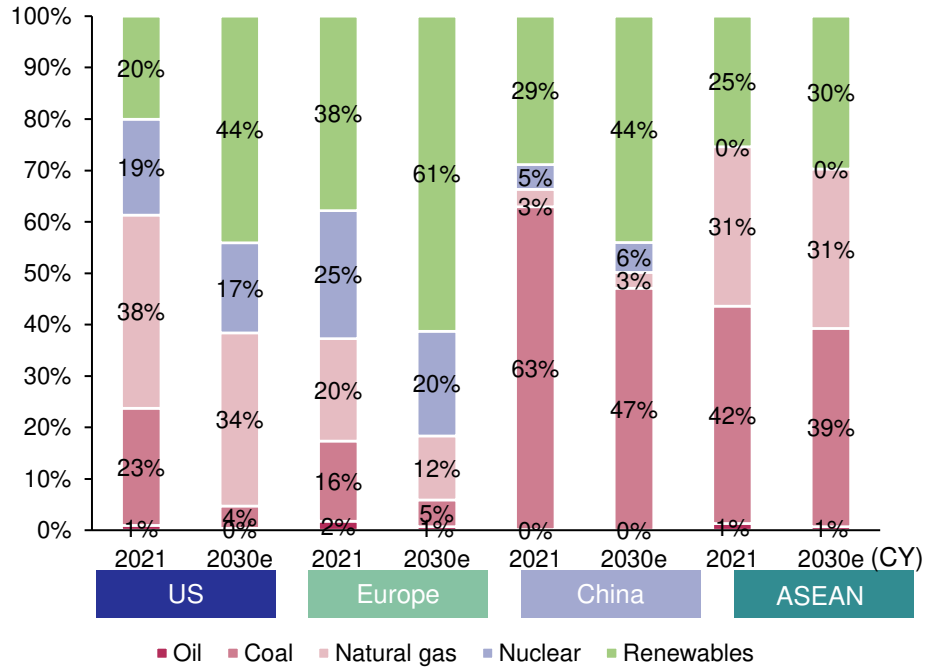
US	■ In response to the economic slowdown triggered by rate hikes, electricity demand for 2022 is set to grow by only 0.6%. ■ Electricity demand is forecast to drop off by 0.3% y-o-y in 2023 as the US enters a recession, and then increase heading toward 2027 backed by moderate economic growth.
Europe	■ Demand is expected to grow 1.6% y-o-y in 2022, as the gas supply outages put a damper on economic recovery. ■ In 2023, demand for electricity will decline by 0.8% y-o-y due to recession, followed by moderate economic growth through 2027 that will lead to increased demand.
China	■ China's economic growth stagnated in 2022 in response to a downturn in consumption among other factors, with y-o-y growth in electricity demand sluggish at 0.9%. ■ While the zero-Covid policy and other factors will limit growth in demand to only 2.4% y-o-y in 2023, it will increase thereafter.
ASEAN	■ While the region will be impacted by deteriorating external demand, the steady trend toward economic recovery will continue, with demand increasing 6.1% y-o-y in 2022 and 4.0% y-o-y in 2023.. ■ Robust economic growth through 2027 will drive demand for electricity.

Note 1: Result for 2021 was from various preliminary reports, or estimated by Mizuho Bank Industry Research Department. Result for 2022 is forecast by Mizuho Bank Industry Research Department.
Note 2: Figures for Europe represent the sum total of demand in Austria, Belgium, Cyprus, Estonia, Finland, France, Germany, Greece, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Portugal, Slovakia, Slovenia, and Spain. Figures for ASEAN represent the sum total of demand in Indonesia, Malaysia, Thailand, the Philippines, and Vietnam.
Source: Compiled by Mizuho Bank Industry Research Department based on IEA, *World Energy Balances 2022,* BP, *Statistical Review of World Energy 2022*, and other materials.

The composition of power sources in each country and region is expected to expand the ratio of non-fossil power sources, which is mainly renewable energy

- In terms of the composition of power sources in each country and region, according to IEA, the share of coal and natural gas thermal power is expected to decrease, while the ratio of renewable energy including mainly solar and wind power will increase by 2030.
  - In the US, the development of renewables has been reinforced through tax support included in the Inflation Reduction Act enacted in September 2022. In Europe, the expansion of renewables has been supported by policies and other efforts to end the dependence on Russia for energy.
  - Along with nuclear power capabilities, China is expected to continue to expand renewable energy, with the advantage of the domestic solar power supply chain. While thermal power is still the main source of the energy composition in ASEAN, the development of renewable energy is making gradual progress.

