



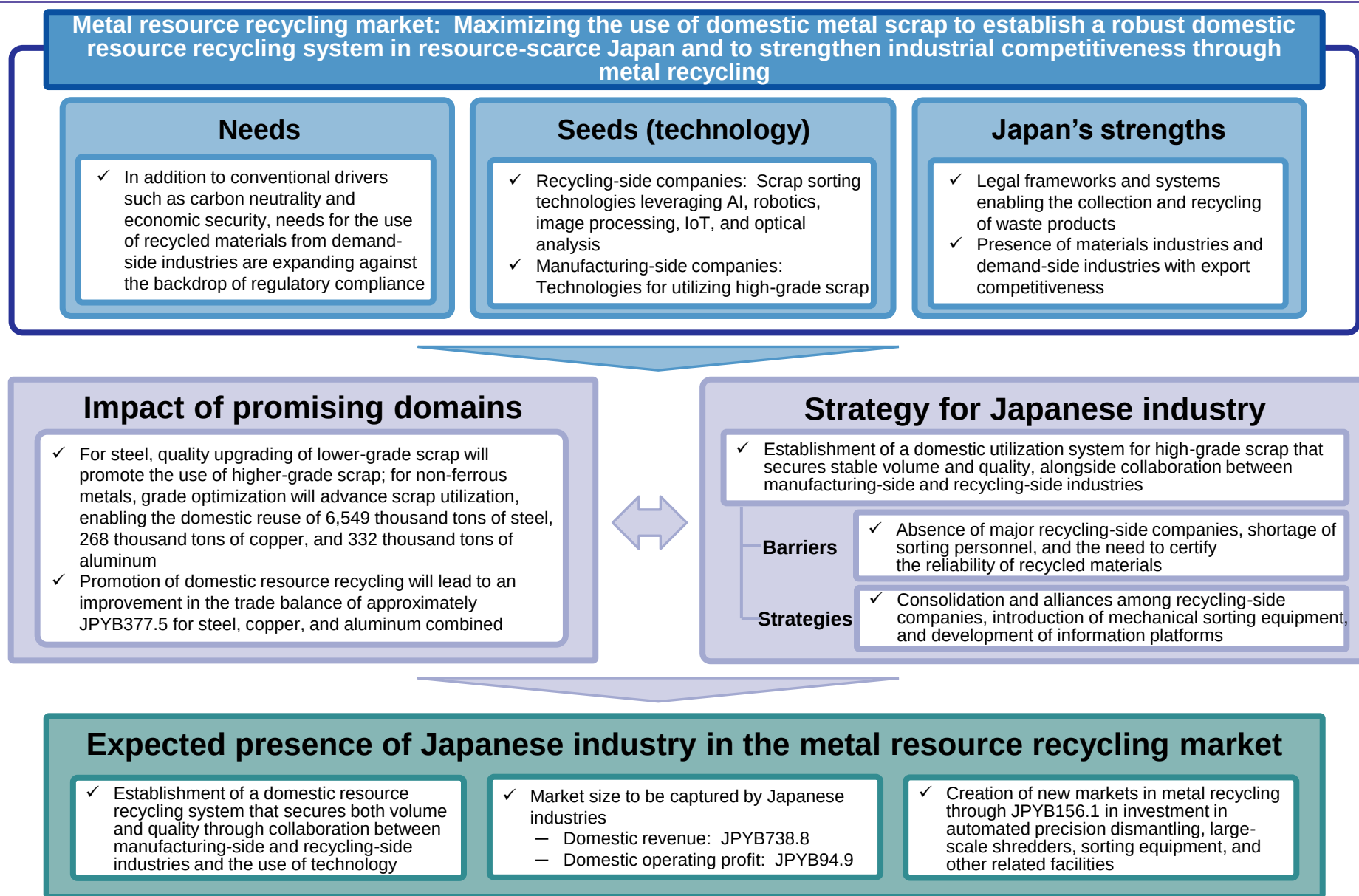
Resource Recycling / Metal Recycling

Expanding the recycled materials market through
quality upgrading of metal scrap and its circulation
back into the domestic market

March, 2026

Industry Research Department
Mizuho Bank

Strategy for capturing the metal resource recycling market and the expected presence of Japan in 2040



Source: Compiled by Industry Research Department, Mizuho Bank, Ltd.

Expansion of the metal recycling market through quality upgrading of ferrous and non-ferrous scrap and its circulation back into the domestic market

■ Background and Issues

- In Japan, virgin metal raw materials are sourced through imports from overseas, while metal scrap is exported overseas in a considerable volume
- Conventional drivers of metal recycling have been demands related to carbon neutrality and economic security; recently, however, in response to European regulations on recycled materials, demand-side industries' needs for recycled materials have been intensifying. Through quality upgrading of domestically generated scrap and promotion of its domestic utilization, metal recycling should be leveraged to strengthen the industrial competitiveness of Japan

■ Summary

- For steel, expansion of scrap utilization in blast furnaces and large electric arc furnaces is expected going forward, and from 2030, demand for higher-grade scrap is projected to exceed supply. Quality upgrading of surplus lower-grade scrap and its effective utilization within Japan will be important
- For copper, challenges include the difficulty of domestic sorting and processing depending on the type and grade of scrap and the fact that demand is centered on high-grade scrap; for aluminum, the challenge is that reuse in wrought products is limited due to alloy characteristics. For both copper and aluminum, Japan exports overseas primarily low-grade scrap that cannot be sorted domestically and then procures higher-grade scrap from overseas
- For recycling-side companies to supply scrap of the volume and quality required by manufacturing-side companies in a timely, appropriate, and stable manner, the technical coordination that has previously taken place between materials manufacturers and brand owners must also be implemented between manufacturing-side and recycling-side players
- Japan, however, lacks major recycling-side companies capable of meeting the volume and quality requirements of manufacturing-side companies, and going forward, there is a risk that quality upgrading of scrap will become difficult due to labor shortages and other challenges among recycling-side companies
- Going forward, recycling-side companies are required to strengthen their financial capacity through consolidation and alliances, accelerate R&D and capital investment, and resolve challenges such as labor shortages by introducing technological seeds for labor-saving. In addition, the establishment of a traceability information platform for recycled materials, through which recycling-side companies visualize the production status of recycled materials and manufacturing-side companies visualize their utilization status, will make it possible to secure the reliability of recycled materials
- Amid expanding green markets and growing regulatory compliance requirements both domestically and overseas, progress in the domestic use of metal scrap by demand-side industries can lead to securing international competitiveness. Metal recyclers, by upgrading the quality of scrap through automated precision dismantling, shredding, and advanced mechanical sorting, are estimated to enable the domestic reuse of approximately 6,549 thousand tons of steel, approximately 268 thousand tons of copper, and approximately 332 thousand tons of aluminum in FY2040, with the recycling market projected to expand by approximately JPYB738.8

Expansion of the recycling market through effective utilization of metal scrap in Japan is anticipated

- Resource-scarce Japan relies on imports from overseas for the natural resources that serve as metal raw materials, while metal scrap is exported overseas in a considerable volume
- The domestic metal recycling market, in which domestically generated metal scrap is circulated and effectively utilized within Japan, has potential for expansion

Current state of metal recycling and the future potential for domestic utilization of scrap

Import volume of virgin raw materials

- Iron ore: 96,394 thousand tons, JPYB1,700.6
- Coking coal: 58,681 thousand tons, JPYB1,948.6
- Copper concentrate: 5,208 thousand tons, JPYB2,144.6
- Aluminum ingots: 1,052 thousand tons, JPYB398.4

