Green steel demand in Japan – market status and enablers

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Prepared by Accenture Development Partnerships for WWF-Australia

accenture

Executive Summary

Demand for low-emission steel products is a critical enabler for the decarbonisation of the global steel industry. The steel sector is in a state of high transition costs, low supply of lower-emission products, and weak emergent demand. Japan has taken a proactive path in attempting to progress from this stalemate. In this report, we examine Japan's efforts to build a market for steel with reduced emissions. We look at what this approach has achieved, and ask key sector stakeholders from government, producers, user industry bodies, corporate steel buyers and investors how these efforts should evolve.

We describe the Japanese steel market and its initiatives, and the state of domestic and international uptake of these products. We review domestic and international policy and initiatives, and emerging mandatory emission reporting requirements that impact the Japanese steel industry. We also present market trends and decarbonisation progress in the wider ASEAN region.

Japan is the world's third largest steel producer, producing 83 million tonnes of crude steel in FY2024 from predominantly blast furnace (BF) technology (73%). Around 70% of steel made in Japan is for the domestic market. In addition to the need to decarbonise production, the domestic industry faces pressure from declining sales and rising competition. Asia (particularly Korea, Thailand and China) is a key export market. Japan is critical trading partner for Australian iron ore, as the third-largest importer.

Steel decarbonisation is one of the key priorities for Japan's "Green Transformation (GX)", a policy and incentive program to take Japan towards carbon neutrality in 2050 - Japan's answer to driving economic growth whilst reducing greenhouse gas emissions. In Japan, a specific category of BF steel ("green steel for GX") is promoted as part of the current GX program. GX focuses on the decarbonisation of blast furnace-based production because (1) this is the high-emission technology and hence a high priority for investment in abatement; and (2) using current production capability is seen as a way to remain in an increasingly competitive market whilst beginning to reduce emissions and creating a marketable product that does not require waiting for broader technology replacement.

To support GX steel, the mass balance system of calculating emission reduction is promoted by Japan both domestically and internationally and has received some international endorsement in the emerging global definitions and standards environment. This methodology enables products to receive labels that are based on an entity's overall emission reduction efforts, rather than reflecting the embodied carbon of individual products. However, this approach has received criticism for not reflecting actual product emissions, not including electric arc furnace (EAF) – produced steel (which already has lower emissions than BF steel), and not including broader sustainability and circularity criteria.

Our findings recommend that future improvements to Japan's steel decarbonisation efforts consider the following stakeholder feedback:

- There is a general hope that GX steel will be internationally recognised as a method of creating an initial product and market. However, it is also recognised that early demand is typically from corporations who value high environmental credentials as an important part of their sustainability commitments and branding. These stakeholders do not always accept GX steel as meeting their ideal of a low-emission product and see EAF steel (in cases where products with comparable performance to BF steel are available) as having better current environmental credentials. EAF green steel is also seen by some sectors as a better investment opportunity.

- EAF steel should be included in government definitions of green steel and included in subsidies, green public procurement initiatives, and in standards because of its existing emission reduction benefit. The circularity benefits of steel recycling should also be recognised. Subsidies and concessions should be more balanced to include both BF and EAF producers in a way that disadvantages neither, because decarbonisation of both production types is needed to achieve national decarbonisation goals.

- Many are confused about current market definition of green steel. There is urgent need for an easy-to-understand criteria for buyers to use when evaluating corporate decarbonisation efforts. Investors struggle to judge whether efforts are good or bad. Both clearer evaluation indicators and buyer education is needed to encourage investors to make judgments. Without mechanisms such as labelling and assurance that convey the value of environmental efforts to the market, investment will not progress.

- Definitions of green steel need to continue to evolve in a way that builds recognition of environmental values as being of equal worth to economic priorities across entire supply chains. One important priority is creating a clear system for carbon footprint/environmental product declaration calculations and a pathway for these to become mandatory. Questions were also raised on the compatibility of mass balance methodology with Scope 3 emission reporting requirements. Without accepted certification, many buyers are reluctant to adopt green steel products. Transparency in global standardisation and certification standards are seen as drivers of demand.

- In addition to current policy and fiscal support from the Japanese government, further support will be needed to both stimulate demand and initial investments in more comprehensive decarbonisation technologies. One of the biggest challenges is retaining commercial feasibility whilst increasing environmental viability. While some stakeholders feel that buyers should bear the cost of reduced emission products, more thought needs to be given to how the costs of decarbonisation can be shared across the entire value chain. Buyers are concerned that paying higher premiums for lower emission products will impact their competitiveness, and about the suitability of non-BF alternatives for high-specification products. Producers believe that the government should explore more ways to reduce the implementation costs of new low-emission technologies and guarantee returns on decarbonisation investments. Future incentives should include support for both producers and buyers.

- Most stakeholders believe that without carbon pricing and a carbon trading market, full decarbonisation will remain too costly.

- Most stakeholders believe that mandatory emission reduction targets and emission disclosure requirements (with penalties for non-compliance in some cases), and mandatory use of lower emission products are needed to achieve both the required amount of emission reduction and to provide investment certainty. There is reluctance to invest in decarbonisation efforts including green steel from the finance sector without a clear policy and regulatory pathway for decarbonisation not just for now, but all the way to 2050. Investors know tighter decarbonisation policy is ultimately necessary and would prefer policy predictability over weaker and often voluntary initiatives so that future costs can be predicted.

- Infrastructure support, including renewable energy and hydrogen availability, and the development of carbon capture and storage/carbon utilisation and storage (CCS/CCUS) technology, are seen as a key role of government and not a producer responsibility. The government also has a key role in social education on the importance of developing and using low-emission products.

- Both domestic and international collaboration efforts need to be increased. The challenge is to do this whilst navigating an environment focused on increased resource nationalism and perceived geopolitical risks.

Current steel sector decarbonisation efforts are recognized as economically critical but not currently enough for Japan to meet its long-term emission reduction requirements. Those interviewed for this report believe that Japan can build on its initial efforts in steel decarbonisation, market creation and advancing international conversations on definitions by continuing to review and improve current incentives. The priority is to develop and implement a clear and certain pathway on agreed principles, verification methods, standards and definitions that everyone agrees will deliver on 2050 decarbonisation goals.

5. Findings and recommendations

In order to improve the marketability of GS during the transition and until the use of low-emission products becomes normalised, it is necessary for industry and government to work together to take measures to resolve both supply and demand issues. The government also needs to deepen international discussions on decarbonisation.

Effective Drivers	Target	Necessary Initiatives
Establishment of definition and evaluation criteria	Supply	• Diversify definitions and harmonise international standards • Establishment of systems to ensure that CFP is attributed to products. Environmental value needs to be recognised on par with economic value
	Demand	• Standardisation and international standardisation of definitions and evaluation criteria through cooperation between supply and demand
Incentives/ policy support	Supply	• In addition to the current support, support and subsidies need to be provided to the steel industry to implement initiatives that can contribute to decarbonisation in line with the progress of the CN roadmap
	Demand	• Provision of subsidies and tax incentives to support initial investment
Regulations and mandates	Supply	• Establishment of a carbon pricing • Development of a corporate evaluation framework and creation of a trading market based on a carbon pricing
	Demand	• Introduction of emission reduction obligations and emission controls in addition to emission disclosure requirements
Technology development/ procurement of raw materials and energy	Supply	• Building a decarbonisation infrastructure supply chain through international cooperation, free from resource nationalism, and supporting technological development via collaboration with other countries • Expansion of the use of EAFs to promote local production and consumption of steel scrap
External environment	Society/End-Consumers	• Promotion of dialogues between relevant ministries and industries to foster awareness and resolve issues throughout society • Strengthening enlightenment activities to increase understanding of environmental values for end-consumers and customers
	Investors	• Establishment of evaluation indicators to encourage investors to evaluate reductions and environmental values

Goals

Transition period

- End users/consumers purchase GS to benefit from its environmental value. The costs of decarbonisation are shared throughout the supply chain
- GS with various definitions for the transition period becomes common and is utilised by users to reduce emissions
- Environmental value is evaluated in the same way as economic value, driving increased demand and sustainable decarbonisation investment by manufacturers

A world where the distribution of low-zero emission steel and a sound cycle of decarbonisation investment and returns occur

Production and dissemination of green steel that does not rely on fossil fuels

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Abbreviations

ASEAN	The Association of Southeast Asian Nations
BF-BOF	Conventional steel production by blast furnace-basic oxygen furnace technology (BF in this report)
B2C	Business to consumer sector (direct sales)
CAPEX	Capital expenditure
CBAM	EU Carbon Boarder Adjustment Mechanism
CCS/CCUS	Carbon capture, storage +/-utilisation
CDP	An independent environmental disclosure initiative
CFP	Carbon footprint of products
CN	Carbon neutrality (balancing the amount of emitted CO_2 with the amount offset)
CEV	Clean energy vehicle subsidy
CO_2	Carbon dioxide
CSRD	EU Corporate Sustainability Reporting Directive
DRI/DR	Direct-reduced iron/direct reduction
EAF	Electric arc furnace
EPD	Environmental product declaration (description of the environmental impact of a product)
ER	Greenhouse gas emission reduction
ESRS	European Sustainability Reporting Standards
ETS	Emission trading scheme
EU	European Union
EV	Electric vehicle
FY	Japanese fiscal/financial year
GHG	Greenhouse gas
GPP	Green public procurement
GX	Green Transformation (Japan's *Basic Policy for the Realisation of Green Transformation)*
GX steel	Steel included in Japan's GX policy
IBECs	Institute for Build Environment and Carbon Neutral for Sustainable Development Goals
IEA	International Energy Agency
ISO	International Organization for Standardization
ISSB	International Sustainability Standards Board