Medium-term outlook for the energy mix in each country and region (IEA Stated Policies Scenario)



Source: Compiled by Mizuho Bank Industry Research Department based on IEA, *World Energy Outlook 2022.*

Renewable energy targets and major policy trends in each country and region

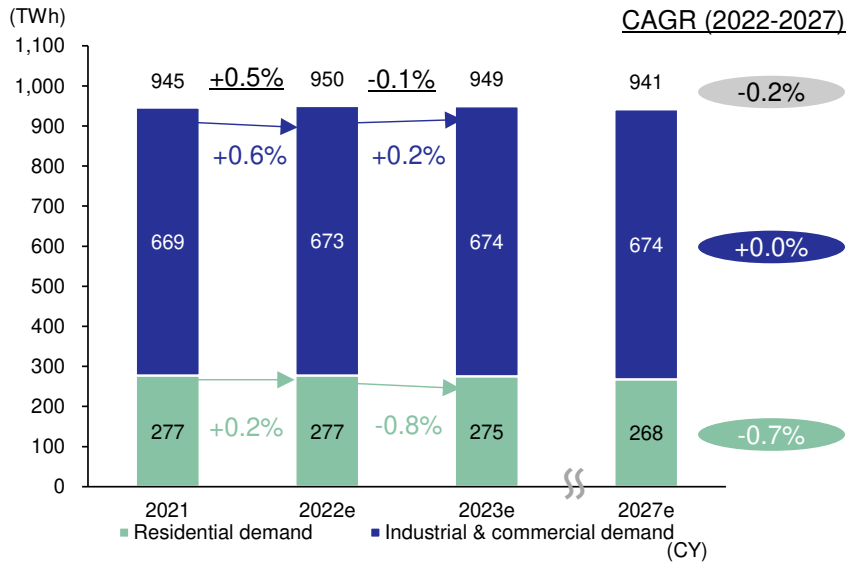
US	■ The Inflation Reduction Act of September 2022 expanded various tax credits for renewable energy such as the PTC (Note 1) and the ITC (Note 2) ■ The US has announced a goal to deliver 30GW in offshore wind power (fixed-bottom turbines) by 2030 and 15GW in floating offshore wind power by 2035.
Europe	■ The REPowerEU plan has raised the EU's 2030 target for renewables from 40% of final energy consumption to 45%. ■ The EU Solar Energy Strategy has set a target of installing 600GW of PV capacity by 2030 to end its dependence on Russian energy.
China	■ China has released numerical targets for 2025 in which renewables account for at least 50% of the increase in primary energy and at least 50% of the increase in electricity consumption in society.
ASEAN	■ The target of the renewable energy share has been 23% of the region's total primary energy supply as well as 35% of the installed power capacity in the region by 2025.

Note 1: Production Tax Credit, a tax credit based on the amount produced.
Note 2: Investment Tax Credit, a tax credit based on the amount invested.
Source: Compiled by Mizuho Bank Industry Research Department based on various published materials.

The outlook for electricity demand in Japan is in moderate decline due to progress with energy saving measures

- Electricity demand in 2022 is expected to increase 0.5% y-o-y due to the weather from January to March and the economic rebound. However, economic stagnation and progress with energy saving are forecast to lower electricity demand by 0.1% y-o-y in 2023.
- Domestic electricity demand is predicted to fall into decline by 2027 as energy saving makes further progress in all sectors.
  - The CAGR (from 2022 to 2027) of the industrial and commercial sectors is estimated to be +0.0%, as low economic growth is forecast.
  - In the residential sector, CAGR of the same period is forecast to decline by 0.7%, as the number of households is forecast to shrink after peaking in 2023.
- In the future, there is potential for electricity demand increase in the industrial sector, as there has been progress in development of data centers and semiconductor production capacity.

Medium-term outlook for electricity demand in Japan



Main factors behind increase/decrease in electricity demand in Japan

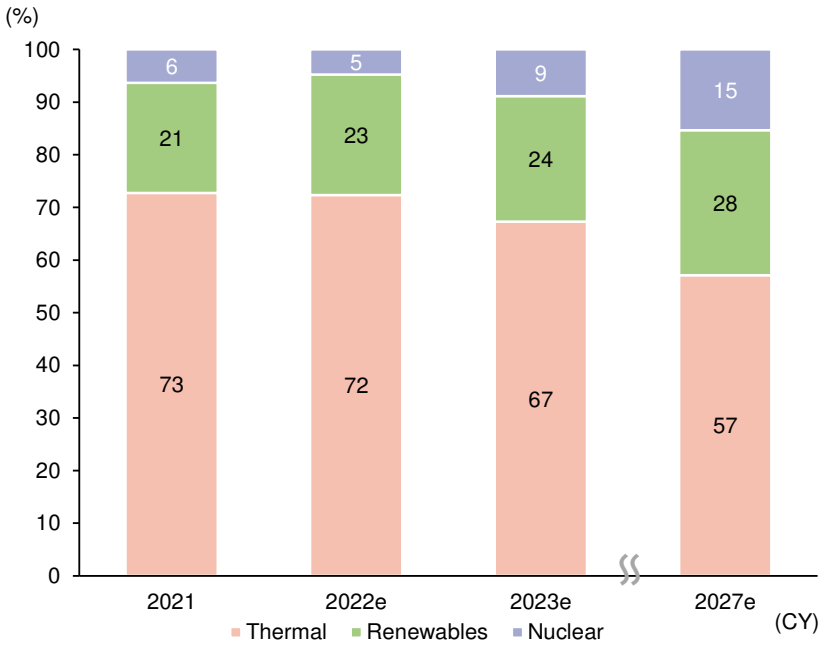
Industrial and commercial sectors	■ Despite the impacts of overseas sluggish economies in 2022, electricity demand grew y-o-y by 0.6% backed by economic recovery from Covid-19. ■ In 2023, demand will grow only 0.2% y-o-y because of an expected decline in external demand as the economies of Europe and the US are in recession. ■ Electricity demand will remain unchanged by 2027 due to low economic growth, progress of energy saving, and so on.
Residential sector	■ Demand will rise by 0.2% y-o-y in 2022 due to demand for heating during the extremely cold weather in the January-March period. ■ Demand is forecast to drop by 0.8% y-o-y in 2023 due to progress of energy saving, on the premise that temperatures remain at normal levels. ■ Heading into 2027, electricity demand is predicted to gradually decrease, as the number of households is expected to decrease after hitting a peak in 2023, and due to progress of energy saving.