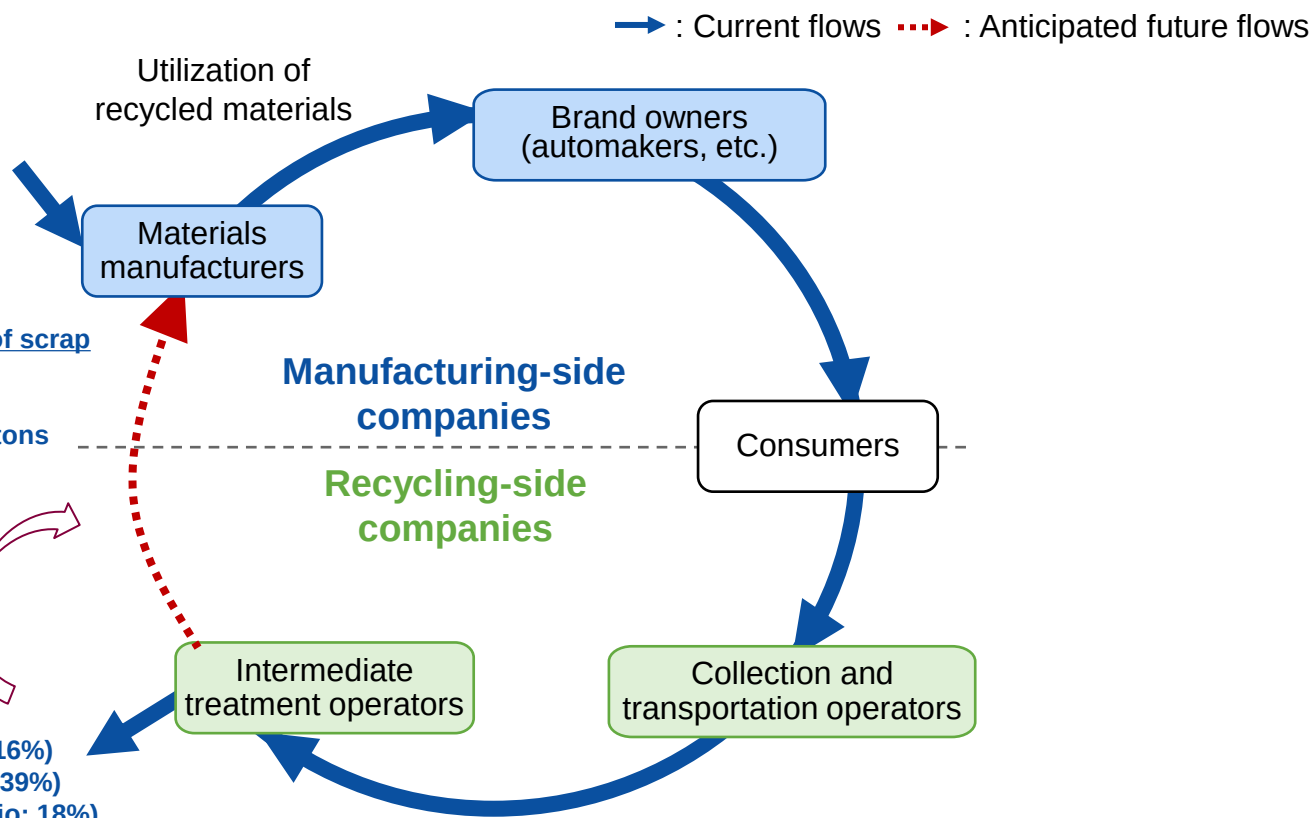
Domestic utilization volume of scrap

- Steel: 35,041 thousand tons
- Copper: 773 thousand tons
- Aluminum: 2,481 thousand tons

Shift toward a system in which recycled materials are effectively utilized within Japan

Export volume of scrap

- Steel: 6,803 thousand tons (export ratio: 16%)
- Copper: 340 thousand tons (export ratio: 39%)
- Aluminum: 432 thousand tons (export ratio: 18%)



Note: Data on import volume of raw materials and domestic utilization and export volumes of scrap are as of 2024

Source: Compiled by Industry Research Department, Mizuho Bank, Ltd. based on Ministry of Finance "Trade Statistics," Japan Ferrous Raw Materials Association "Ferrous Raw Materials Annual Report," and Nikkan Shikyo Tsushin "Nikkan Shikyo Tsushin"

Needs for recycled materials are set to expand against the backdrop of regulatory introduction

- Conventional drivers of metal recycling in Japan have primarily been demands for resolving social issues such as carbon neutrality and economic security; against the backdrop of the introduction of regulations in Europe that mandate the use of recycled materials, needs for recycled materials themselves are expanding
 - Promotion of domestic resource recycling enables regulatory compliance for downstream industries and contributes to maintaining international competitiveness

Significance of ferrous and non-ferrous metal recycling

		Steel	Aluminum	Copper
Significance of ferrous and non-ferrous metal recycling	Carbon neutrality (CN)	■ Increasing the volume of scrap utilization in steel production contributes to reducing CO2 emissions associated with steel production within Japan	■ Primary smelting consumes a large amount of electric power (Japan has already withdrawn from this), but CO2 emissions during the production of recycled ingots are as low as 3% compared with those for new ingots, making the significance of scrap utilization high	■ In Japan, the predominant smelting method, the flash smelting furnace, uses heat from oxidation reactions as its heat source; emissions are thus low, and from the standpoint of carbon neutrality for copper, the needs for scrap are small
	Economic security	■ While Japan depends on imports for iron ore and coking coal, the main raw materials for steel, it is the world's third-largest net exporter of ferrous scrap. The utilization of scrap contributes to improving the self-sufficiency rate of ferrous raw materials	■ Japan has no domestic primary smelting capacity and imports all of its new ingots, presenting a supply chain risk. The utilization of scrap is an important issue	■ Japan imports all of its copper concentrate as raw material. Along with declining ore grades and deteriorating ore purchasing terms, the difficulty of ore-based smelting is increasing, and the utilization of scrap is becoming important

Anticipated future needs (economic aspect)	Regulatory compliance (utilization of recycled materials)	■ Needs for the utilization of recycled materials from demand-side industries such as automakers are increasing ■ In Europe, promotion of recycled material use among demand-side industries and management of scrap exports are advancing; for Japan, the establishment of product brands utilizing green steel will be a differentiating factor in international markets	■ Needs for the utilization of recycled materials from demand-side industries such as automakers are increasing ■ Reflecting the alloy characteristics of aluminum (the difficulty of separating different alloys), horizontal recycling and the establishment of closed-loop systems are progressing ■ Possessing product brands utilizing green aluminum will be a differentiating factor	■ Needs for the utilization of recycled materials from demand-side industries such as automakers and home appliance manufacturers are increasing ■ Along with the increase in copper demand both domestically and overseas, demand for high-grade scrap recovered from electrical wires, automobiles, home appliances, and other products is rising
--	---	---	---	---

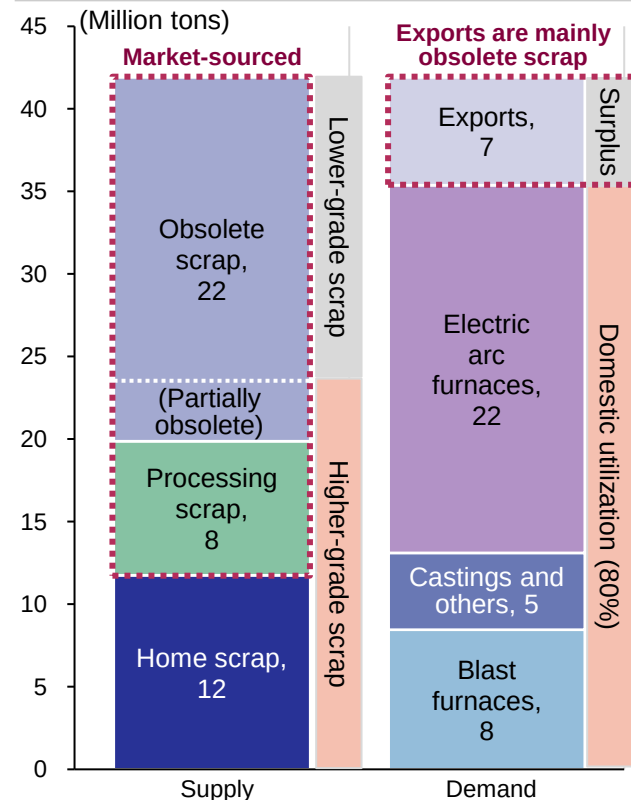
Conventional latent needs for resolving social issues are set to become manifest and gain economic value through the introduction of regulations

Source: Compiled by Industry Research Department, Mizuho Bank, Ltd. based on Japan Aluminum Association and Ministry of Economy, Trade and Industry materials

Toward decarbonization of the steel industry, domestic demand for higher-grade scrap is set to increase substantially going forward

- Japan is currently in a surplus position for ferrous scrap and exports approximately 7 million tons, mainly of obsolete scrap
- Going forward, with the operation of large electric arc furnaces and the decarbonization of blast furnace processes, the utilization of ferrous scrap will be newly required for the production of high-grade steel, increasing demand for higher-grade scrap by up to 7 million tons. Meanwhile, demand for lower-grade scrap used in commodity products is projected to decline due to contracting domestic demand
 - Lower-grade scrap contains impurities such as copper that are difficult to remove during refining and shows considerable variation in composition, presenting challenges for its effective utilization in high-grade steel

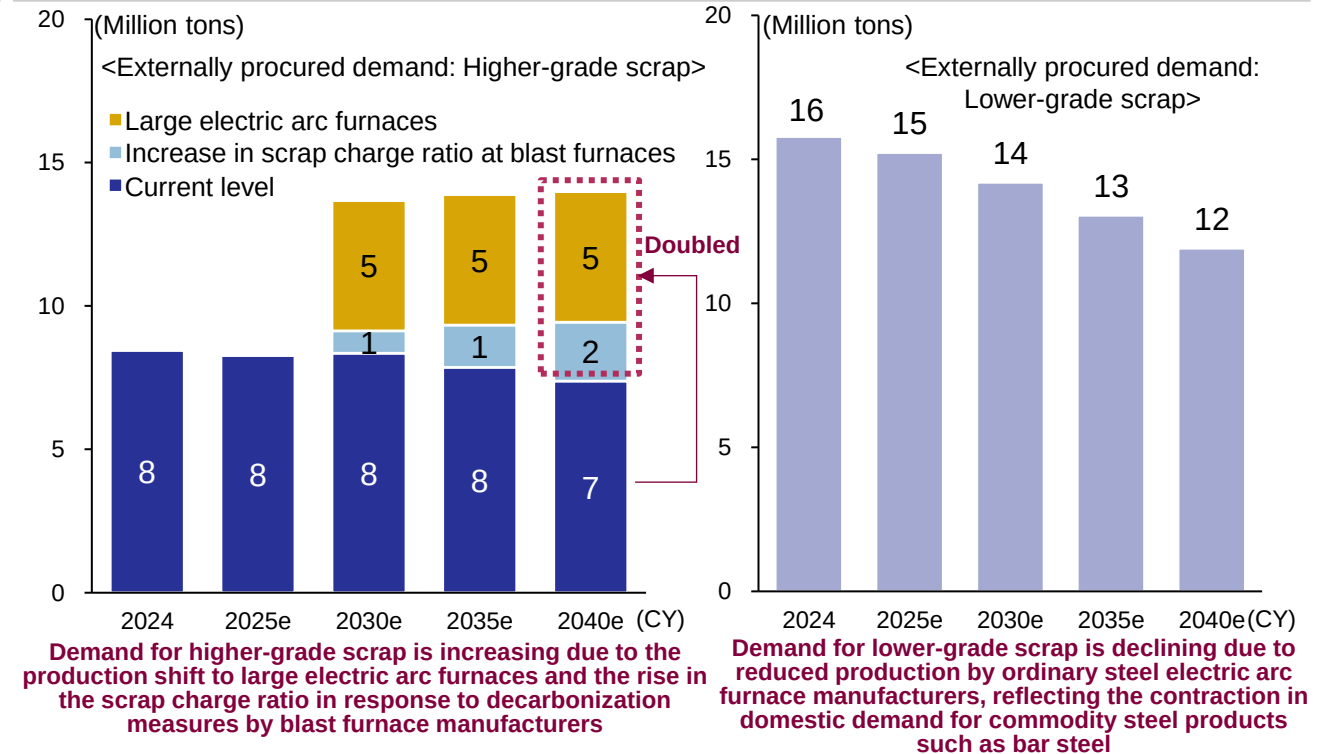
Overview of domestic supply and demand for ferrous scrap