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Abbreviations (continued)

JAMA	Japan Automobile Manufacturers Association
JFCC	Japan Federation of Construction Contractors
JISF	The Japan Iron and Steel Federation
JPY	Japanese Yen
LCA	Life-cycle assessment (method for impact assessment for the life cycle of a product, process or service)
LCI	Life-cycle inventory
METI	Ministry of Economy, Trade and Industry
MLIT	Ministry of Land, Infrastructure, Transport and Tourism
MOE	Ministry of the Environment
Mt	Million tonnes (metric)
NFRD	Non-Financial Reporting Directive (EU)
NG	Natural gas
NEDO	New Energy and Industrial Technology Development Organisation
NZ	Net zero (elimination of GHG emissions coupled with offsets)
OECD	Organization for Economic Cooperation and Development
OEM	Original equipment manufacturer (product or component producer)
OPEX	Operating expenses
p.a.	Per annum
PDS	Product disclosure statement
PPA	Power purchase agreement
R&D	Research and development
RE/REC	Renewable energy/renewable energy certificate
RECAJ	The Real Estate Companies Association of Japan
SBTi	Science-Based Targets Initiative
SDGs	Sustainable Development Goals
SEC	SEC Climate Rules of the US Securities and Exchange Commission
SMEs	Small and medium-sized enterprises
SSBJ	Sustainability Standards Board of Japan
USD	United States dollars
WSA	World Steel Association (also written as Worldsteel)
WWF	WWF-Australia, part of the global WWF network

Definitions of "green steel" used in this report

There are differing interpretations on the meaning of "*green steel*", and as yet no global consensus. In Japan, as elsewhere, there can be different degrees of correspondence between green labels and the embodied carbon of products, requiring that investors and buyers independently assess the individual merits of corporate decarbonisation plans and marketed products.

Globally it is recognised that there is an urgent need for comparable and transparent definitions to both build markets and confidence in the products sold. This slide gives examples of current definitions and presents the WWF-Australia position. Definitions in use in Japan are covered in section 1.

The current level of emissions associated with typical BF-BOF steel production are up to 3 tonnes of CO_2 / tonne of crude steel (if coal-related emissions are included). The World Steel Association (WSA) estimates the global average emissions from the BF-BOF production in 2023 at 2.32 tonnes of CO_2 / tonne of crude steel. In FY2024, Japan's Nippon Steel BF-BOF operations averaged over 2 tonnes of CO_2 / tonne of crude steel.

Global	• The WSA understands green steel as steel manufactured using breakthrough technology, steel produced from scrap, reused and remanufactured steel, and conventional steel with emissions offset through the use of carbon units or allowances. In November 2024, the WSA guideline was formulated based on the Green Steel Guideline established by the Japanese steel industry. • The International Energy Agency (IEA) defines near-zero emission primary steel as a "steel product produced by generating less than 400 kilograms of CO_2 equivalent (total GHG emissions) per tonne of steel" in communique issued ahead of the G7 Climate, Energy and Environment Ministers Meeting in May 2022 (Achieving Net Zero Heavy Industry Sectors in G7 Members)
WWF	WWF-Australia uses a broader definition, chosen to reflect the need for the sector to meet its emission reduction requirements at levels compatible with the Paris Agreement – a reduction of 50% by 2030 and 95% by 2050 against 2020 levels[2], and the broader need to minimise further negative impacts on nature and communities: • Green iron is iron produced without the use of fossil fuels. Only power from renewable energy is used, and renewable hydrogen (hydrogen made from water by electrolysis) is used where reductants are needed. The small amount of carbon needed to make steel is also replaced with carbon that is not sourced from fossil fuels or unsustainable biomass sources. • Green also means that low-emission industries prioritise avoidance of adverse environmental, biodiversity and community impacts. The carbon intensity of the entire steel production value chain needs to be known to ensure processes are low-emission. WWF has released a guidance document to assist steel buyers: Toolkit for lower emission steel procurement

Source: 1. https://www.nipponsteel.com/en/ir/library/pdf/20250509_200.pdf 2. 1.5C Steel: decarbonising the steel sector in Paris-compatible pathways - E3G

1. Green steel in Japan

1. Green steel in Japan

The Japanese government calls its efforts to decarbonise the economy and society "Green Transformation" (GX). The broad aim of GX is to reach carbon neutrality by 2050. GX is one of the four key priorities for government investment. GX initiatives include policies for "GX steel". Officially, the term "green steel" in Japan currently only applies to steel decarbonisation efforts that are part of GX. These focus on decarbonisation of BF production facilities. The Japanese Iron and Steel Federation (JISF) have developed a definition of green steel for GX for the Ministry of Economy, Trade and Investment (METI) to use in policy development. Conventional EAF steel producers and broader social interpretations about green steel are not yet included in the definition of "GX steel".

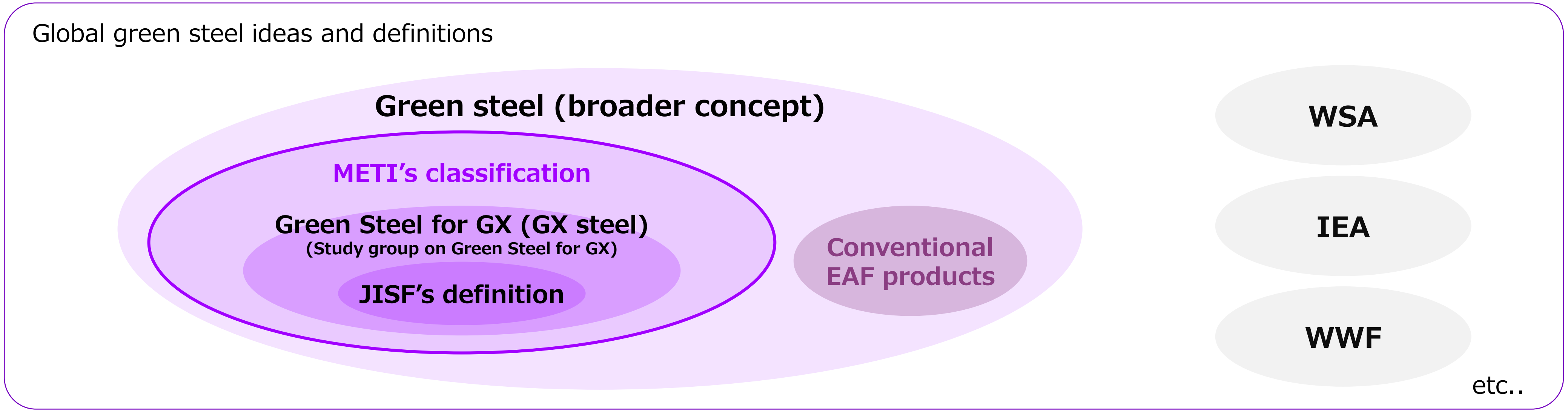
Decarbonisation in Japan

Green Transformation (GX)

- GX is *The Basic Policy for the Realisation of Green Transformation*, Japan's policy roadmap to transform Japan's economy, society and industry from a structure dependent on fossil fuels to one that drives economic growth through emission reduction. Under GX, the steel sector has a CO_2 emission reduction target of 30% from 2013 levels by 2030 and CN by 2050.
- As the steel industry has the highest CO_2 emissions among industries, its actions are critical. Ongoing collaboration between government and industry is crucial for advancing initiatives.

The relationship between domestic and global green steel definitions in Japan

Green Steel



Source: METI

1. Green steel in Japan

While the definition of green steel in Japan will continue to evolve, the use of GX steel definitions is currently promoted and in use in markets. The primary GX steel definition method is “mass balance steel”. Mass balance emission reduction calculation methodology enables products to receive emission reduction labels that are based on an entity’s overall emission reduction efforts, rather than the embodied carbon of individual products. It is seen as a transition entry-level enabling policy for established steel producers.

Definition of Green Steel

Japan

- Discussions on a definition of GS are in progress. However, GS is generally recognised in the market as **steel products with lower CO_2 emissions than conventional products.** The methods of emission reduction calculation varies by product.
- **JISF has formulated a “GS Guideline”** as a common rule for the industry. **The definition of GS in this guideline is based on mass balance accounting,** which is in accordance with ISO. The definition is continuously updated as discussions continue.
- Since 2024, METI has hosted the “*Study Group on Green Steel for Green Transformation*” to discuss decarbonisation in the steel industry and the expansion of the GX steel market. This study group has defined **“Green Steel for GX” (GX steel)** as “steel products that have a significant environmentally favourable impact due to **additional direct emission mitigation actions on a company-by-company basis. Mass-balance accounting methodology is one of the primary definitions of GS**. These products also experience a **significant price premium compared to standard products when the costs associated with (emission reduction measures) are included**”.