Note 1: Electricity demand numbers for 2021 are estimated results calculated by Mizuho Bank Industry Research Department, which include estimates for on-site electricity consumption by private-use power generation facilities with a total output of 1,000kW or more, on-site electricity consumption by solar power generation for homes, etc. in addition to the amount of electricity sales by electricity providers and the specified supply and on-site electricity consumption of electricity providers listed in the Electricity Survey and Statistics.
Note 2: Data since/from 2022 are forecast by Mizuho Bank Industry Research Department.
Source: Compiled by Mizuho Bank Industry Research Department based on Agency for Natural Resources, *Comprehensive Energy Statistics*, and other materials

The ratio of non-fossil fuel power sources in Japan's energy mix is expected to rise due to restarting of nuclear reactors and other measures

- Thermal power generation is expected to still account for over 70% of Japan's power source mix in 2022, while non-fossil fuel power sources only making up 28%.
- In 2023, the ratio of non-fossil fuel power sources is projected to increase to 33% as a result of the progress of renewable energy development, along with the restart of many nuclear power plants. Although 3% of electricity supply capacity necessary for stable supply will be reserved, the risk of power supply shortage by disruption in LNG supply or temperature-related reasons still remains.
- The ratio of non-fossil fuels in Japan's energy mix will continue to increase until 2027, as the operation of offshore wind power generation is expected to commence in the port and general sea areas along with the restart of nuclear power plants, which have already received approval for facilities modification.
  - While decommissioning of aging thermal power plants is expected to make progress, they will continue to be a major power supply source.

Medium-term outlook for Japan's energy mix (based on electric power generated)



Main factors behind increase/decrease in each power source

Nuclear	■ The restart of nuclear power plants is focused on facilities* with approval for modification on the premise that the consent of local community will make progress at a certain extent. * Tohoku Electric Power: Onagawa-2 reactor, TEPCO: Kashiwazaki-Kariwa-6 and 7 reactors; Japan Atomic Power Company: Tokai II reactor; Kansai Electric Power: Takahama-1 and 2 reactors; Chugoku Electric Power: Shimane No.2 reactor
Renewables	■ It is expected that solar power will mainly expand continuously due to heightened demand of power consumers, and private power generation for homes driven by the recent sharp increase in electricity prices. ■ Offshore wind power is expected to have been gradually developed until 2027 in port and some ocean areas.
Thermal	■ Decommissioning of aging facilities is expected to make progress. ■ Thermal power will continue to serve as a major supply source, in view of the switch from coal and oil to LNG and the operation of power plants currently under construction or being replaced.

Note: Actual value of 2021 is estimated by Mizuho Bank Industry Research Department. Data from 2022 are forecasts by Mizuho Bank Industry Research Department.
Source: Compiled by Mizuho Bank Industry Research Department based on Agency for Natural Resources and Energy, Comprehensive Energy *Statistics*, and other materials

While electricity system reform has had some positive effects, changes in the situation have brought new challenges to the fore

- Owing to electricity system reforms, efficiency improvement of electric power companies will progress in response to increased competition, various choices for consumers thanks to diverse retail plans, and the ability of supply and demand management nationwide.
- However, a sharp rise in fuel prices as a consequence of the carbon neutrality (CN) trend and the war in Ukraine has made Japan face the following new challenges.