Note: Among obsolete scrap, automobile shredder scrap is classified as higher-grade scrap

Source: Compiled by Industry Research Department, Mizuho Bank, Ltd. based on The Japan Ferrous Raw Materials Association "Ferrous Raw Materials Annual Report"

Outlook for demand volume of externally procured scrap



Note 1: Externally procured scrap refers to scrap that steel manufacturers need to procure from the market in addition to home scrap

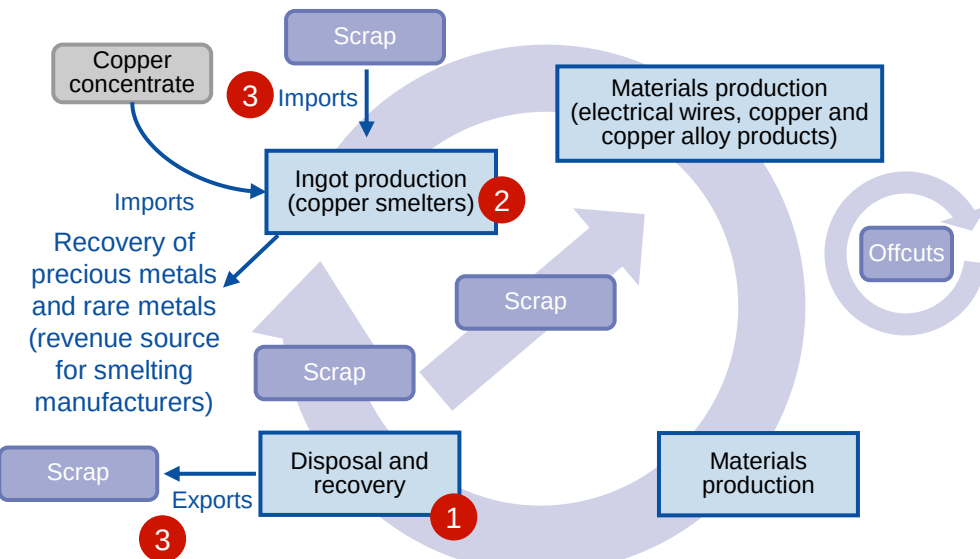
Note 2: Assumptions: The volume of scrap utilization if the current blast furnace production process continues is defined as the "current level"; large electric arc furnaces are assumed to operate at full capacity from 2030 using only higher-grade scrap; and the ferrous scrap charge ratio in blast furnaces and converters is estimated to rise to 18% by 2040

Source: Compiled by Industry Research Department, Mizuho Bank, Ltd. based on The Japan Ferrous Raw Materials Association "Ferrous Raw Materials Annual Report"

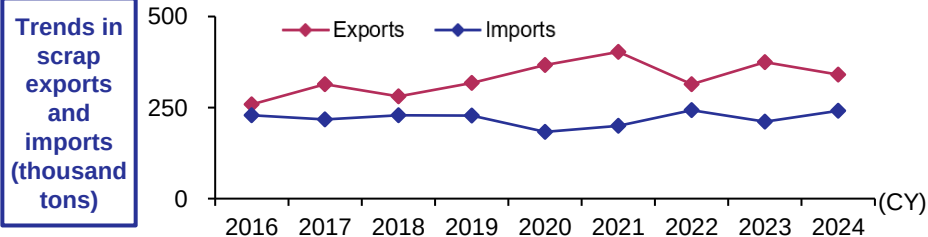
Non-ferrous metal scrap continues to be exported overseas, primarily due to technical hurdles and challenges in grading and sorting

- For copper, depending on the type of scrap, domestic sorting and processing are difficult, and demand is centered on high-grade scrap. For aluminum, reuse of scrap in wrought products is currently limited due to alloy characteristics. A common challenge for both copper and aluminum is that Japan exports a certain volume of mainly low-grade scrap that cannot be sorted domestically and imports higher-grade scrap from overseas

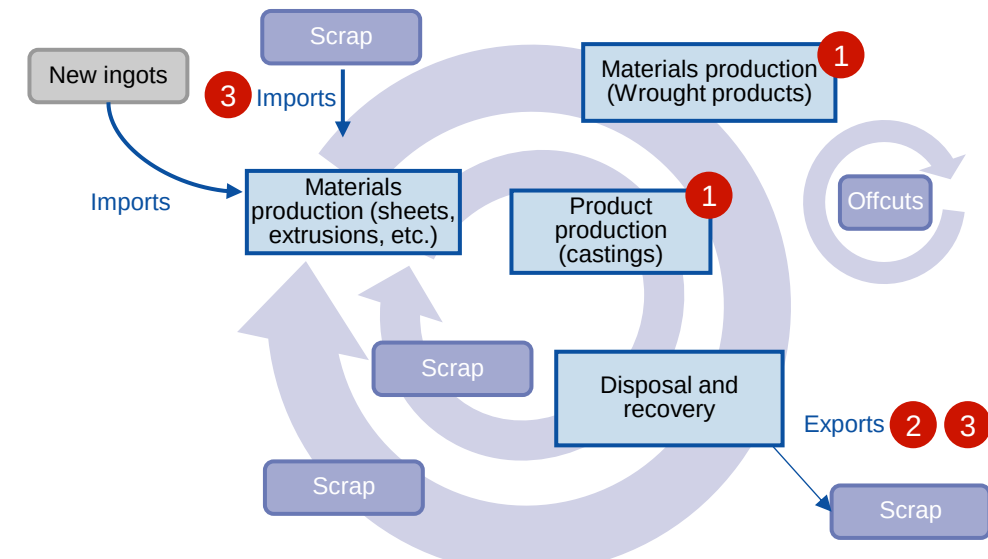
Overall picture and key challenges of copper recycling



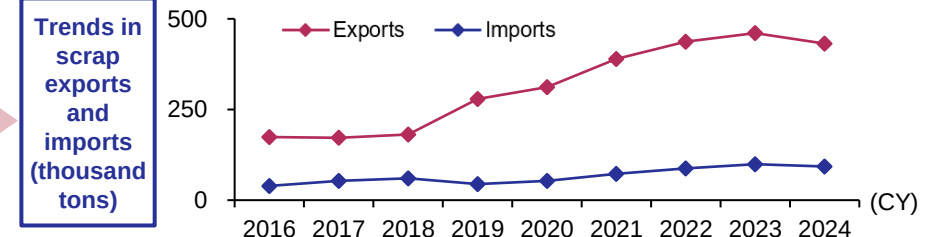
- 1 Depending on the type and grade of scrap, domestic sorting and processing are difficult
- 2 Demand is centered on high-grade scrap, and there is an upper limit on the volume of scrap that can be charged
- 3 Japan exports low-grade scrap and imports the higher-grade scrap needed domestically



Overall picture and key challenges of aluminum recycling



- 1 Reuse in wrought products is currently limited due to the alloy characteristics of aluminum
- 2 Rising scrap prices due to increasing scrap demand overseas
- 3 Japan exports low-grade scrap and imports the higher-grade scrap needed domestically



Source: Both charts compiled by Industry Research Department, Mizuho Bank, Ltd. based on Global Trade Atlas

Both quality upgrading technologies for scrap at recycling-side companies and scrap utilization technologies at manufacturing-side companies are required

- At recycling-side companies, technologies that upgrade the quality of scrap through the use of image processing, AI, IoT, robotics, and optical analysis are being developed and introduced; at manufacturing-side companies, technologies for utilizing high-grade scrap by material type are being developed and introduced

Seeds along the supply chain

	Collection	Intermediate treatment (dismantling, shredding, sorting)	Resource recovery	Reuse
Operators	Recycling-side companies		Manufacturing-side companies	
Current state	Collection	- Bulk collection with high-grade and low-grade scrap mixed together - Material information at the point of generation is insufficient or unrecorded	Steel	- The iron ore-based blast furnace and converter process is the premise - Scrap is positioned as a secondary raw material for cost adjustment
	Dismantling	- Alloy types and components become mixed during heavy machinery dismantling - Removal of adherents from high-grade metals relies on manual work	Copper	- Smelting is centered on copper ore-based processing, with scrap serving as a complementary raw material - Processing difficulty varies depending on the type of scrap and the impurities contained
	Shredding	- Bulk shredding causes mixing of different metals and grade degradation - Even after shredding, composite materials remain adhered or combined	Aluminum	- New ingots derived from bauxite are the main raw material for sheets and extrusions - Scrap is mainly directed to secondary alloys for castings and die-casting applications
	Sorting	- High-purity metal recovery is difficult for composite materials and plated products - Manual sorting plus gravity sorting are predominant, with labor costs and accuracy presenting challenges		
Seeds for resolving challenges (examples)	Technologies for upgrading the quality of scrap		Technologies for utilizing scrap	
	Utilization of image processing, AI, IoT, robotics, optical analysis, and others		Seeds based on the characteristics and challenges of each metal	
	Collection	- Material-specific management using IoT containers plus RFID C - Electronic manifests plus cloud-based material databases B	Steel	- Innovative electric arc furnaces enabling high-grade steel production (high-efficiency, large electric arc furnaces) C - Expansion of scrap utilization in blast furnace–converter production (low-HMR operations) C
	Dismantling	- Selective dismantling using 3D scanning plus image processing B - Automated pre-treatment using robotics plus ultrasonic cleaning B	Copper	- Enhancement of the volume of scrap that can be charged at primary smelters B - Expansion of scrap processing and utilization through the establishment of new secondary smelters C
	Shredding	- Pre-division by analyzing internal structures with X-ray CT plus AI B - Selective fracturing of interfaces using electromagnetic pulse shredding B	Aluminum	Advancement of effective scrap utilization through the realization of upgrade recycling into wrought products (vertical high-speed twin-roll casting, extraction and phase separation technologies) A
	Sorting	- Alloy identification through multi-element spectral analysis C - Integrated control system combining AI imaging, magnetic sorting, and eddy current sorting B		