Classification of Green Steel

METI’s classification of green steel

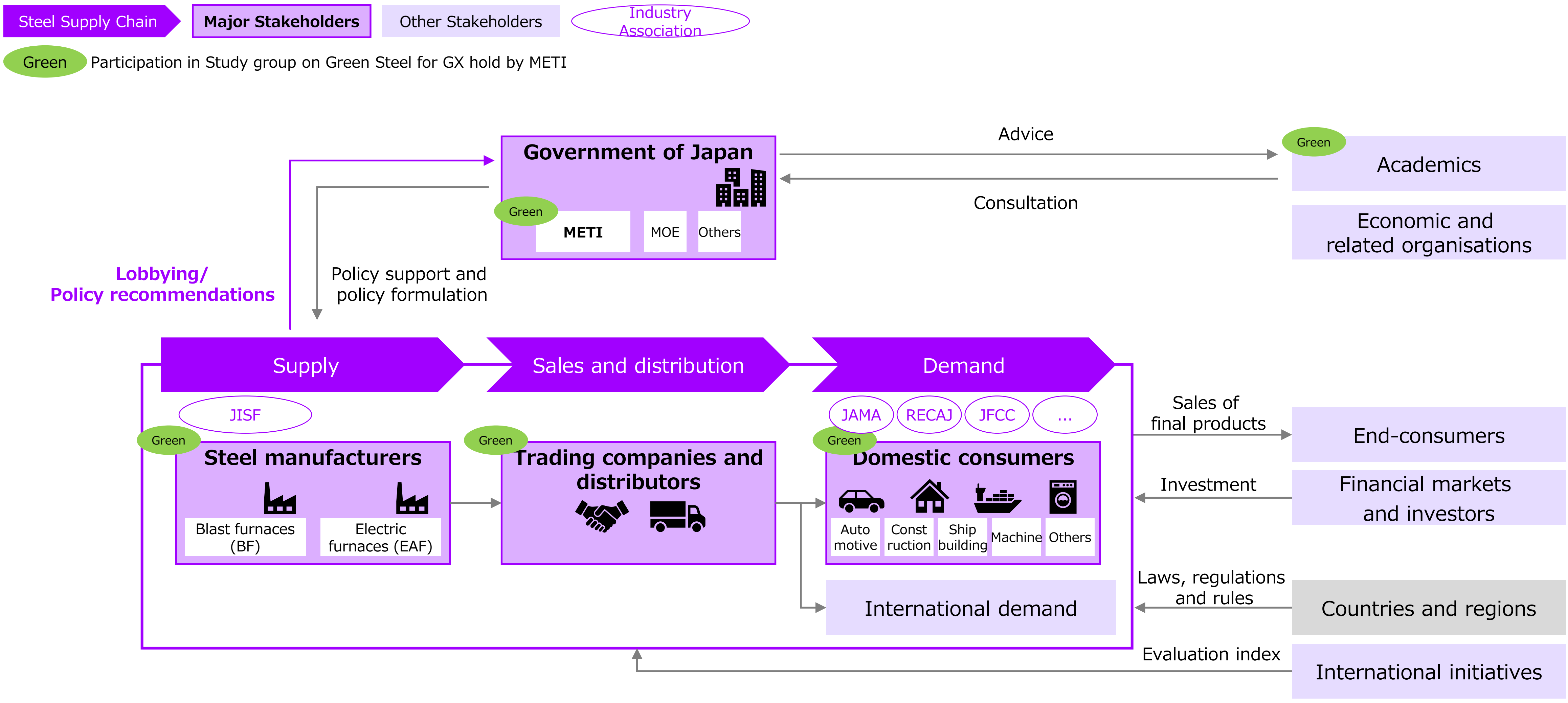
Mass balance GS	Products allocated the amount of GHG emission reduction generated by reduction projects carried out within an organisation, including manufacturing process improvement. Currently only applies to BFs.
Low/Zero Emission in production process	A future GS category where the amount of GHG emissions reductions from manufacturing processes using decarbonisation technology(e.g. DRI, fossil-free) are declared.
With renewable electric power certificates and credits	Reduced GHG emissions arising from electric power used in EAF by REC and credit-offset.
EAF products	Existing conventional EAF products are also recognised as “green steel“ but not GX steel. EAF CO_2 emissions are already significantly lower than BF products.

*At present, natural capital has not been discussed as part of the definition of green steel in Japan and is therefore excluded from the scope of this study.

2. Domestic and international market trends and Japan’s steel industry

2.1. Overview of the Japanese steel market

This diagram shows significant players in the Japanese steel market and its relationship to international and domestic influences. To identify key drivers for the expansion of the green steel market, and to understand their needs, key stakeholders from supply and demand sectors, government and representatives of key industry bodies were consulted.



2.1. Overview of the Japanese steel market

Japan is the third largest steel producer in the world. BF production accounts for over 70% of crude steel production in Japan, giving the nation a large decarbonisation imperative. A declining domestic steel market has led producers to see expansion into overseas markets as providing a way forward in the future.

Overview of Japan's steel market

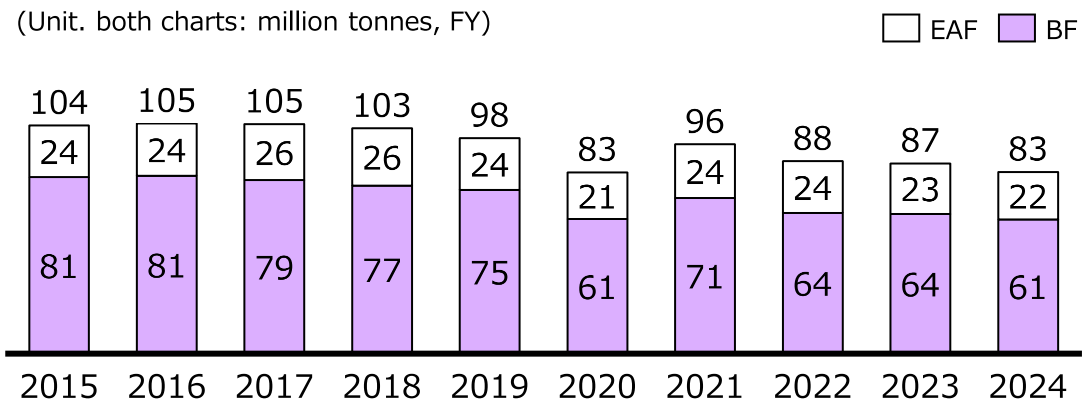
Production

- Japan's steel market in FY 2024 was 83 million tonnes of crude steel production, **third in the world** after China and India.
- BFs account for **73% of production** (crude steel production)
  - Nippon Steel, JFE Steel and Kobe Steel are the only three BF mills after industry restructuring in Japan. **Nippon Steel holds a more than 50% share of domestic BF production and ranks fourth in the world for crude steel production.**

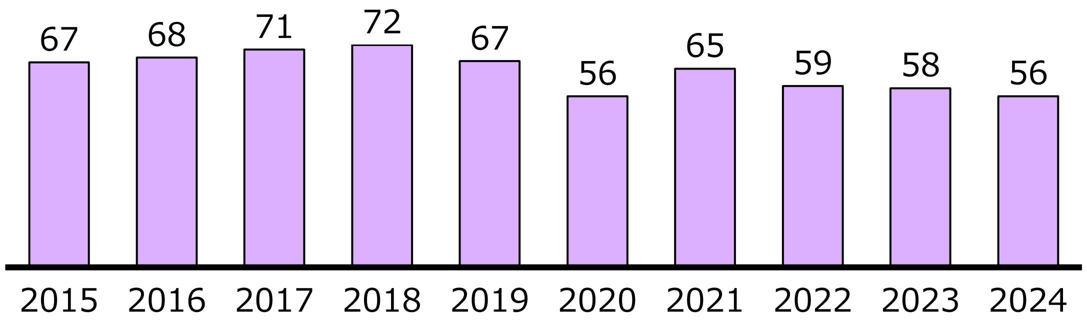
Consumption

- Steel consumption has decreased by 30% from its peak in the 1990s but still exceeds 50 million tonnes.
- However, future domestic demand is expected to decline due to domestic population decreases.
- These factors have resulted in major steel mills undergoing structural reforms to **build a global production structure, actively investing overseas to expand the sales and production in international markets.**

Trends in domestic crude steel production



Trends in domestic crude steel apparent consumption



*This report focuses on steel mills capable of integrated production from crude steel and does not include specialised 2nd tier mills such as rerollers and pipe mills. Source: The Japan Iron and Steel Federation HP

2.1. Overview of the Japanese steel market

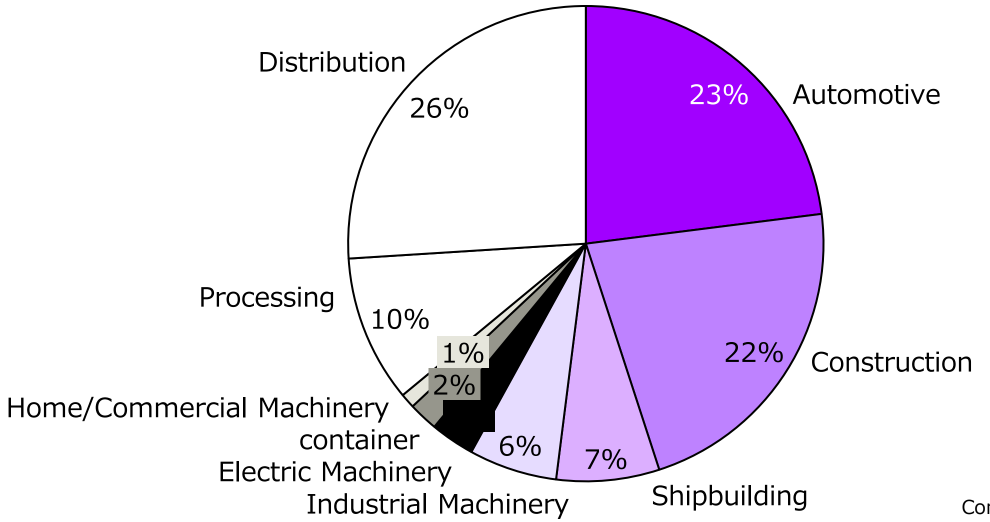
The automotive, construction and distribution sectors are the largest steel consumers in the domestic market, accounting for 70% of steel use. Specialised steel products are more challenging to decarbonise than simple steel products. New steel production technologies and EAF producers need to demonstrate the ability of their steel to meet more complex steel product specifications to access these markets.