Objectives of electricity system reform and new challenges currently being faced along with the direction of solutions

Objectives of electricity system reform

- Securing a stable supply of energy
- Suppressing electricity rates to the maximum extent possible
- Expanding choices for consumers and business opportunities for providers

Delays in developing the business environment, improving systems in order to introduce renewable energy, and restarting nuclear reactors

Challenges that have arisen due to delays in energy policy

Insufficient supply capacity

- Thermal power plant operating rate reduced
- More thermal plants shut down or scrapped
- Delays in restart of nuclear power plants

Achievement of CN target with stable supply

- Develop the power T&D network
- Adopt distributed systems
- Need ability to regulate

Volatility seen in retail rates and services

- Facing soaring electricity rates
- Exiting retail business
- Mid-term contract cancellations

Secure the supply capacity needed for stable supply

- Maintain/expand existing power sources
  - Capacity market, secure reserve power sources, speed up restart of nuclear reactors
- Enhance fuel management
  - Enhance fuel procurement, flexibility, and management
- Expand new power source installation
  - Introduce long-term decarbonized power source auctions
- Enhance supply and demand management
  - Supply capacity management system, sophisticated electricity demand forecasting

To achieve CN, upgrade the power transmission and distribution network and make progress with introducing decarbonized power sources

- Increase ability to regulate electricity
  - Maintain and enhance pumped storage generation, utilize distributed power sources such as grid-scale storage batteries
- Build a next-generation network
  - Rebuild the electric power network and enhance network management
- Adopt distributed systems
  - Utilize distributed and low-voltage resources
- Invest in decarbonized power sources
  - Long-term decarbonized power source auctions, speed up restart of nuclear reactors

Redesign the retail electricity business in order to protect consumers

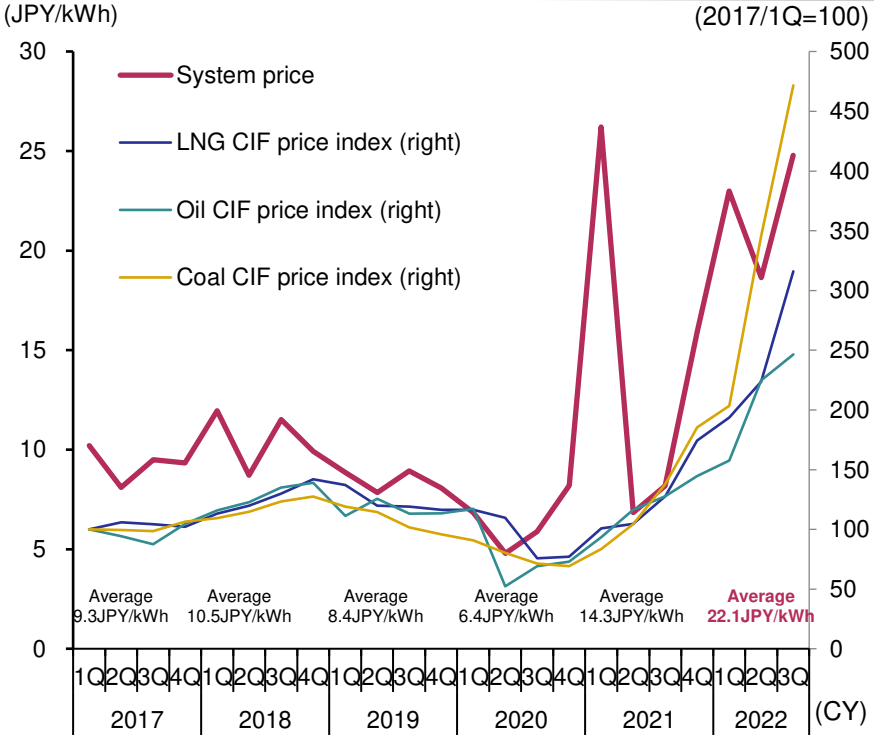
- Stabilization of services and ideal form of competition
  - Strengthen screening at the time of registration, monitoring, and discipline at the time of business exit for retail electricity providers
  - Ways to further boost competitiveness, including a wide variety of rate options
- Stabilization of rate levels
  - Management of the imbalance rate system that leads to curbing significant increases in procurement costs
  - Optimize transactions between the wholesale electricity market and the supply and demand balancing market

Source: Compiled by Mizuho Bank Industry Research Department based on Agency for Natural Resources and Energy materials

Withdrawals of some new electricity companies due to soaring electricity market price

- The average electricity spot trading price (system price) for 2022 (January-September 2022) was 22.1 yen/kWh, which was high compared to the past five years.
  - The main factors behind the high price are skyrocketing fuel prices and the ongoing supply capacity shortages.
- As of July 2022, new electricity's(Note) sales in the low-voltage sector has grown to over 25%.
  - However, new electricity's share of the extra-high voltage and high-voltage sectors fell to around 17% due to the withdrawal of some new electricity companies. Analyst's View (1)