Note 1: **A** Research and development stage; **B** Partially demonstrated; **C** Seeds for which the technology has already been established and demonstration projects have been completed, and which will spread going forward

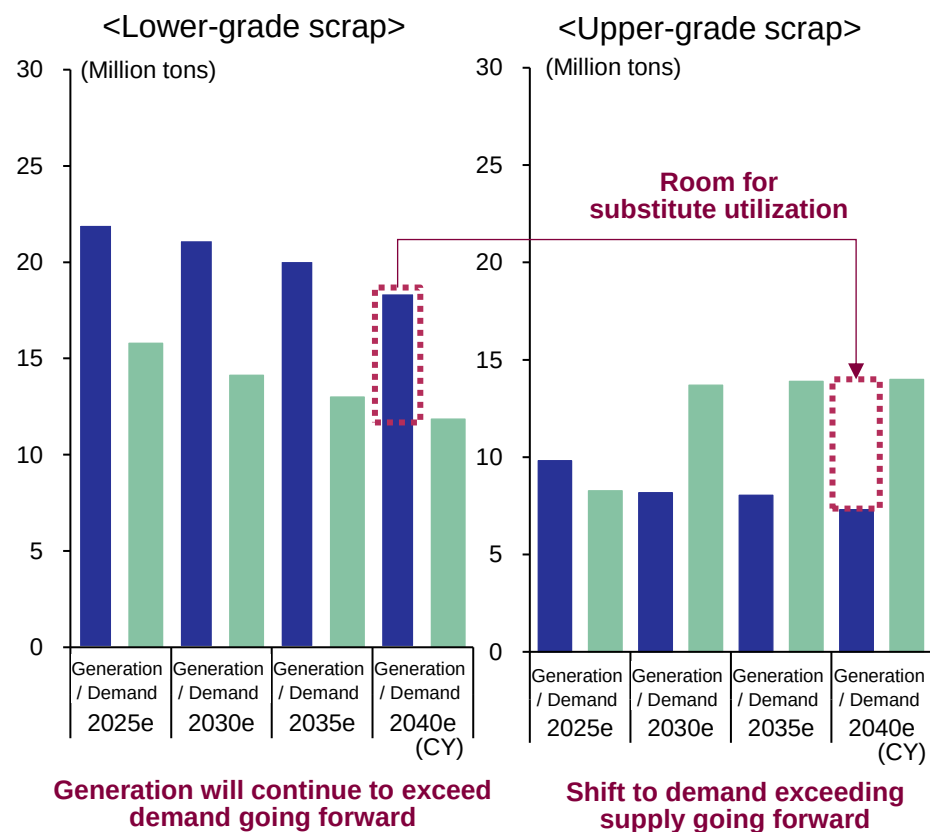
Note 2: HMR (Hot Metal Ratio): The proportion of hot metal (molten pig iron with high carbon content produced by reducing iron ore in a blast furnace) among the main raw materials charged into the converter

Source: Compiled by Industry Research Department, Mizuho Bank, Ltd.

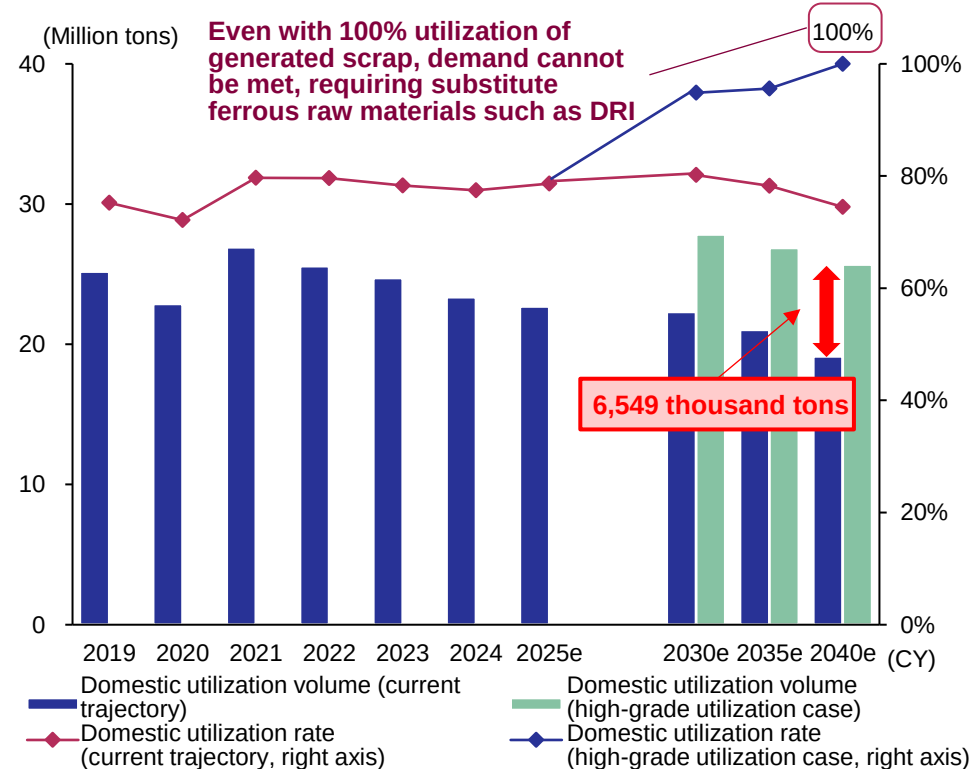
Toward 2040, higher-grade ferrous scrap will be in short supply, expanding business opportunities for quality upgrading of lower-grade scrap

- For ferrous lower-grade scrap, the situation in which the volume generated exceeds the volume of demand is projected to continue going forward, while for higher-grade scrap, the volume of demand is projected to significantly exceed the volume generated. If lower-grade scrap can be upgraded in quality and effectively utilized, it will be possible to compensate for the supply shortage of higher-grade scrap
- Through the effective utilization of lower-grade scrap, the domestic utilization rate of ferrous scrap can be increased and overseas resource outflows can be suppressed; in addition, the creation of a high-value-added business for lower-grade scrap on a scale of up to 6,549 thousand tons is anticipated as a new market for the recycling-side industry

Outlook for supply and demand of market-sourced scrap



Outlook for domestic utilization volume and utilization rate of ferrous scrap



Note 1: The case in which lower-grade scrap is not effectively utilized is defined as the current trajectory; the case in which higher-grade scrap demand is met through effective utilization, within the volume of lower-grade scrap generated, is defined as the high-grade utilization case

Note 2: DRI (Direct Reduced Iron)

Source: Compiled by Industry Research Department, Mizuho Bank, Ltd. based on The Japan Ferrous Raw Materials Association "Ferrous Raw Materials Annual Report"

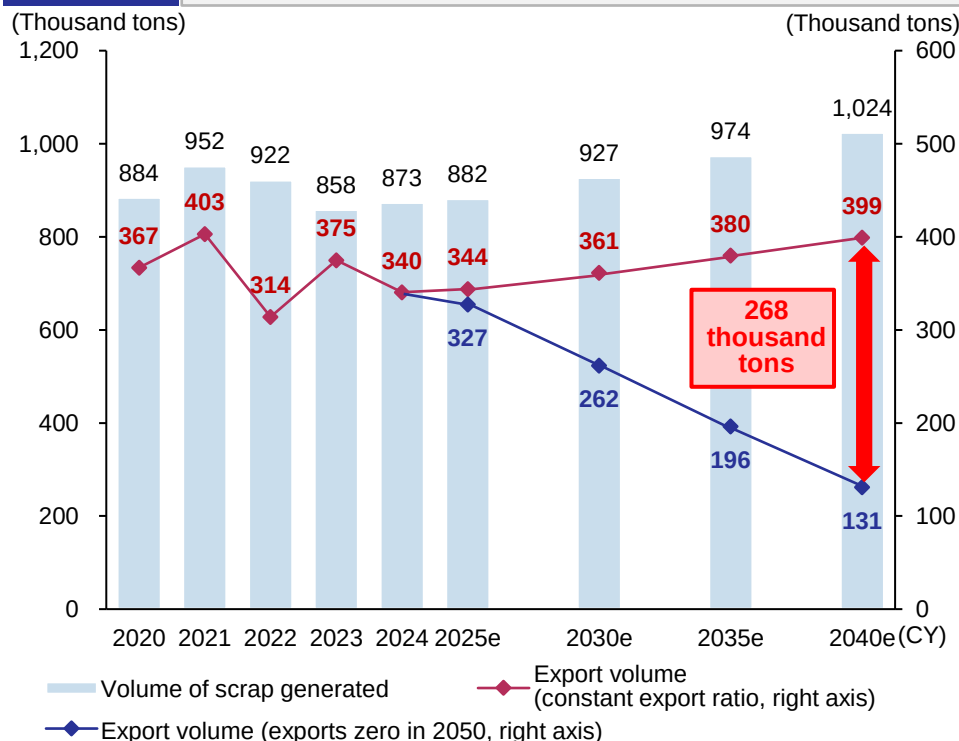
Source: Compiled by Industry Research Department, Mizuho Bank, Ltd. based on The Japan Ferrous Raw Materials Association "Ferrous Raw Materials Annual Report"