Domestic market

Market Structure

- **Less than half of domestic steel consumption is in the automotive and construction industries, and the rest is used in shipbuilding, machinery, containers and other sectors.**
- The ratio of EAF to BF steel use varies greatly depending on the application. Currently, **high-grade steel users like the automotives and energy infrastructure sectors mainly use BF steel**.
  - BFs have a high market share of about 90% in flat steel sheet products, which is mainly used in manufacturing and export.
  - EAFs (not including special steel) have a high market share of long products such as H-beam and steel deformed bars, which is mainly used for domestic construction.

Breakdown of domestic applications (FY 2024)



Compiled by the author

Major products	Main applications	BF	EAF
H-beam	Construction, Civil engineering, Shipbuilding	28.2%	71.8%
Wire rod	Iron Wire, Wire, Nails	49.3%	50.7%
Plate	Construction, Shipbuilding	85.3%	14.7%
Sheet pile	Civil engineering	86.8%	13.2%
Galvanised steel sheet*	Automotive, Construction, Electric machinery	87.1%	12.9%
Cold-rolled steel sheet / coil	Automotive, Electric Machinery	92.3%	7.7%
Hot-rolled steel sheet / coil	Automotive, Construction, Industrial Machinery	92.7%	7.3%

Source: The Japan Iron and Steel Federation

*Flat Steel

2.1. Overview of the Japanese steel market

Market structure

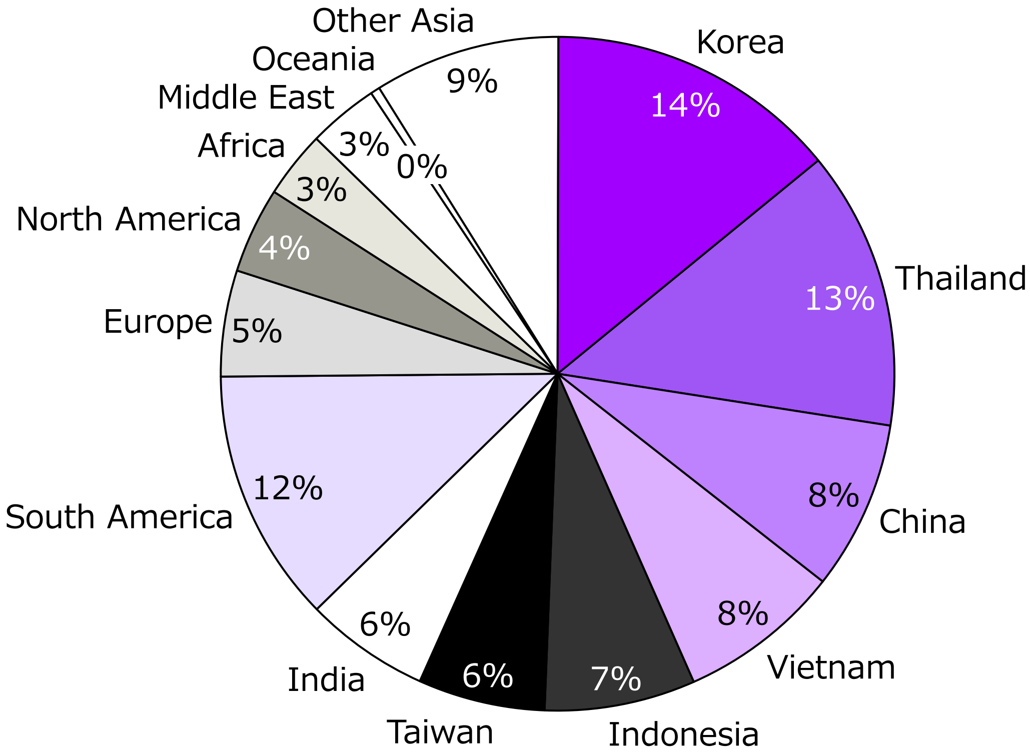
Over 70% of Japanese steel exports go to Asia - a strategically important market for Japanese mills.

Export market

Market structure

- **Approximately 70 % of crude steel produced in Japan is consumed domestically and the remaining 30% is for export.**
- The annual export volume (for normal steel and specialty steel) has remained at approximately 32 million tonnes.
- By export destination, Korea, Thailand, and China are the largest in 2024, but Korea has decreased for 2 consecutive years, Thailand for 3 consecutive years, and China for 4 consecutive years.

Export destinations (FY 2024)



Compiled by Accenture from the Japan Iron Source Association website

Source: The Japan Iron and Steel Federation

2.2. Industry initiatives towards carbon neutrality

Global expansion

The Japanese steel industry is focusing not only on the domestic market but also on global partnerships, actively aiming to contribute to global rule-making for GS and the decarbonisation of overseas steel industries. Key activities of the Japanese steel industry are summarised below.

Global cooperation

World Steel Association Guidelines* (Nov 2024)

- This guideline is an industry guideline issued by the WSA to promote the use of green steel materials on a global scale. It was developed based on the Japan Iron and Steel Federation Guidelines on Green Steel (JISF).
- A method has been established in which GHG reduction certificates have been issued for emission reductions achieved through steel mill emission reduction projects. These reductions can be allocated to any product and supplied to customers together with the certificates. The process consists of three steps:
  (1) Calculating CFP for each steel product,
  (2) Calculating actual emission reductions from implemented emission reduction measures, and
  (3) Either issuing GHG reduction certificates or allocating the reductions to specific steel products using a mass balance approach.
- In response to the conclusions of METI's Study Group on GS for GX, JISF are engaged in dialogue and collaboration with the WSA and overseas steel industries, aiming to develop new guidelines on the allocation method. An updated version by JISF and another by WSA is expected mid-late 2025.

* *"Worldsteel guidelines for GHG chain of custody approaches in the steel industry"*

Other initiatives/ Case studies

- Promoting the revision of ISO and GHG Protocol standards to reflect the approach to GX steel in Japanese steel market.
- Through both governmental and private-sector channels, the Japanese steel industry is engaging in dialogue and collaborative initiatives with various Asian countries to advance carbon neutrality.
  - Since FY2023, JISF and the Korea Iron and Steel Association have co-hosted the Japan-Korea Green Steel Joint Seminar, facilitating discussions on a wide range of topics related to carbon neutrality in the steel industry.
  - In FY2024, the Japan-India Public-Private collaborative meeting on iron and steel industry, attended by government officials, steel manufacturers, and international organisations from both countries, has focused on sharing policies, initiatives, and challenges to achieve carbon neutrality.
  - At an ASEAN-Japan Steel Initiative webinar in 2024, hosted by SEAISI, representatives from both Japan and ASEAN countries presented policy developments, technological trends, and challenges faced by steel mills in their pursuit of carbon neutrality.

Source: The Japan Iron and Steel Federation HP, METI, World Steel Association HP

2.2. Industry initiatives towards carbon neutrality

The steel industry is working in collaboration with government toward carbon neutrality by setting targets, formulating implementation roadmaps, and establishment of rules on GS.

Initiatives of the Japan Iron and Steel Federation

Carbon Neutrality Action Plan (Feb 2021)	~2030	Eco-processes	Reduction of total energy-derived GHG emissions by 30% in 2030 compared to 2013 by promoting energy conservation, utilising waste plastics, and introducing innovative technologies.
	~2030	Eco-products	Contributing to CO_2 reduction at the stage of final product use in society by supplying high-performance steel products to Japan and overseas.
	~2030	Eco-solutions	Contributing to CO_2 reduction on a global scale by transferring and disseminating Japanese advanced energy-saving technologies and facilities to the global steel industry.
	~2050	Innovative Tech Development	(1) Hydrogen reduction technology, (2) Low-carbon technology utilising CO_2 contained in exhaust gas, (3) Direct hydrogen reduction technology, (4) Technology for removing impurities in EAF using directly reduced iron.

Guidelines For Green Steel (Sep 2022; Revised in Apr 2025)

- To support and contribute to the Japanese government's goal of CN by 2050, **this guideline identifies supplying GX steel as a key solution** to meet customer needs during the steel industry's decarbonisation transition, to sustain investment for developing and implementing new decarbonisation technologies, and for reducing GHG emissions.
- This guideline **clarifies the concept of green steel using mass balance methodology and the principles of common rules for GHG emission calculation.**

CFP calculation rules for Steel products etc; (fall 2025)

- If the allocation method for green steel proposed by JISF is adopted for LCA/CFP, **rules for calculating the CFP of steel products should be established and reflected in METI/MOE CFP guidelines**.
- Based on this premise, discussions have begun among JISF, its member steel mills (BFs, ordinary steel EAFs, and specialty steel EAFs), academic experts, and METI to formulate "Product Category Rule" for steel products in accordance with the CFP guidelines jointly published by METI and MOE in March 2023.
- In addition, the guidelines for steel products utilising renewable energy, which have been under development by the Non-Integrated Steel Producer's Association, are also being aligned with the GS Guidelines by JISF and CFP calculation rules, with the aim of finalisation in mid to late 2025.

Source: The Japan Iron and Steel Federation HP

2.2. Industry initiatives towards carbon neutrality

Transition timeline

This table summarises the components of Japan's steel decarbonisation plan and their timelines for implementation. Under current rules, there is no requirement for hydrogen-based processes to use renewable hydrogen. Process technologies considered innovative are marked, and issues for further decarbonisation identified. Available renewable energy is a common barrier for all technologies.