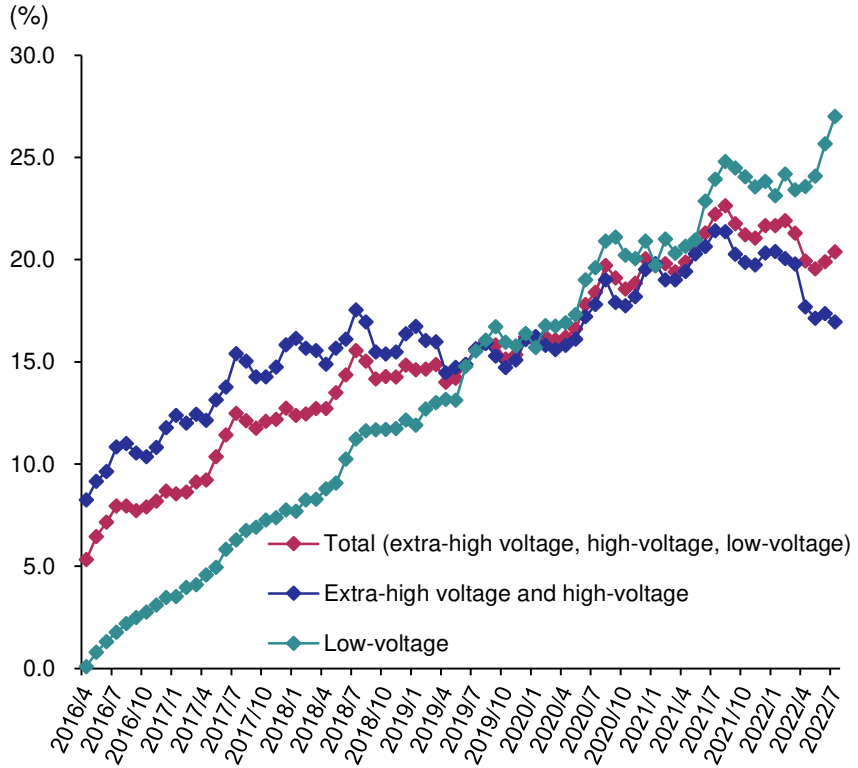
Trends in the electricity spot trading price (system price)



Note: New retail electricity providers that have entered the market since the deregulation of electricity retailing.

Source: Compiled by Mizuho Bank Research Department based on Japan Electric Power Exchange, *Trading Information*, and The Institute of Energy Economics Japan, *Statistics*.

New electricity's share after full deregulation of electricity retailing



Source: Compiled by Mizuho Bank Industry Research Department based on Electricity and Gas Market Surveillance Commission, *Results of Electricity Trading Report*.

Profit deterioration of electric power companies due to skyrocketing fuel prices

- Ordinary income of five of Japan's ten leading electric power companies are expected to be negative in the fiscal year ending March 2022 as a result of the time lag of the fuel cost adjustment system and the impact of exceeding the fuel adjustment ceiling caused by soaring fuel prices.
  - — Kansai Electric Power and Kyushu Electric Power, who have restarted nuclear power plants, are able to keep the increase of the fuel cost out of expenditure ratio under the control.
- Many power companies forecast to record ordinary losses on the scale of JPY 100 billion because fuel prices are expected to remain very high in the fiscal year ending March 2023, so the severe business environment seems to be continuing.

Analyst's View (1)

Operating profits recorded by Japan's electric power companies

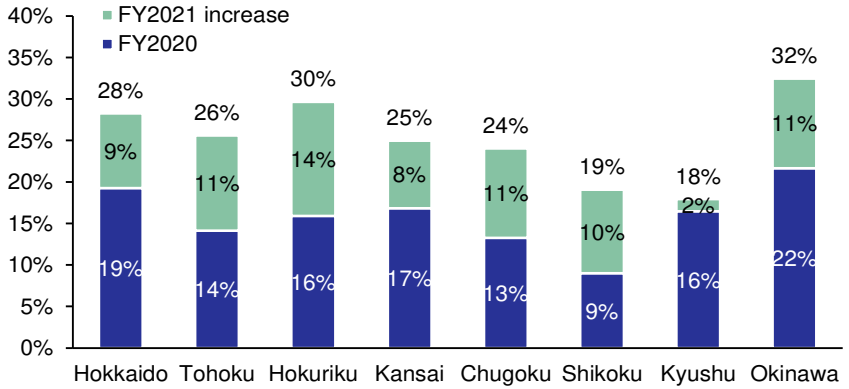
(JPY 100M)

Company	FY2020	FY2021		FY2022 Company estimate
	Operating profit	Operating profit	Y-o-y	Operating profit
Hokkaido Electric Power	412	138	- 273	- 700
Tohoku Electric Power	675	- 492	- 1,167	- 2,000
TEPCO Holdings	1,899	450	- 1,449	TBD
Chubu Electric Power	1,922	- 593	- 2,515	- 1,700
Hokuriku Electric Power	124	- 176	- 300	- 1,000
Kansai Electric Power	1,539	1,360	- 179	- 2,000
Chugoku Electric Power	301	- 619	- 920	- 1,860
Shikoku Electric Power	52	- 121	- 173	- 300
Kyushu Electric Power	557	324	- 233	TBD
Okinawa Electric Power	113	27	- 86	-470

- In October 2022, all 10 companies hit the fuel adjustment ceiling.
- If this situation continues and companies do not apply to the government to raise regulated rates, it is feared that electric power companies will have to shoulder a heavier burden
- Trends in fuel prices will continue to exert a powerful influence on electric power companies' earnings.