The recycling market expands as exports of non-ferrous metal scrap decline and domestic circulation progresses

- At present, exports of non-ferrous metal scrap are centered on low-grade scrap, while higher-grade scrap needed domestically are imported
- If domestic scrap utilization advances through grade optimization, compared with a case in which the export ratio remains at current levels, domestic resource recycling of approximately 268 thousand tons for copper and approximately 332 thousand tons for aluminum will become possible

Outlook for copper scrap volume

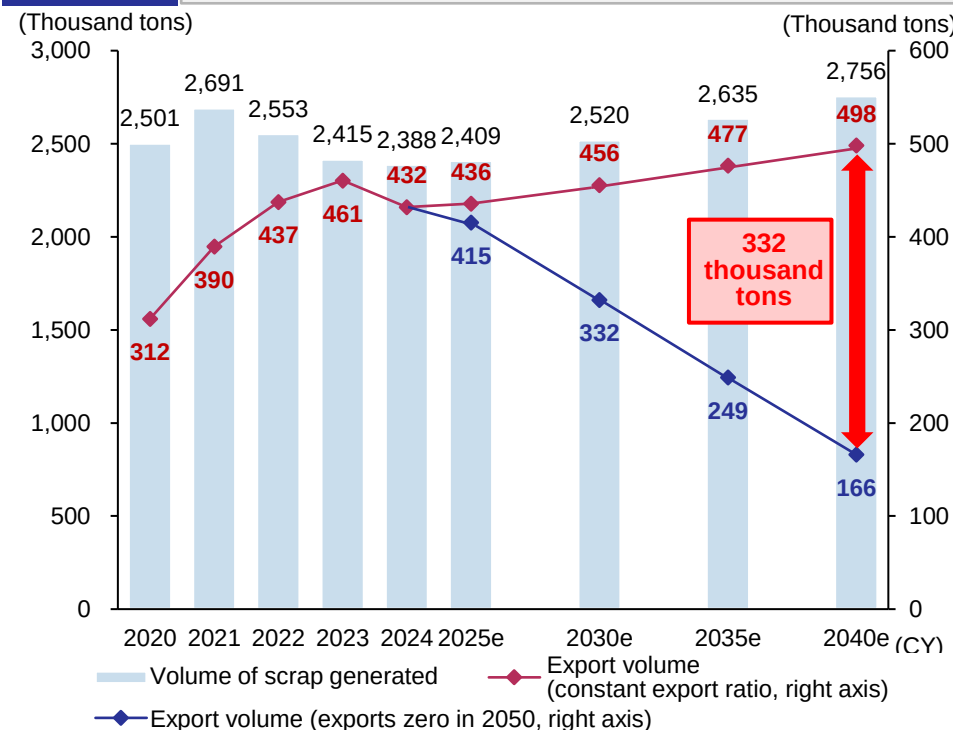
Assumptions	
■ The volume of scrap generated is estimated assuming that the growth rate of domestic copper demand is +1.0% per year, with the volume generated increasing accordingly	
■ The export ratio relative to scrap generated was 39.0% in the 2024 actual result; the export volumes are estimated for the case in which this ratio remains constant and for the case in which all scrap is assumed to be utilized domestically in 2050	



Source: Compiled by Industry Research Department, Mizuho Bank, Ltd. based on Nikkan Shikyo Tsushin "Nikkan Shikyo Tsushin" and Global Trade Atlas

Outlook for aluminum scrap volume

Assumptions	
■ The volume of scrap generated is estimated assuming that the growth rate of domestic aluminum demand is +0.9% per year, with the volume generated increasing accordingly	
■ The export ratio relative to scrap generated was 18.1% in the 2024 actual result; the export volumes are estimated for the case in which this ratio remains constant and for the case in which all scrap is assumed to be utilized domestically in 2050	

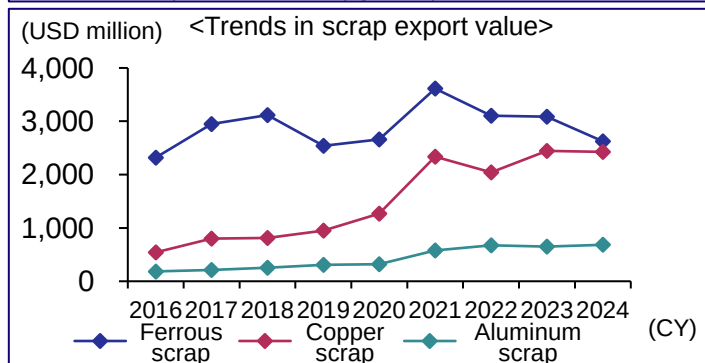
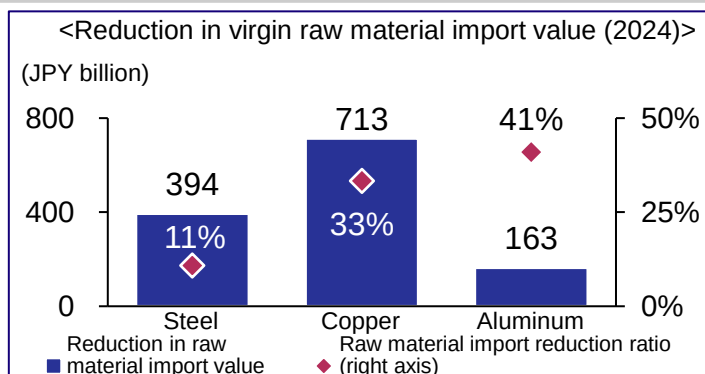


Source: Compiled by Industry Research Department, Mizuho Bank, Ltd. based on Nikkan Shikyo Tsushin "Nikkan Shikyo Tsushin," Global Trade Atlas, and Japan Aluminum Association

Shifting raw material procurement sources from overseas to within Japan is expected to also contribute to improving the trade balance

- If domestic resource recycling is promoted and ferrous, copper, and aluminum scrap currently exported overseas is reused domestically, the trade balance is estimated to improve by approximately JPYB406.8 based on 2024 actual values
 - Although electric power consumption increases during the recycling process, even if it were entirely covered by LNG-fired power, the negative impact on the trade balance from LNG procurement would be limited at approximately JPYB38.0
- Reducing the import volume of virgin raw materials and minimizing the ratio of resource procurement from overseas is also effective from the standpoint of economic security

Effects of promoting resource recycling



Trade balance improvement of approximately JPYB406.8
(Estimated based on 2024 actual values)

Virgin raw material imports (2024)

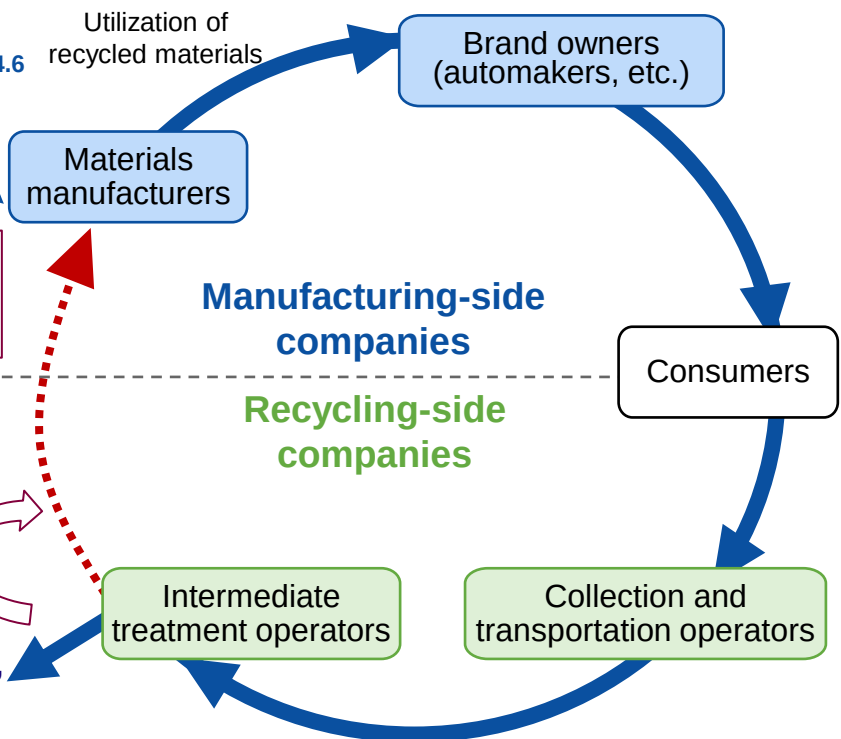
- Iron ore: JPYB1,700.6
- Coking coal: JPYB1,948.6
- Copper concentrate: JPYB2,144.6
- Aluminum ingots: JPYB398.4

Reducing the import volume of virgin raw materials and minimizing the ratio of resource procurement from overseas

Shift from overseas exports to domestic resource recycling

Scrap exports (steel, copper, aluminum)