Decarbonisation technologies and issues for steel manufacturing processes in Japan

			Technology		Issues	Future introduction (2020 / 2030 / 2040 / 2050 / 2100)
Steelmaking process technology	Reduction with hydrogen in BF	Innovative Technology	COURSE50	Development of hydrogen reduction technologies in BFs and CO_2 separation from BF gas by using hydrogen in off gas. Test furnace commercialised.	Green hydrogen sourcing, CCUS need, temperature drop in furnace due to hydrogen	R&D / Implementation
Steelmaking process technology	Reduction with hydrogen in BF	Innovative Technology	Super COURSE50	Further improvement of hydrogen reduction ratio in BFs and CO_2 separation from BF gas by using external hydrogen	Green hydrogen sourcing, CCUS, temperature drop in furnace due to hydrogen	R&D
Steelmaking process technology	Reduction with hydrogen in BF	Innovative Technology	Shaft Furnace Carbon Recycling BF	Indirect use of external hydrogen combined with methanation technology in BFs and shaft furnaces, and repeated use as reducing material	Green hydrogen sourcing, CCUS, temperature drop in furnace due to hydrogen	R&D
Steelmaking process technology	Existing technology development	Innovative Technology	Large-sized Innovative EAF	Replacing BF process. Realisation of high-grade steel production using large size EAFs (utilising directly reduced iron)	Shortage of DRI sources, stable procurement and quality of scrap	R&D / Implementation
Steelmaking process technology	Existing technology development		Hydrogen Reduced Iron	Direct reduction method using 100% hydrogen as reducing material	Quality of iron ore and hydrogen. Technical issues due to the downstream production process	R&D / Natural gas / Hydrogen / Implementation
Steelmaking process technology	Existing technology development		Direct reduced iron (DRI)	Method of direct reduction from iron ore using natural gas CO_2 emission is about 1/2 of that of the blast furnace method	Quality of iron ore and production. Technical issues due to the downstream production process	
Infrastructure development (external conditions)	Energy infrastructure		Low carbon electricity Renewable energy	Low-carbon generation of in-house power, procurement of green power, and non-fossilisation of externally purchased energy	Cost increase	R&D / Implementation
Infrastructure development (external conditions)	Energy infrastructure	Innovative Technology	CCU/CCS	Separate recovery, utilisation, and storage of CO_2 generated	Technology development for utilisation. Securing and maintenance of separated CO_2 storage sites	R&D / Implementation

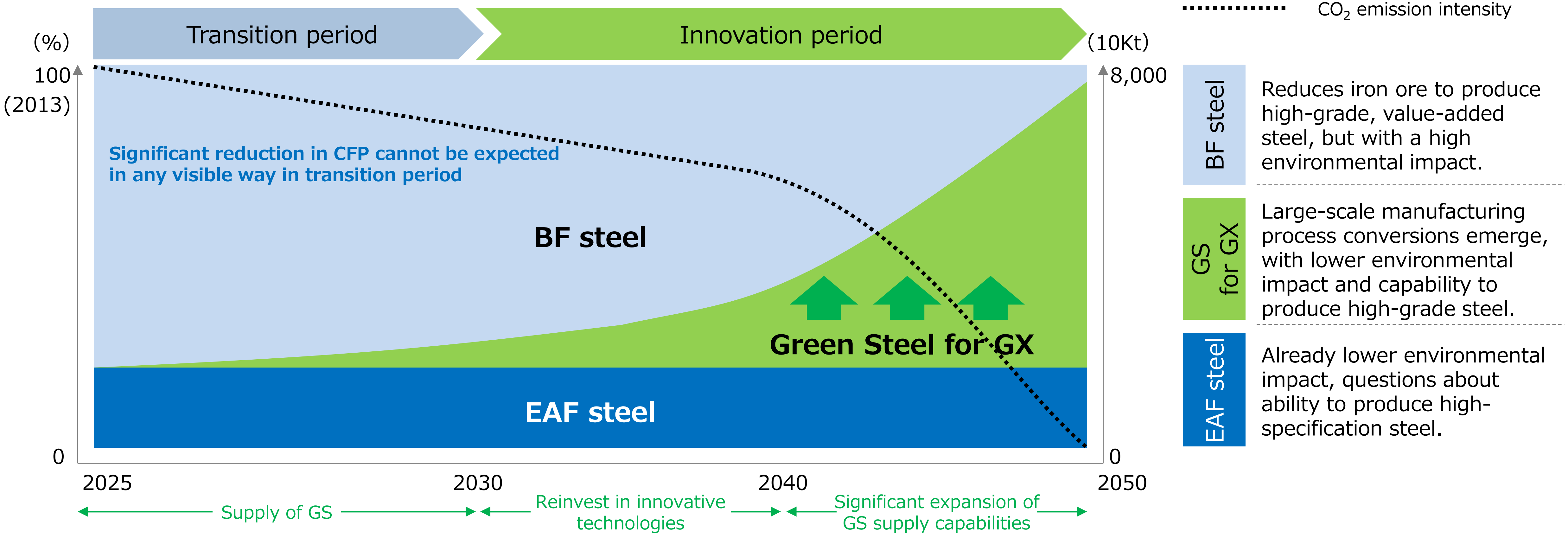
*Hydrogen from BF gas have been used in COURSE50. In Super COURSE50 external hydrogen will be used that does not have to be RE hydrogen (green hydrogen).
Source: Japan Iron and Steel Federation HP, METI

2.2. Industry initiatives towards carbon neutrality

Transition verses innovation period

Current GX policy describes a transition period and an innovation period. In the transition period, GX steel is the main focus to allow use of exiting BF technologies. No significant CFP reduction is assumed before 2030, and later reductions are highly dependent on new technology implementation. This figure implies that increased EAF capacity is expected to make less contribution to decarbonisation than GX steel.

Decarbonisation timeline for the domestic steel industry



Reduces iron ore to produce high-grade, value-added steel, but with a high environmental impact.

Large-scale manufacturing process conversions emerge, with lower environmental impact and capability to produce high-grade steel.

Already lower environmental impact, questions about ability to produce high-specification steel.

*Assumes that domestic crude steel production rate in 2023 will be maintained through 2050. Source METI, JISF

2.2. Industry initiatives towards carbon neutrality

Green steel brands currently marketed in Japan

Japanese steel manufacturers are already marketing GS-labelled products. The level of emission reduction by product is variable. Many products rely on the use of carbon credit certificates. Under mass balance methodology, products with no real reduction in embodied carbon can be assigned reductions from elsewhere in a company's operations (of up to 100%). Credits can also be used.

Major mill's Green Steel Brands

Type	By	Green Steel product				
		ER method	Brand	Details	Start sales	Sales plan
BF	Kobe Steel	Mass balance★	Kobenable® Steel	ER by BF charging with gas-MIDREX HBI, with a real reduction of 20-40%. Using mass balance to designate products as 50-100% ER	May 2022	Target 1Mt in 2030 p.a.
BF	Nippon Steel	Mass balance★	NS Carbolex® Neutral	100% emission reductions in production process allocated to any products	Sep 2023	300Kt p.a. 10Mt in the future
BF	JFE Steel	Mass balance★	JGreeX®	GHG reduction by technologies allocated to any products	Sep 2023	200Kt p.a. at the launch Target 3Mt in 2030
EAF	Yamato Kogyo	With RE Certificate and credit	+Green	Offset by credits and the environmental value of renewable energy certificates derived from forests and biomass in Japan	April 2024	Not disclosed
EAF	Tokyo Steel	①With RE certificates ②Normal EF products	①Hobozero (Almost zero) ②enso®	① CO_2 100 kg / tonne of steel, utilising non-fossil certificates ②GS branding for overseas markets jointly developed with Stemcor. Products have up 76% less emissions than BF products	July 2024	Not disclosed
EAF	Chubu Steel Plate	Allocation	Sumiresu	Reduced emission to zero by allocating the environmental value of renewable energy sourced through an offsite PPA to specific steel products	Jun 2025	Not disclosed

Source: Website of each company, JISF's material

2.2. Industry initiatives towards carbon neutrality

Perception of mass balance GX steel products

Mass-balanced GX-GS products are the mainstream in the green steel market in Japan, where these are seen by manufacturers as essential to recover investments during the transition period. Mass balance methodology receives mixed market perceptions due to its lack of correlation with real product embodied carbon.

Perceptions and adoption of mass balance materials

Positives

- **Seen as having the potential to create an early market during the transition**
  - Is available, may meet user's demand for "transitional green products" for GPP and Scope 3 reduction.
- **Lower initial investment for suppliers**
  - Compared to GHG emission reductions in production processes, it requires less initial investment and is easier to implement during the transition.

Negatives

- **Unclear Reduction and Calculation Methods**
  - Methods vary by company, with no unified standards or CFP calculation process.
- **Misalignment with Product Evaluation**
  - Hard to align with EPD labelling, possibly hindering low-carbon steel assessment.
- **Risk of Greenwashing**
  - Promoting mass balance as green steel may delay investment in true decarbonisation technologies.

Trends

Domestic

- **The Japan Iron and Steel Federation, who set government GS guidelines, see mass balance materials as vital** for decarbonisation.
- The Japanese government includes them in green public procurement (GPP) and supports their use during the transition.

International

- **WSA sees mass balance as a key transitional solution** but stresses the need for transparent accounting.
- The EU treats mass balance as a strong GPP candidate (March 2025).
- Environmental groups oppose labelling mass balance materials as green steel.