Source: Compiled by Mizuho Bank Industry Research Department based on IR materials from each company

Changes in fuel costs as a percentage of electricity providers' operating expenses (FY2020→FY2021)



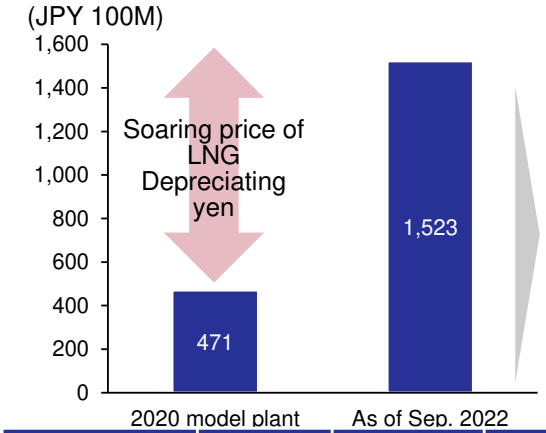
Risk factors caused by high fuel prices by business sector

Business area	Overview
Generation	✓ As it is possible to pass on the costs to retailers and others, it is a comparatively low-risk sector
Transmission and distribution	✓ Increase in electricity procurement costs in the supply and demand balancing market, etc.
	✓ Unable to collect wheeling charges, imbalance fees, etc. due to the withdrawals of new electricity providers
Retailing	✓ Increase in cost of procuring electricity from the wholesale electricity market
	✓ Higher costs due to increased market procurement and reaching the fuel adjustment ceiling

In Japan: Generate investment capacity by restarting nuclear power plants
Overseas: Increased electricity demand capture in ASEAN

- The effect of LNG fuel costs saved by the restart of one nuclear power plant has become significant under the circumstance of high fuel prices and the weak yen.
  - Based on the same assumptions, the estimated amount that would be saved was JPY 47.1 billion in 2020 and expands to JPY 152.3 billion in September 2022.
  - In addition to finance improvement, these savings can be allocated to the renewable energy development in Japan, overseas projects, and the transition from thermal power generation, etc. Analyst's View (2) (3)
- Electricity demand in ASEAN is expected to continue to increase. As renewable energy alone will not be able to meet these needs, construction/development of thermal power generation is expected to continue for the time being.
  - Region-wide deployment of multi-fuel firing technology, which Japanese companies are focusing on, will be important for the thermal power transition. Analyst's View (2)

Reduction in LNG fuel costs by restarting nuclear plant (estimate)



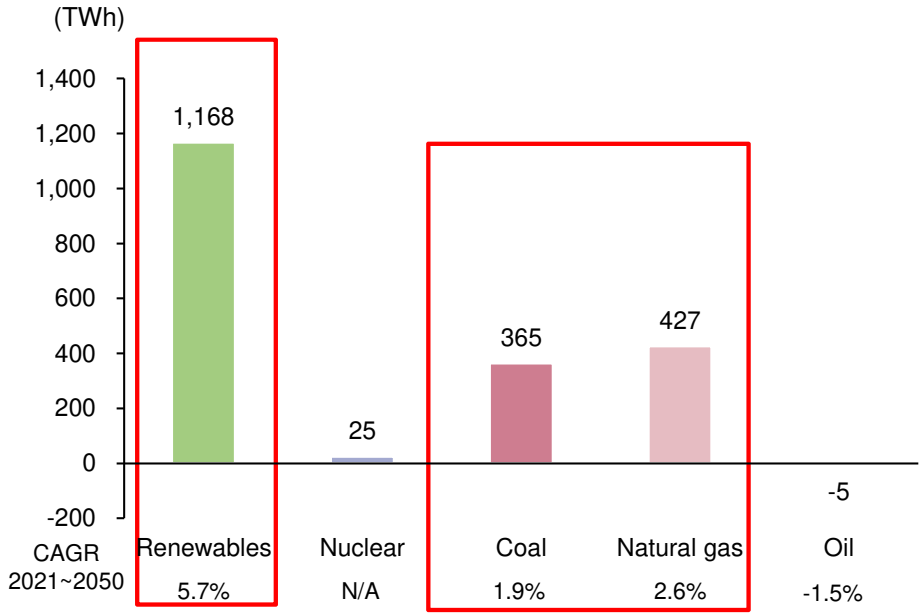
Direction for Investment

- Acquire and promote introduction of renewable energy generation assets
- Thermal power transition using hydrogen-ammonia co-firing, etc.
- Increase overseas renewables development and other projects in ASEAN, the U.S. etc.