→ : Current flows ...→ : Anticipated future flows

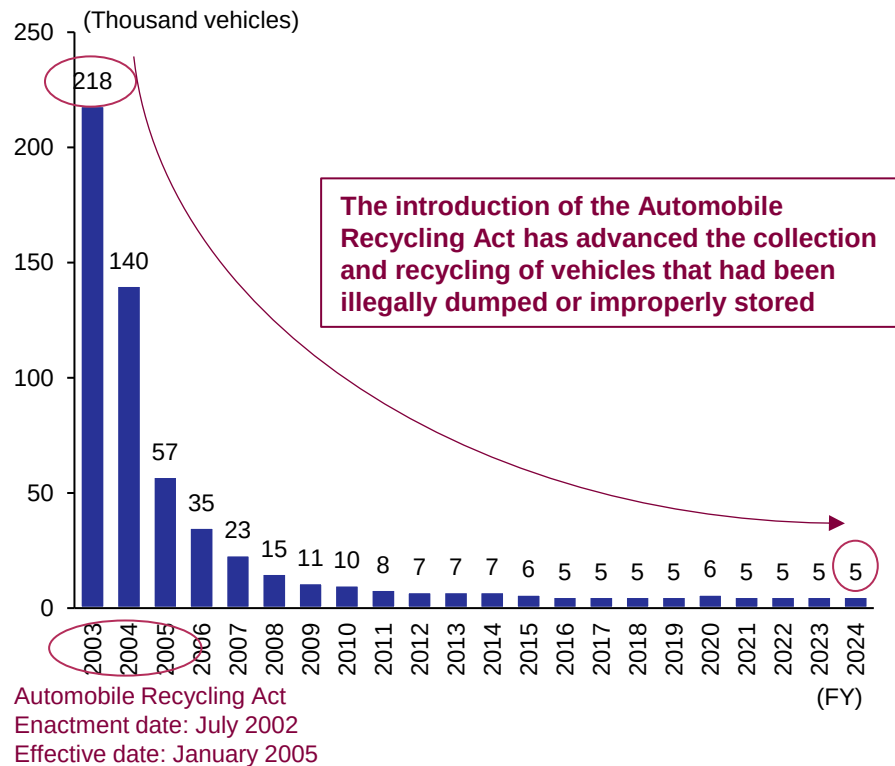


Note: Operations of electric arc furnaces, melting furnaces, and shredder facilities increase electric power consumption by 2.84 billion kWh; LNG price is assumed at USD 700 per ton
 Source: Compiled by Industry Research Department, Mizuho Bank, Ltd. based on Ministry of Finance "Trade Statistics," IEA "World Energy Outlook 2024," Agency for Natural Resources and Energy "6th Working Group on Verification of Power Generation Costs, Document 2: List of Specifications for Each Power Source," Nikkan Shikyo Tsushin "Metal Recycling Handbook," and the Electricity and Gas Market Surveillance Commission website

Efficient collection and recycling systems for waste products and the presence of players with export competitiveness

- Japan has long worked to establish waste collection and recycling systems as a countermeasure against the tightening capacity of landfill disposal sites
 - For example, with the introduction of the Automobile Recycling Act, many vehicles that had been illegally dumped or improperly stored were directed to recycling
- The presence of materials industries and brand owners with export competitiveness and the potential to integrally carry out the entire process from production to reuse are also strengths

Number of vehicles remaining illegally dumped or improperly stored following the introduction of the Automobile Recycling Act



Note: Improper storage: the state in which end-of-life vehicles are left or stored in violation of storage standards

Source: Compiled by Industry Research Department, Mizuho Bank, Ltd. based on Ministry of Economy, Trade and Industry / Ministry of the Environment "Subcommittee on the Circular Economy, Automobile Recycling Working Group: Current Status of the Automobile Recycling System" (2025)

Positioning of each country in materials and demand-side industries

<Materials industries: Steel export volume>

Rank	Country	Steel export volume (million tons, 2024)
1	China	103
2	Japan	37
3	Germany	29
4	Korea	27
5	Indonesia	21

<Materials industries: Export volume of copper and its products>

Rank	Country	Copper export volume (million tons, 2024)
1	United States	1.7
2	Germany	1.5
3	China	1.4
4	Japan	1.3
5	Korea	0.6

Automobile export volume (million units, 2023)

Rank	Country	<Demand-side industries: Automobile export volume>
1	China	4.1
2	Japan	4.0
3	France	3.2
4	Germany	3.1
5	Korea	2.7

Note 1: HS codes – Steel: 72; Copper: 74 (Data for Chile and the Democratic Republic of the Congo are NA)

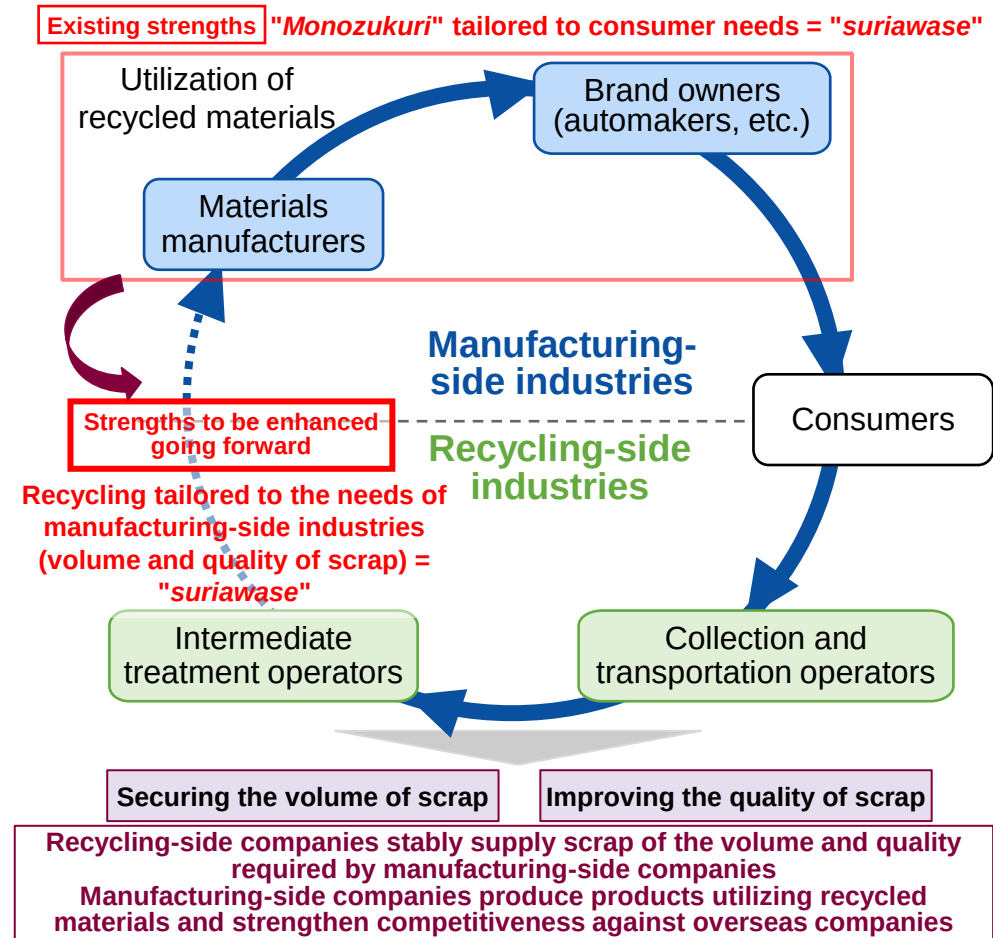
Note 2: Automobile export volume covers passenger cars only

Source: Compiled by Industry Research Department, Mizuho Bank, Ltd. based on Global Trade Atlas and Japan Automobile Manufacturers Association

Through collaboration between manufacturing-side and recycling-side industries, recycling-side companies supply scrap of the volume and quality required by manufacturing-side companies in a timely, appropriate, and stable manner

- For recycling-side companies to supply scrap of the volume and quality required by manufacturing-side companies in a timely, appropriate, and stable manner, the "suriawase" that has previously taken place between materials manufacturers and brand owners must also be implemented between manufacturing-side and recycling-side players
 - By leveraging Japan's strength of jointly conducting "monozukuri" tailored to consumer needs through the pooling of technologies, needs, and constraints held by multiple players, and applying this strength to the relationship between manufacturing-side and recycling-side players, the manufacturing industry, including the supply and procurement of raw materials, can be further strengthened

Strategies to be adopted by Japan



Source: Compiled by Industry Research Department, Mizuho Bank, Ltd.

Patterns of collaboration between manufacturing-side and recycling-side industries

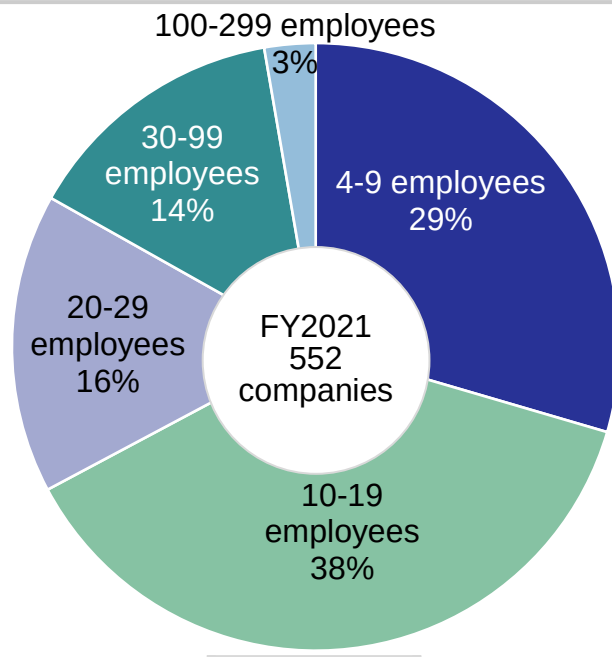
	Joint venture / consortium type	JV / minority investment type	Wholly-owned subsidiary / intra-group integration type
Approach			
Overview	- Formation of a closed loop among multiple companies - Manufacturing-side and recycling-side companies establish a consortium and jointly conduct research and technology development	- Joint operation through a joint venture company - Minority investment in recycling-side companies	- Manufacturing-side companies make recycling-side companies wholly-owned subsidiaries - Operate them as an integrated value chain within the group
Strengths & weaknesses	- Can involve a large number of stakeholders at low risk - Speed and profitability tend to become ambiguous	- Easy to balance risk and degree of involvement - Risk that governance becomes insufficiently robust	- Enables group-wide optimization and fast decision-making - Heavy investment burden

Source: Compiled by Industry Research Department, Mizuho Bank, Ltd.