Source: METI

2.3. Domestic and international investments by Japanese steel makers

In response to declining domestic demand and global supply-demand imbalances causing market uncertainty and instability, Japanese steel producers are reviewing their business structures, reorganising and consolidating facilities to improve margins, and actively pursuing strategic investments both domestically and internationally. BF producers have formulated roadmaps and large-scale investment in technology development and commercialisation for emission reduction in production processes and are also planning to strengthen investment in existing EAFs.

The investments related to higher decarbonisation potential are highlighted in purple

Recent investments by Japanese BF steel producers

	Domestic	Overseas
Nippon Steel	• Investing JPY870 billion in converting to EAF starting in 2028, targeting annual production of 2.9 million tonnes. • Agreed to invest jointly around JPY50 billion with Nakayama Steel Works (EAF) to build a new EAF with annual production capacity of 1.2 million tonnes in 2026. • Due to declining domestic demand and shifts to high-value-added production (i.e., economic motivations), 5 BFs have been shut down by the end of FY2024.	• Acquired US Steel, which owns BRS, with plans to invest JPY1.6 trillion in facilities by 2028 (next slide). • Acquired G Steel and GJ Steel in Thailand, which operate integrated **EAF-based** hot-rolling coil facilities (2022). • Considering additional investment to expand the capacity of AM/NS India. • Master Agreement to acquire interests in the Kami Iron Ore Project in Canada, which can supply DRI grade iron ore, and to establish a JV company.
JFE Steel	• Adjusting production capacity and transitioning to EAF, 3 BFs will be shut down from FY 2023 to FY2028. In addition, existing EAFs will be upgraded to replace BF production. • Investing JPY329.4 billion to convert to EAF, 2 million tonnes per year starting in FY2028 • Anticipated to invest JPY1 Trillion in emission reduction including technology development (Ultra-innovative BF, hydrogen direct reduction steelmaking, innovative EAF) by 2035.	• Acquired 10% interest in Blackwater Coal Mine in Australia in 2024, which can supply high-quality coking coal along with a long-term offtake agreement. Claim this will contribute to carbon-recycling in BFs, one of the decarbonisation technologies (2024). • Established a manufacturing and sales company in India with JSW Steel. • Jointly acquired the electrical steel manufacturing of Thyssen Krupp in India with JSW (2024)
Kobe Steel	• Plan to convert 1 of 2 BFs to EAF in the 2030s.	• Plans to begin direct reduced iron production (NG MIDREX) in Oman jointly with Mitsui & Co., targeting to start in 2027.

Source: Company's websites

2.3. Domestic and international investments by Japanese steel makers

Nippon Steel acquires US Steel

- Nippon Steel has successfully acquired US Steel, aiming to reinstate its position as the world's No.1 steel manufacturer through the achievement of a global 100 million tonne production vision. By leveraging US Steel's operational and sales foundation, they seek to capture the US market, which is expected to maintain high levels of steel demand and continue its steady growth. The move is a way to strengthen Nippon's global production system and gain a competitive presence against China.
- One of the aims of the acquisition was to strengthen green steel production by acquiring the EAF technology of Big River Steel, an EAF capable of producing high-grade steel for automotives, which became a wholly owned subsidiary of US Steel in 2021.
- Nippon Steel announced 28/08/2025 that US Steel will start to invest USD 4 billion to build two new large-scale EAFs with annual capacity of 3 million tonnes, producing from 2029. Nippon Steel will provide technical support.

NIPPON STEEL

United States Steel

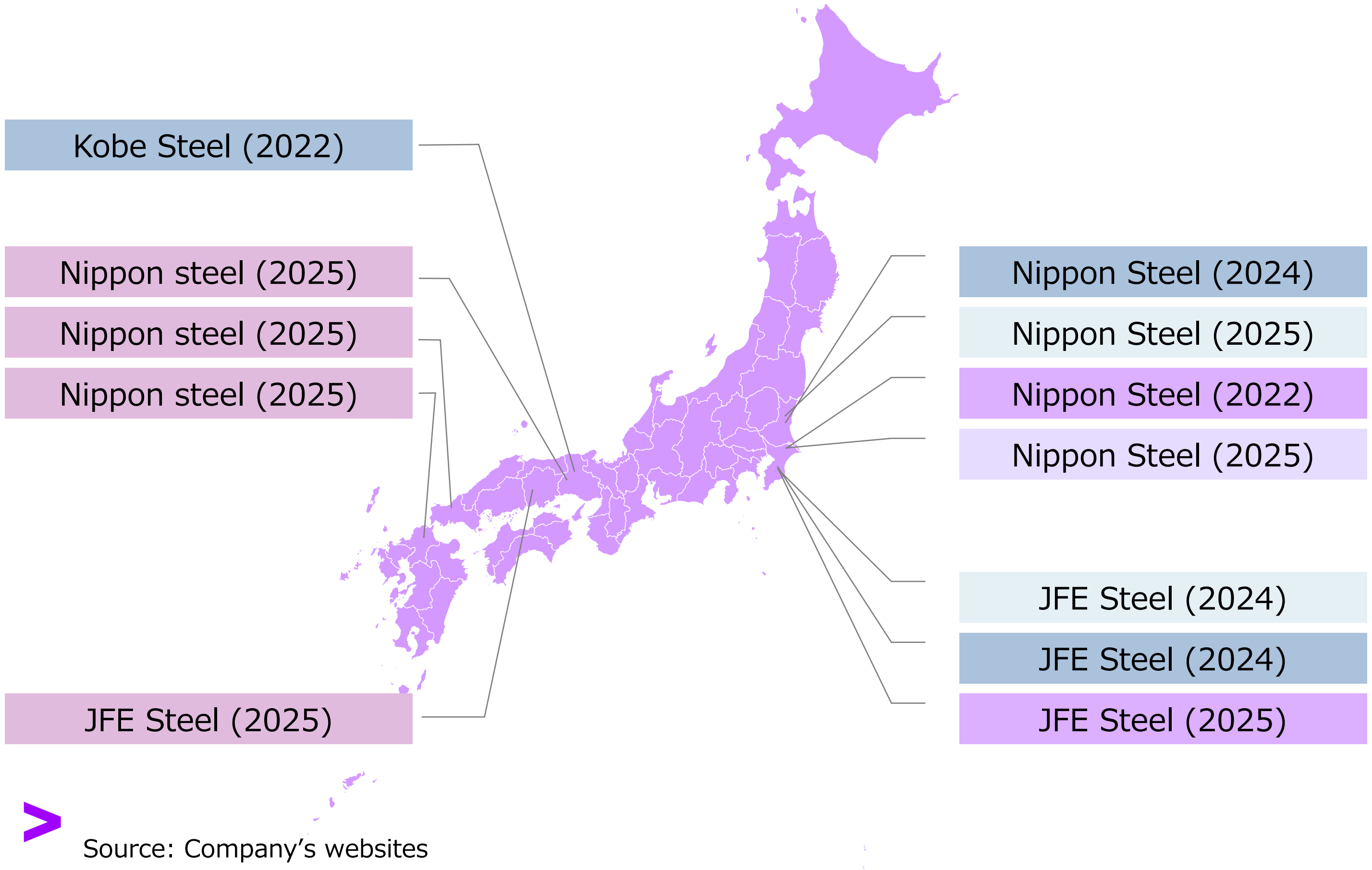
Source: Nippon steel

2.3. Domestic and international investments by Japanese steel makers

Domestic decarbonisation investments aimed at BF production in Japan

There is a strong emphasis on improving BF efficiency and research and development spending on BF operations under GX. These include hydrogen use in BFs, but investments in hydrogen-DRI capability and EAFs are also proposed.

Map of domestic investment plan for new decarbonisation technology for BFs（including R&D)



Development of hydrogen reduction technology using BF (1) Utilisation of hydrogen in the facility

Development of hydrogen reduction technology using BF (2) Utilisation of external hydrogen supplies

Development of direct hydrogen reduction technology to reduce low-grade iron ore using hydrogen alone (DRI)

Development of impurity removal technology for electric furnaces using direct reduced iron

Plan to development of new large-scale innovative EAF

Source: Company's websites

2.3. Domestic and international investments by Japanese steel makers

Investments by EAF producers

EAF mills have also been actively investing in expanding overseas, mainly in Asia. Japanese EAF technology has the potential to contribute to decarbonisation in this region, particularly if there is access to renewable energy.

The investments related to higher decarbonisation potential are highlighted in purple.

Recent investments by Japanese EAF steel producers

Domestic

Company	Investments
Tokyo Steel	• Formulated long-term environmental vision "Tokyo Steel Eco Vision 2050", targeting a 66% reduction in emission intensity by 2030, and 100% by 2050 (compared to FY2013). • Plan to expand annual production to 6 million tonnes by 2030 and 10 million tonnes by 2050 to promote the replacement of BF products with EAF products.
Chubu Steel Plate	• Investment of about JPY 12 billion from 2024 to 2026, including the installation of new EAF.

Overseas

Company	Investments
Sanyo Special Steel (Nippon Steel Group)	• Their subsidiary Ovako AB (Sweden) invested in a new carbon-free hydrogen plant jointly with Volvo, Hitachi Energy and Stegra backed by Swedish government financial support. Started operation in 2023.
Kyoei Steel	• Total investment of about JPY19 billion to increase production capacity of subsidiaries in Vietnam and Canada by 600,000 tonnes per year.
Yamato Kogyo	• Owns joint venture companies in 5 countries (U.S., Thailand, Korea, Vietnam and Indonesia). Plans to invest JPY 135 billion to strengthen bases in ASEAN, India and emerging market countries by 2030.