Assumption	LNG price (USD/t)	Exchange rate (JPY)	LNG thermal fuel cost (JPY/kWh)	Nuclear facility utilization rate (%)	Nuclear facility capacity (10K kW)
2020 model plant	505.17	107	6.4	70	120
As of Sep. 2022	1,178.55	140	20.7	70	120

Source: Compiled by Mizuho Bank Industry Research Department based on Agency for Natural Resources and Energy and other materials

Projected increase in electricity generation in ASEAN by power source (IEA Stated Policies Scenario 2021-2050)



Capitalize on increased demand for renewables

Support the thermal power generation transition

Source: Compiled by Mizuho Bank Industry Research Department based on IEA, *World Energy Outlook 2022*

[Retail] Rate review and risk management system establishment are urgently needed to deal with soaring electricity market prices

- The major electric power companies now need to secure additional supply capacity in skyrocketing markets and increased demand as a result of the withdrawals of some new electricity providers caused by the soaring price in the electricity market.
  - Besides providers who are pricing based on market volatility, including reviewing their unit prices and factoring in market price adjustments, some providers are considering raising low-voltage regulated rates.
- From the standpoint of consumer protection as well, there is an urgent need to establish a risk management system for electricity retailing business.
  - Currently, more than 20% of the top 50 companies in terms of electricity sales do not have a quantitative grasp of risk.
  - After ascertaining the amount of risk through EaR(Note) or another metric, it is useful to hedge the risk by utilizing futures markets, etc.

Actions taken by major electric power companies in response to soaring electricity market prices

Background

- Rising fuel prices caused by the war in Ukraine and other factors have led to a sharp spike in electricity market prices.
- As a result, some electricity providers that depend on market procurement are making moves to exit the sector.

Major electricity players must secure additional supply capacity due to increasing return of demand

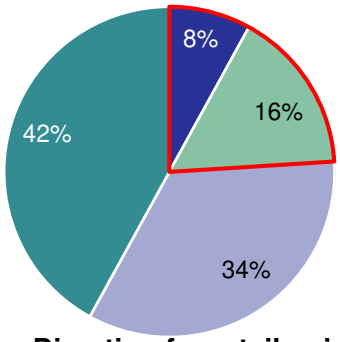
Actions taken by major electric power companies

Final guaranteed supply	Overhauling market-linked rates for final guaranteed supply provided by the transmission and distribution sector, which had been undervalued
Review service line-up	Electric power companies are pricing based on fuel price and market price volatility, including reviewing rates and factoring in market price adjustments.
Low-voltage regulated rate	Multiple electric power companies are considering raising low-voltage regulatory rates, for which government approval is necessary

Note: Earning at Risk. Refers to the expected amount of portfolio loss in the event of a shock, including a price spike during a supply and demand crunch.
Source: Compiled by Mizuho Bank Industry Research Department based on various published materials.

Current grasp of market risk among the top 50 companies in electricity sales and direction for response

(N=38, Electricity and Gas Market Surveillance Commission held in April 2021)



- No grasp of risk — 24% have no quantitative grasp of risk
- Qualitative grasp of risk, but not managed quantitatively
- Risk is managed quantitatively, but have not moved to agile trading
- Risk is managed quantitatively, and conducting agile trading commensurate with risk

<Direction for retailers' actions to establish a system for managing market risk, etc.>

Ascertain position and amount of risk

- Create a monitoring system
- Run stress tests and calculate EaR

Confirm losses under a shock scenario in relation to business strength, e.g. capital adequacy

Hedge risks

- Utilize futures markets, forwards markets, base load markets, negotiated transactions, etc.

Agile spot market procurement, adjustment of ratios

Source: Compiled by Mizuho Bank Industry Research Department based on Ministry of Economy, Trade and Industry and other materials

[Renewables] Japan: Pursuit of development via alliances Overseas: Demand capture in ASEAN

- RE100, an initiative that sets a target of procuring 100% of renewable electricity used in business operations, updated its technical criteria in October 2022 to set a limit standard for procurement of renewable energy within 15 years from operation commencement (applies to contracts from January 2024).
  - As demand for renewable energy with additionality(Note) is expected to increase, electric power companies will be required to make more efforts on enhancing their renewable energy development capabilities through business alliances, pursuing joint renewable energy development with consumers and securing customers with strong renewables procurement needs.
- Participation in renewables development projects in ASEAN is a way to capture growing electricity demand and contribute to decarbonization.
  - Some companies are not only working on renewables development, but also pursuing further efforts in green hydrogen and ammonia development.

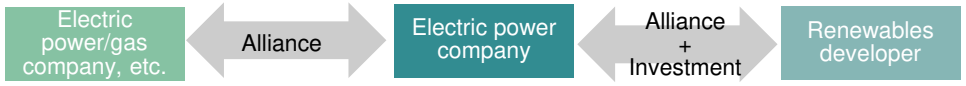
Directions for electric power companies to expand renewable energy supply capabilities in Japan

RE100 TECHNICAL CRITERIA (October 2022)
The RE100 technical criteria require corporate buyers' procurement of **renewable electricity to observe a fifteen-year commissioning or re-powering date limit**

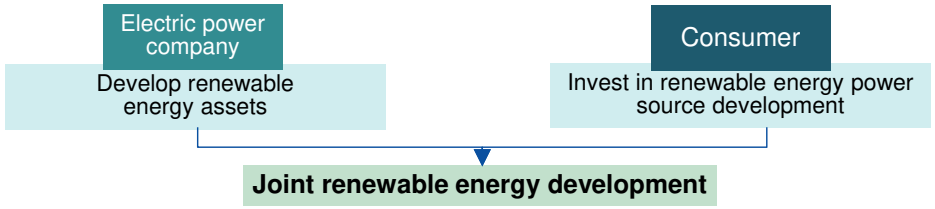
Background
- ✓ RE100 does not recognize hydropower offerings or post-FIT power sources
- ✓ Growing demand for renewable energy power sources with additionality

Further expansion of corporate PPAs, growing demand for renewable energy development

<Possible methods (1) : Enhance renewable energy development capabilities>



<Possible methods (2): Joint renewable energy development with consumers>



Note: Refers to the procurement of renewable energy encouraging new building of and investment in renewable energy facilities around the world
Source: Compiled by Mizuho Bank Industry Research Department based on based on various published materials.