In addition to the absence of major recycling-side companies and labor shortages serving as barriers, the need to certify the reliability of recycled materials is also rising

- The absence of major recycling-side companies capable of meeting the requirement levels of manufacturing-side companies in terms of scrap quality, volume, and other factors has become an impediment to collaboration between manufacturing-side and recycling-side industries
- Going forward, as labor shortages increase the difficulty of dismantling and sorting, there is concern that securing quality will become even more challenging
- For Japanese companies exporting products to Europe and companies within their supply chains, the need to grasp information from the generation of metal scrap through to its recycling and utilization is rising, in order to supply such information to European digital platforms

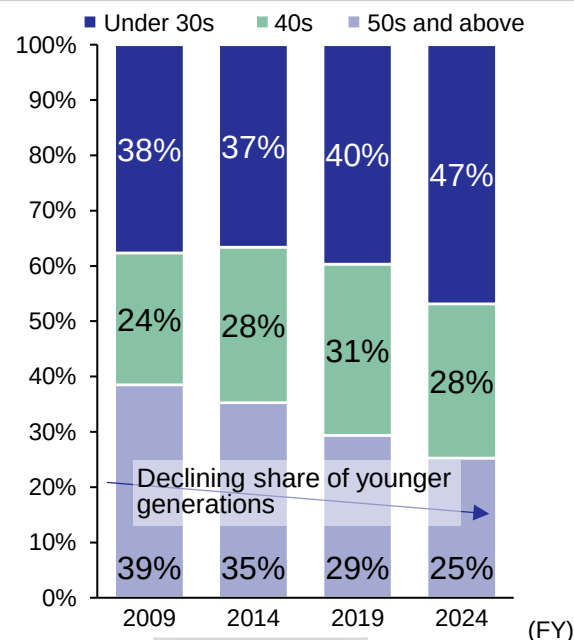
Distribution of employee numbers among ferrous scrap processing operators



The absence of major recycling-side companies in Japan acts as an impediment to the growth of the circular industry

Source: Compiled by Industry Research Department, Mizuho Bank, Ltd. based on Statistics Bureau "2021 Economic Census – Activity Survey" and other sources

Composition of workers in the waste treatment industry



Possibility that labor-dependent scrap processing will become more difficult in the future

Source: Compiled by Industry Research Department, Mizuho Bank, Ltd. based on Ministry of Health, Labour and Welfare "Basic Survey on Wage Structure" and other sources

Developments in Europe regarding data visualization

	Direction of Europe	Main applicable regulations (examples)
Digital Product Passport (DPP)	- Assignment of a DPP to each product - Digitalization, management, and sharing of information on structure, materials, contained substances, recyclability, and other attributes	Ecodesign for Sustainable Products Regulation (ESPR)
Traceability including environmental information	Disclosure of environmental information such as recycled content ratio, efficiency, and CO2 emissions	EU Battery Regulation
Integrated implementation with human rights and environmental due diligence	Identification of high-risk regions and operators and management of human rights and environmental risks	- Conflict Minerals Regulation - Corporate Sustainability Due Diligence Directive

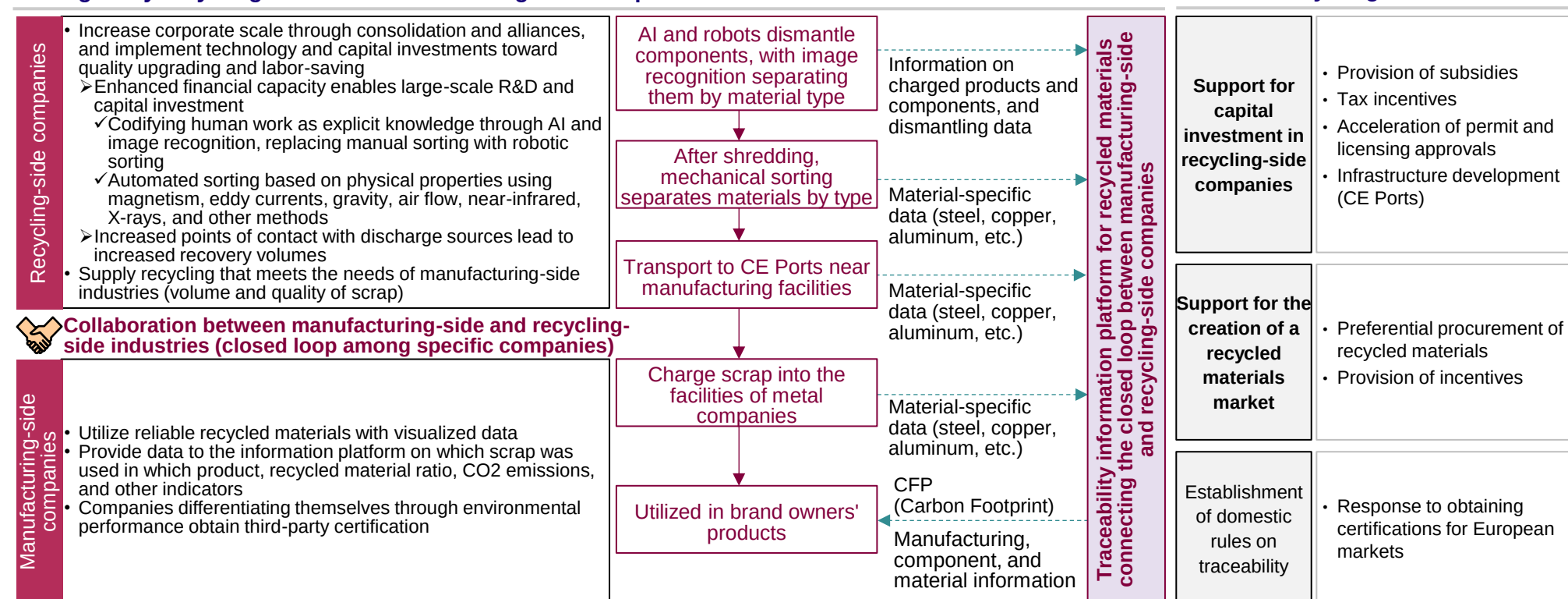
Acts as an impediment to expansion for companies exporting products from Japan to Europe

Source: Compiled by Industry Research Department, Mizuho Bank, Ltd. based on the European Commission official website and other sources

Strengthen financial capacity, introduce large-scale, high-efficiency recycling facilities, and secure the reliability of recycled materials

- Recycling-side companies strengthen their financial capacity through consolidation and alliances, accelerate R&D and capital investment, and resolve challenges such as labor shortages by introducing technology for labor-saving
- Manufacturing-side and recycling-side companies form a closed loop and jointly build a traceability information platform for recycled materials utilizing blockchain
 - Through grasping how recycling-side companies recycle materials after use and what kinds of recycled materials manufacturing-side companies use, the reliability of recycled materials is secured with third-party certification
- The government supports private investment in advanced facilities and the creation of a domestic market for recycled materials

Strategies by recycling-side and manufacturing-side companies



Collaboration between manufacturing-side and recycling-side industries (closed loop among specific companies)

Manufacturing-side companies • Utilize reliable recycled materials with visualized data • Provide data to the information platform on which scrap was used in which product, recycled material ratio, CO2 emissions, and other indicators • Companies differentiating themselves through environmental performance obtain third-party certification
--

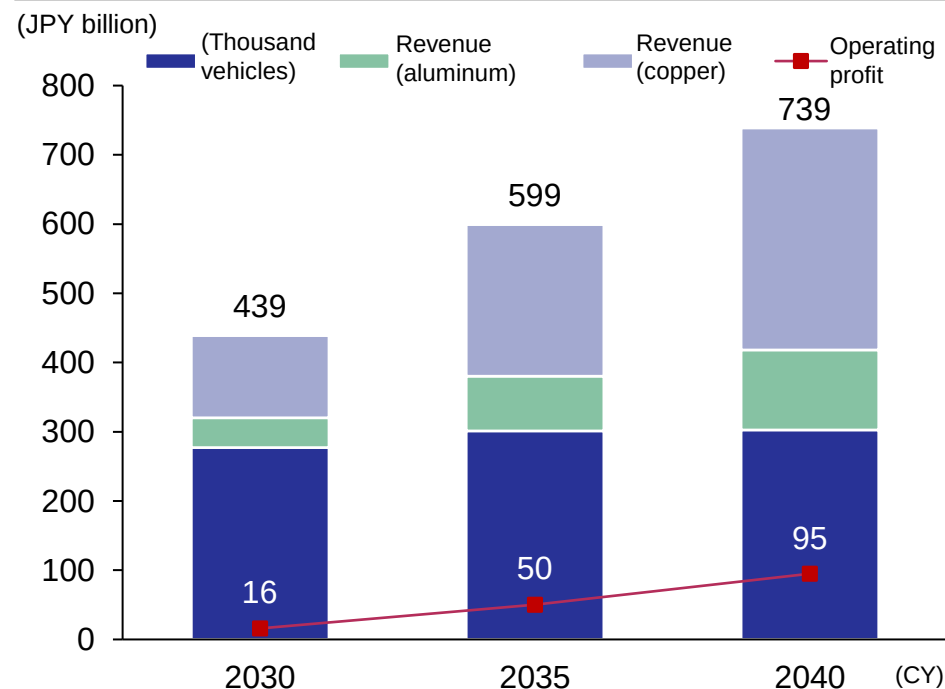
Note: CE (Circular Economy) Port: Ports with industrial clusters possessing advanced recycling technologies, to be designated by the government

Source: Both charts compiled by Industry Research Department, Mizuho Bank, Ltd.