Source: Company's websites

2.4. Demand side trends - measuring GHG emissions and green steel uptake

Initiatives to visualise and reduce CO_2 emissions in demand sectors

Initiatives have begun to measure GHG emissions and set reduction targets across the supply chains of steel buyers, and to implement concrete actions. In core industries such as automotive and construction, regulations and mandatory requirements both domestically and internationally have led to corporate initiatives that are ahead of other sectors. The table below shows the distribution of GHG emissions across the value chains for each sector.

Trends in major industries

- Downstream sectors, mainly in automotive and construction, are driving efforts to visualise emissions, set reduction targets, and implement measures across the supply chain.
- Additionally, major brand owners in other industries like electronics, machinery, and packaging are individually advancing active initiatives to visualise and reduce emissions of both their company and their products.

GHG emission distribution by sector

Legend
Major Emissions Sources
- Very High
- High
- Middle

		Upstream			Company		Downstream		
		Scope 3 (upstream/main items only)			**Scope1**	**Scope2**	**Scope 3** (downstream, main items only)		
	Industry	Material procurement (Category 1)	Capital investment (Category 2, etc.)	Delivery& transportation (Category 4)	fuel combustion	Use of electricity	Delivery& transportation (Category 9)	Use of products (Category 11)	Disposal of products (Category 12)
Manufacturing	Automotive	16%	2%	0%	1%	1%	-	**79%**	1%
Manufacturing	Construction	**44%**	4%	2%	1%		-	**47%**	2%
Manufacturing	Materials/chemicals	31%	9%	5%	11%	28%	1%	-	16%
Manufacturing	Energy	6%	1%	1%	10%		0%	**82%**	-
Manufacturing	Pharmaceutical	**65%**	14%	1%	9%	10%	2%	-	0%
Manufacturing	Food	**56%**	8%	9%	7%	7%	-	10%	3%
Manufacturing	Electrical equipment	**51%**	4%	1%	0%	5%	-	39%	-
Others	Logistics	**73%**	6%	8%	9%	3%	-	-	-
Others	Retail	**77%**	5%	1%	0%	10%	0%	0%	6%
Others	Information/ telecommunications	34%	36%	0%	1%	24%	-	5%	0%
Others	Finance	11%	16%	11%	12%	49%	-	-	-

Sources: Accenture, Toyota HP, Panasonic HP

Example reduction targets of major companies

Toyota (2019 standards)
- 2035 Scope1 and 2: 68% reduction
- 2030 Scope3:
  - 33.3% reduction in passenger cars
  - 11.6% reduction in midsize and heavy-duty cargo

Panasonic (2021 basis)
- 50% reduction in 2030 CFP
- 100 million ton-CO_2 reduction impact by 2050

See: Panasonic GREEN IMPACT

2.4. Demand side trends - measuring GHG emissions and green steel uptake

Development of LCA/CFP calculation rules in Japan

CFP visualisation rules have been developed to create a society and market in which green products are chosen to promote emission reduction throughout the supply chain. The importance of recognising the environmental value of products has steadily grown. The approach to mass balance products remains unclear in CFP calculation rules.

CFP calculation and labelling are a foundation for the popularisation and utilisation of green products. Since the announcement of the CFP guidelines by METI and the Ministry of the Environment in March 2023, various industries have started to formulate and discuss CFP calculation guidelines, although there are differences among industries. In addition, industry groups have provided simple CFP calculation tools to support the efforts of their companies.

Industry		Industry CFP Visualisation Rulemaking Trends	Organisations and Institutions Leading the Industry
Steel Related sectors	Construction	Under industry-government-academia collaboration, the Zero Carbon Building Promotion Council was established to develop emission assessment methods, releasing the $LCCO_2$ calculation tool in October 2024.	RECAJ, IBECs
	Automotive	The CFP Guide for Automotive Products was established in 2024 as a common guideline for the industry. Data linkage in the supply chain is also in progress to comply with Regulation (EU) concerning batteries and waste batteries.	Japan Automobile Manufacturers Association
	Consumer goods	Formulation of CFP calculation rules for the office furniture, stationery, and other industries as a project supported by METI (March 2024).	Japan Office and Institutional Furniture Association etc
Other materials	Chemicals	Formulation of the CFP Calculation Guidelines for Chemical Products in March 2023.	Japan Chemical Industry Association
	Aluminum	・Formulation of CFP guidelines for aluminum, scheduled for publication in October 2025. ・Definition of "Green Aluminum" and clarification of targets for policy support.	Japan Aluminum Association
	Concrete	CFP calculation rules for ready-mixed concrete and precast concrete were established in March 2025.	RRCS Association

Source: Association websites, general information

2.4. Demand side trends - measuring GHG emissions and green steel uptake

Perspectives and positions on green steel in major demand sectors

Key sectors intend to utilise green steel to reduce emissions across their supply chains, however, advancing these efforts requires an agreed definition of green steel, standardised CFP calculation rules, and appropriate incentives or mandatory measures, including those addressing the cost burden. In this section we present the thoughts of representatives from major demand sectors on how to increase the use of green steel and examples of current uptake.

Although it is recognised that green steel contributes to decarbonisation in the steel industry, because of the price premium for greener products including GX steel, and questions regarding the quality of some products, these products struggle to compete with conventional BF products. In addition, supply-demand balance is an issue. Efforts to promote consumer awareness and understanding are also important in terms of stimulating GS market needs.

Main barries to green steel uptake reported by the automotive and construction industry (as proposals to the study group on GS for GX)

Construction	RECAJ	• As development slows due to rising construction costs, and requirements for energy efficiency and renewable energy use increase, it is essential for customers and suppliers to work together to understand the challenges facing the sector. This includes economic viability, shared responsibility for addressing emissions, and changing societal attitudes to decarbonisation.
Construction	Japan Federation of Construction Contractors	• Priority needs are a definition of green steel, economic rationality, incentives, and increasing demand by promoting an understanding of customer needs and of customer understanding of decarbonisation challenges. Rulemaking should be made by collaboration between public and private sectors.
Automotive	Japan Automobile Manufacturers Association	• Although individual companies set reduction targets and make efforts on a company-by-company basis, for exports, there are major issues in preparing for restrictions and competition in overseas markets. For domestic sales, there is a need for a cost-sharing framework to promote decarbonisation across the board, including cost-sharing with consumers. • In order to overcome these issues, it is necessary to develop rules that can appeal to the public, both on a company-by-company basis and on a product-by-product basis. Rules need to consider actual manufacturing conditions and have a certification mechanism. Establishment of a system for calculating global emissions is required.

Source: RECAJ, JFCC, JAMA websites Each organisation's HP

2.4. Demand side trends - measuring GHG emissions and green steel uptake

Case studies - Uptake of GX steel and other lower emission steel by the automotive industry

Driven by concrete initiatives from automotive OEMs and suppliers that have set supply chain-wide emission reduction targets, the adoption of green steel is gradually expanding with government subsidies playing a partial role but mainly being used on a trial basis for now. This table shows examples of this sector's actions towards decarbonisation.

Industry	Japan Automobile Manufacturers Association		• Targets are to reduce GHG emissions per vehicle by 38% in 2030 (compared to 2013) and 80% by 2050. • Proposed CFP guidelines were formulated in 2024 for calculating and evaluating CFP for automotive products in Japan and internationally. The Japan Automobile Parts Manufacturers Association aligns with these guidelines but has also created its own LCI database.
Industry	Tokyo Steel		EAF materials are used in some parts of Toyota Motor Corp.'s competition vehicles. In cooperation with electric vehicle venture FOMM, an EV concept car, "Upcycled Car," was completed, in which approximately 70% of the steel used in the body was EAF steel.
Consumers	OEM	Nissan	Nippon Steel's green steel "NSCarbolex Neutral" is used for mass-production vehicles.
Consumers	OEM	Isuzu	Isuzu has decided to use GS (mass balance supplied by Nippon Steel, JFE and Kobe) as part of its mass-production vehicles and part of the electric development laboratory "The EARTH lab." under construction at Fujisawa Plant in Fujisawa City, Kanagawa Prefecture. Starting green steel orders in April 2025.
Consumers	Tier1	OILES	Nippon Steel's NSCarbolex® Neutral will be used in its lineup of bearing products manufactured and sold under its own brand.
Consumers	Tier1	Atago Automobile	Manufacturer of body remodelling and body parts. In 2023, Nippon Steel's NSCarbolex ® Neutral was adopted in its main product - containers for transporting recycled resources.
Government	METI		As a new requirement for subsidies for electric vehicles, up to JPY50,000 will be added from FY 2025 if manufacturers of vehicles purchased by consumers plan to introduce GX steel to reduce greenhouse gas emissions during manufacturing (CEV subsidy).

Source: Press Releases from Each Company

2.4. Demand side trends - measuring GHG emissions and green steel uptake

Case studies - Uptake of GX steel and other lower emission steel by the construction (building) sector

The construction industry has already begun actively utilising EAF steel to advance carbon LCA in buildings and increasing the use of BF GX steel in large-scale projects. In addition, MLIT is planning to mandate building LCA reporting by 2028, which requires industry to accelerate CO_2 emission reduction.