Key renewables development and investment deals in ASEAN by major Japanese electric power companies in recent years

Date Announced	Electric Power Company	Country	Project / Investee
May 2018	Kyushu Electric Power	Indonesia	Sarulla Geothermal IPP project
Nov. 2018	TEPCO	Vietnam	Coc San hydrogen plant
May 2019	Kyushu Electric Power, JERA	Thailand	EGCO (thermal and renewables project)
Feb. 2021	TEPCO	Indonesia	Kencana Energi Lestari (hydro and other renewables project)
Sep. 2021	JERA	Philippines	Aboitiz Power (thermal and renewables project)
Sep. 2021	Chubu Electric Power	Vietnam	Bitexco Power (renewables project)
April 2022	TEPCO	Thailand	CE9 (Rooftop-mounted solar PPA project)
Aug. 2022	JERA	Vietnam	Gia Lai electric power (renewables project)
Oct. 2022	Kyushu Electric Power	Philippines	PetroGreen (renewables project)

TEPCO has concluded an agreement with Pertamina Power Indonesia, the arm of Pertamina in charge of energy, for **joint research on green hydrogen and green ammonia development**

Source: Compiled by Mizuho Bank Industry Research Department based on materials published by each company.

[Thermal power generation] Building of decarbonization supply chains is accelerating

- Efforts to build hydrogen and ammonia supply chains for the thermal power transition are accelerating with participation by electric power companies.
  - — Considerations of joint procurement with overseas providers and joint supply chains with other industries are underway.
  - — The optimal carriers are being considered by accumulating hydrogen-related technologies, leveraging knowledge from other industries, and striving to find solutions for the technical challenges.
  - — Hydrogen and ammonia receiving sites are being established, mainly in port areas, in cooperation with neighboring industries and local governments.

Developments in the building of hydrogen and ammonia supply chains by electric power companies

	Overseas procurement/fuel production	Transportation/Storage	Fuel receiving/Utilization
JERA	■ **PETRONAS (major Malaysian oil company)** — Promoting the use of LNG in various Asian countries and building hydrogen and ammonia supply chains ■ **Uniper (major German energy company)** — Joint consideration of procurement and selling of LNG and U.S.-produced clean ammonia	■ **Hydrogenious (German startup)** — Invested in the company, which is engaged in development of hydrogen storage and transportation technologies — Obtain knowledge on proprietary technology for liquid organic hydrogen carriers, which is one type of hydrogen energy carrier	■ **Port of Nagoya area** — Joint consideration with Idemitsu Kosan of building a hydrogen supply chain in the Ise Bay area — The LNG terminal jointly operated by JERA and Toho Gas is nearby, along with oil refineries and steel mills ■ **Hekinan Thermal Power Station (coal)** — Targeting a fuel ammonia co-firing rate of 20% by fiscal 2023
Kansai Electric Power	■ **Iwatani, Kawasaki Heavy Industries, Marubeni, Australian companies** — Feasibility study on building a large-scale green liquefied hydrogen supply chain between Australia and Japan ■ **JOGMEC, Hokuriku Electric Power, Marubeni, Australian companies** — Feasibility study on building a clean fuel ammonia supply chain between Australia and Japan	■ **Mitsui O.S.K. Lines, Mitsubishi Heavy Industries** — Joint consideration of the future introduction of a receiving and storage ship (a floating storage and regasification unit for ammonia)	■ **Port of Himeji area** — Considering building a hydrogen supply chain in collaboration with neighboring industries such as steel and chemicals, with a view to hydrogen co-firing at Kansai Electric's own power plants — Kansai Electric will handle both LNG receiving and power generation at the Himeji No. 2 Power Station — Aims to start receiving hydrogen shipments in 2030
Direction for future efforts	✓ **Stable procurement of LNG, etc. for the time being** ✓ **Pursue production development in the U.S., Australia or other potential hydrogen and ammonia supply bases** ✓ **Considerations for future domestic production**	✓ **Find solutions for technical challenges and consider cost-competitive carriers, while also utilizing knowledge from other industries**	✓ **Select hydrogen-ammonia co-firing sites** ✓ **Establish hydrogen and ammonia receiving sites in cooperation with neighboring industries such as steel and chemicals and local governments, with support from government policies as well**

Source: Compiled by Mizuho Bank Industry Research Department based on materials published by each company.

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