Expansion of the domestic metal recycling market through quality upgrading of scrap and its circulation back into the domestic market

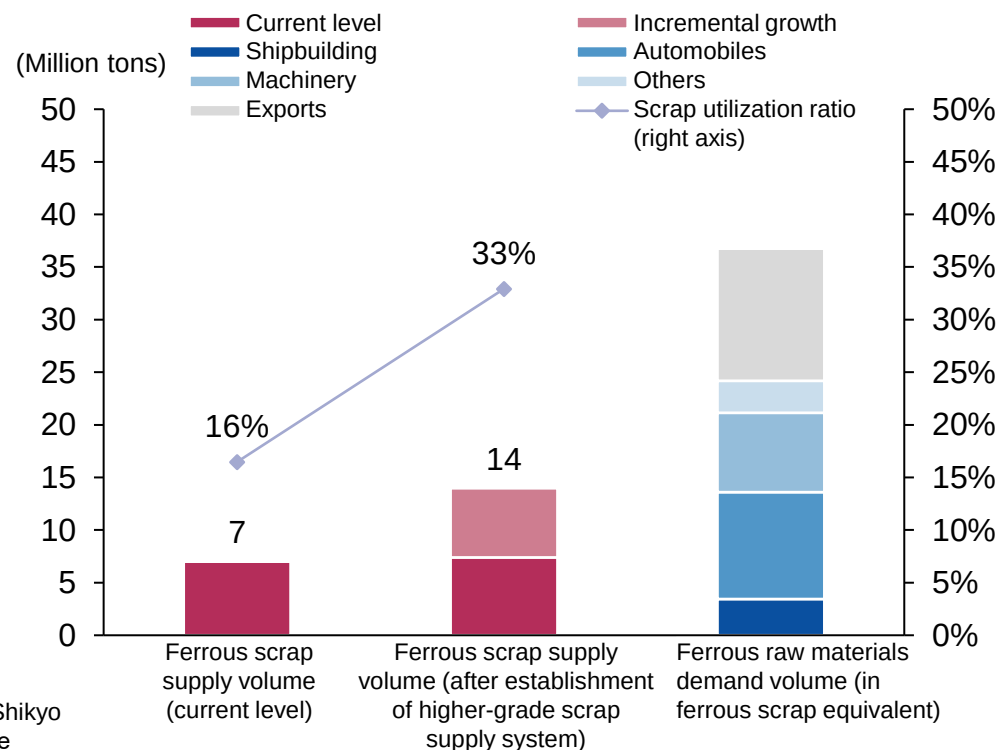
- Metal recyclers, by upgrading the quality of metal scrap through automated precision dismantling, shredding, and advanced mechanical sorting, will sell scrap currently exported overseas to manufacturing-side companies within Japan
 - By metal recyclers selling high-grade scrap domestically, revenue is projected to increase by approximately JPYB738.8 in 2040
- Amid intensifying requirements for the utilization of recycled materials both domestically and overseas, progress in the domestic circulation of metal scrap contributes to securing the international competitiveness of demand-side industries
 - For example, with regard to steel, against a maximum scrap demand of 42 million tons for the manufacturing industry in 2040, quality upgrading of scrap will enable an additional supply of 7 million tons of higher-grade scrap, raising the recycled material ratio to 33%

Incremental growth in the metal recycling market through quality upgrading and domestic circulation of metal scrap



Source: Compiled by Industry Research Department, Mizuho Bank, Ltd. based on Nikkan Shikyo Tsushin "Metal Recycling Handbook," "Nikkan Shikyo Tsushin," and "Metal Recycle Monthly," as well as Japan Ferrous Raw Materials Association "Ferrous Raw Materials Annual Report," and other sources

Supply volume of higher-grade ferrous scrap in 2040 and steel product output for the manufacturing industry (including exports)



Source: Compiled by Industry Research Department, Mizuho Bank, Ltd. based on Japan Ferrous Raw Materials Association "Ferrous Raw Materials Annual Report"

(Reference) Assumptions for the simulation

- Investment in shredders, automated precision dismantling facilities, LIBS sorters, and other equipment to process steel, aluminum, and copper into high-grade scrap
 - Across the entire supply chain, investment in large electric arc furnaces and the associated increase in electric power consumption are also assumed (excluded from the simulation)

Assumptions for the market expansion simulation based on quality upgrading and domestic circulation of metal scrap

Methods of upgrading quality	Steel	■ Quality upgrading of surplus lower-grade scrap in Japan into higher-grade scrap ■ Recovery of higher-grade scrap from automobiles through automated precision dismantling (assumed at approximately 620 kg of steel per vehicle) ■ Other steel is upgraded in quality through shredders	CAPEX	Automated precision dismantling equipment	■ JPYB100.0 in investment in automated precision dismantling facilities ➢ Approximately 1 million vehicles are targeted (target value set by the BlueRebirth Council)
	Non-ferrous	■ Quality upgrading of low-grade non-ferrous scrap currently exported overseas ■ Sorting by type using LIBS sorters and other equipment		Shredders and sorting equipment	■ Assuming the utilization rate of existing shredder facilities at 40%, the volume of ferrous scrap processed is increased so that the shredder facility utilization rate reaches 100% for quality upgrading ■ Existing facilities lack processing capacity of approximately 2.1 million tons of ferrous scrap. To compensate for this shortfall, JPYB180.0 is invested in shredders, buildings, sorting equipment, and other facilities ➢ Referenced from the investment amount at REVER Corporation's ELV Kawashima plant
Price	Steel	■ Higher-grade scrap is granted a green premium, rising from JPY43,000 per ton in 2025 to JPY53,800 per ton in 2040 ➢ Assumed to be at a level comparable to the future cost of CO2 emissions regulation applied to existing blast furnace production methods. Toward 2040, a charge of JPY20,000/t-CO2 is applied to the excess portion exceeding 70% of the 2025 level on a CO2 emissions intensity basis. The CO2 emissions intensity for existing blast furnace production methods in 2025 is estimated at 1.8 t/ton ■ Lower-grade scrap is set to remain flat at the 2024 end-of-life vehicle hulk price of JPY30,000 per ton		LIBS sorters	■ JPYB36.0 in investment in LIBS sorters for the purpose of advanced sorting processing of 360,000 tons of aluminum scrap ➢ Referenced from the LIBS investment amount at ARBIZ Corporation
				Depreciation	■ Estimated using the straight-line depreciation method over 10 years
				Subsidies	■ Adopting the 1/2 capital investment subsidy rate from the Ministry of the Environment's "Industry-Government-Academia Collaboration Promotion Project for Expanding the Supply of Recycled Materials in Automobiles," assuming half-cost subsidies for each facility
	Non-ferrous	■ The price of higher-grade scrap is set as the import price and the price of lower-grade scrap as the export price; the value of quality upgrading is calculated using the difference between the 2024 import and export prices (the price gap between exports and imports is assumed to be constant)		OPEX	■ Labor costs, electric power costs, dust treatment costs, and other items are set based on data from Nikkan Shikyo Tsushin "Metal Recycling Handbook"
				Start of operation date	■ Newly introduced facilities begin operation from 2028, when large electric arc furnaces start operations

Note: LIBS sorter: A sorting machine that utilizes lasers to analyze the elemental composition of metals such as aluminum alloys and sorts them at the elemental level

Source: Compiled by Industry Research Department, Mizuho Bank, Ltd. based on Nikkan Shikyo Tsushin "Metal Recycling Handbook," "Nikkan Shikyo Tsushin," and "Metal Recycle Monthly," Japan Ferrous Raw Materials Association "Ferrous Raw Materials Annual Report," Japan Aluminum Association materials, the River Co., Ltd. website, Abidu Co., Ltd. "FY2024 Final Report on the Subsidy Project for Surveys, Research, and Demonstrations Contributing to the Advancement of Automobile Recycling," and other sources

Industry Research Department

Primary Materials Team

Takashi Okamoto

Kouta Kume

kouta.kume@mizuho-bk.co.jp

Yuki Morita

yuki.c.morita@mizuho-bk.co.jp

Toru Sugimoto

Mizuho Industry Research／80 2026

Published March 31, 2026

© 2026 Mizuho Bank, Ltd.

This document has been prepared solely for the purpose of providing information. This document is not recommendation for sales. This document has been prepared based on information believed to be reliable and accurate. The Bank accepts no responsibility for the accuracy or appropriateness of such information. Upon using this document, if considered appropriate, or if necessary, please consult with lawyers, CPAs and tax accountants. This document may not be altered, reproduced or redistributed, or passed on to any other party, in whole or in part, without the prior written consent of Mizuho Bank, Ltd.

Edited / issued by Industry Research Department, Mizuho Bank, Ltd

1-3-3 Marunouchi, Chiyoda-ku, Tokyo ird.info@mizuho-bk.co.jp