Industry	Industry Organisations		Mitsui Fudosan and Nikken formulated and published the *GHG Emissions Calculation Manual*. Based on this manual, the Japan Real Estate Association released the *GHG Emissions Calculation Manual for Construction* in 2023. In 2022, as an MLIT project, the Council for the Promotion of Zero Carbon Buildings was established with members from the Housing and Building SDGs Promotion Centre, experts, local governments, related industry organisations, and related ministries. In 2024, a tool was developed to calculate whole-life carbon emissions from design to completion.
Consumers	Construction	TAISEI Corporation	Initiated the Zero Carbon Steel Initiative to promote the construction of zero carbon buildings that reduce CO_2 emissions throughout the life cycle of buildings to NZ.
Consumers	Construction	Sumitomo Corp. Kumagai	JFE Steel's JGreeX was adopted for the new construction of Suidobashi PREX (tentative name), an office building project developed by Sumitomo Corporation and constructed by Kumagai Gumi. This is the first use of green steel by Sumitomo Corporation and Kumagai Gumi. This is also the first use of JGreeX by JFE Steel in the real estate and construction industry (2023).
Consumers	Logistics	Mitsui Fudosan	Use of +GreenTM by Yamato Steel company (a Yamato Kogyo subsidiary) as a building material for Mitsui Fudosan Logistics Park Amagasaki I. This is the first use of +GreenTM (2024).
Consumers	Logistics	Tomakomai Kuribayashi Unyu	JFE Steel's JGreeX green steel material has been adopted for the new construction of "Shin Harumi Warehouse“. Tomakomai Ritsurin Transport Co., Ltd. is the first company to adopt green steel material and the first to adopt JGreeX in Hokkaido.

*In addition to the above projects, the construction industry has started to adopt GS in building materials manufacturing.

Government	Ministry of Land, Infrastructure, Transport and Tourism	The Study Group on a System to Promote the Calculation and Evaluation of Life Cycle Carbon of Buildings was launched this fiscal year. (The Japan Iron and Steel Federation also participated in the meeting.) The aim is to launch a system to promote the implementation of building LCA by FY2028. In order to reduce life cycle carbon of government facilities, LCA of buildings will be implemented by calculating life cycle carbon at the design stage of new government facilities from this fiscal year.

Source: Press releases from various companies

2.4. Demand side trends and measuring GHG emissions in supply chains

Case studies - Uptake of GX steel and other lower emission steel by the construction (civil engineering) sector

GX steel is being adopted in public civil engineering projects, and the government is also promoting its use in public-sector projects.

Consumers	MILT Kyushu	JEF Steel decided to adopt GS (NSC Carbolex® Neutral and Kobe Steel's Kobenable® Steel) for bridge construction work. This is the first adoption of GS in the Japanese bridge industry.
	Okayama Prefecture	JEF Steel's GS JGreeX ® has been adopted for the Shimonosho Overpass Bridge Superstructure. This is the first time for JEF Steel to use JGreeX ® in public works.
	Yokohama City	JFE Steel's Green Steel JGreeX ® has been adopted for the "Takashima Bridge" in the "City Planning Road Katsura-cho Totsuka-Endo Line (Kamikurada Totsuka District) in Yokohama City.
Supply	Kobe Steel	Kobenable ® Steel was the first GX steel product registered in the Ministry of Land, Infrastructure, Transport and Tourism's New Technology Information System (NETIS).
Government	MLIT	The National Institute of Land, Infrastructure and Technology Policy (NIST) formulated and published the *Draft Manual for Calculation of GHG Emissions during Construction in the Infrastructure Sector* in 2024, which provides a unified approach to the calculation of GHG emissions generated at construction sites and GHG emissions reduction by decarbonisation technologies.
	METI MOE	Specific procurement items specified in the "Basic Policy on Promotion of Procurement of Eco-Friendly Goods" based on the "Act on Promotion of Procurement of Eco-Friendly Goods by the State, etc.." (Green Purchasing Act) and the criteria for judging them are reviewed every fiscal year. Proposals that are considered to contribute to the reduction of greenhouse gas emissions and the recycling of plastic resources are invited to participate in these schemes.

Source: Company Press Releases

2.4. Demand side trends - measuring GHG emissions and green steel uptake

Case studies - Uptake of GX steel and other lower emission steel by the electronics and machinery manufacturing sectors

Although the entire industry has yet to move forward or make policies, each company is highly aware of environmental initiatives and is actively working to adopt GS and recycle resources. However, due to the need to balance costs, the utilisation of BF's GX steel remains limited at present.

Consumers	Resources Recycling	Panasonic	Approximately 93 kt of recycled iron (EAF products) per year, equivalent to the amount of 113,415 cars, is used for their own products. High-purity resources including steel from waste home appliances are also extracted and used as recycled materials.
		Ricoh	Developed EAF steel sheet with quality characteristics equivalent to that of BF steel sheet in collaboration with Tokyo Steel and used EAF steel sheet for the first time in the industry. Ricoh also makes use of recycled plastics in its products.
		CANON	Recycled iron (EAF sheet) used in some of the new products launched in 2025. Targets are set for resource recycling rates and efforts are made to utilise recycled resources
	Green Steel	Hitachi	Nippon Steel's GS "NSCARBOLEX ® Neutral" used for Non-Directional Electromagnetic Steel for Electric Motors
		AIRMAN	Nippon Steel's GS "NSCARBOLEX ® Neutral" used for compressor and generator products for the first time.
		Aichi Electric	JFE's green steel product JGreeX ® has been selected as one of its product line-up for industrial large transformers. The steel product used is directional steel sheet. This large transformer has also been adopted for use by JFE, promoting the active procurement of JFE's green products.
		NEC	Established a system of cooperation throughout the supply chain to utilise green steel in communications equipment materials, in collaboration with companies involved in materials and manufacturing. Using Tokyo Steels Hobozero product.

Source: Press Releases from Companies

2.4. Demand side trends - measuring GHG emissions and green steel uptake

Case studies - Uptake of GX steel and other lower emission steel in shipbuilding, energy and other sectors

In the shipping industry, the adoption of GS started in 2023 as one of the decarbonisation measures in the construction stage of new ships. In addition, the adoption of GS is expected to increase further in response to the latest IMO regulations and MILT support measures.

Consumers	Ship building	Imabari Shipbuilding	One of the largest shipbuilding companies in Japan has developed a new business model in collaboration with JFE, to share the value of CO_2 reduction across the entire supply chain. JFE's green steel JGreeX ® is used for the Ultramax-class dry bulk ship. Kobe Steel's Kobenable Steel is also used.
Consumers	Ship building	Tsuneishi Shipbuilding	・Uses JFE's green steel JGreeX ® in hydrogen-fuelled tugboats ・Kobe Steel's Kobenable Steel is used in container carriers built by Tsuneishi Shipbuilding Co., Ltd.'s Chinese subsidiary, Tsuneishi Group (Zhoushan) Shipbuilding Co., Ltd. The first overseas shipment of Kobenable Steel in 2024.
Consumers	Ship building	Others	・JFE's JGreeX ® will be adopted by eight domestic shipping companies for new construction of dry bulk vessels ・Higaki Shipbuilding adopted JFE's JGreeX ® green steel for its BRIGHT QUEEN dry bulk vessel. This vessel is the first in the world to have a classification code "a-EA (GRS)", which indicates the use of green steel in the hull structure according to the "Environmental Guidelines" of the Japan Maritime Association.
Consumers	Energy	Siemens Gamesa Renewable Energy	Signed a memorandum of understanding with Siemens Gamesa Renewable Energy, one of the world's leading companies in the field of wind power generation, to promote joint efforts to promote the use of Nippon Steel's NSCarbolex ® Neutral in the production of wind power towers for use in Japan.
Consumers	Others	JKK	JFE decided to sell JGreeX ®, JFE's green steel material, to JFE Shoji Steel Pipe & Piping Co., Ltd., a steel pipe and pipe material trading company of JFE Shoji Group, targeting the infrastructure sector.
Government	MILT、IMO		•MILT has provided subsidies to support the development of production facilities needed for the construction of zero-emission vessels. •The International Maritime Organisation (IMO) approved new regulations aimed at NZ shipping by 2050, introducing the world's first carbon pricing system for the shipping industry.

Source: Press Releases from Companies

2.4. Demand side trends - measuring GHG emissions and green steel uptake

Case studies - Export of GX steel and other GS by Japanese producers

Japanese mills are trying to promote GX steel not only in Japan but also for export but successful cases are limited.

ASEAN	・Nippon Steel Corporation started selling thick plates with NSCarbolex ® Neutral to STEELARIS, a steel wholesaler in Singapore. Tokyo Steel also signed “hobozero (almost zero)*" contract for STEERARIS. ・JFE signed a memorandum of understanding with Mycron Steel Berhad, a steel plate and pipe manufacturer in Malaysia, to establish a supply scheme for JGreeX®. ・JFE's JGreeX ® will be used as roof and wall materials for Logicross Nam Thuan, a large-scale logistics facility in Long An Province, Vietnam. JGreeX ® is the first hot-rolled steel sheet used overseas.
Other Asia Middle East	・Nippon Steel's NSCarbolex ® Neutral is used in a CCS project for Qatar Energy's blue ammonia production plant. ・Nippon Steel's NSCarbolex ® Neutral is used for diamond wire manufactured by YANGLING METRON NEW MATERIALS.
Europe	・Nippon Steel's NSCarbolex ® Neutral has been selected for the 85 Degrees Renewables Bleiswijk project, which is run by Dutch geothermal developer 85 Degrees Renewables with ITECO Oilfield Supply France SAS as a partner. ・JFE's JGreeX ® will be used in transformers manufactured in Europe. The type of steel to be used is directional electric steel. ・Tokyo Steel and Trader's Stemcor have launched their own GS brand "enso ®**" for the UK, aiming to export 80,000 tonnes annually.
United States	Nippon Steel's NSCarbolex ® Neutral will be used for transformers manufactured by GE Vernova.

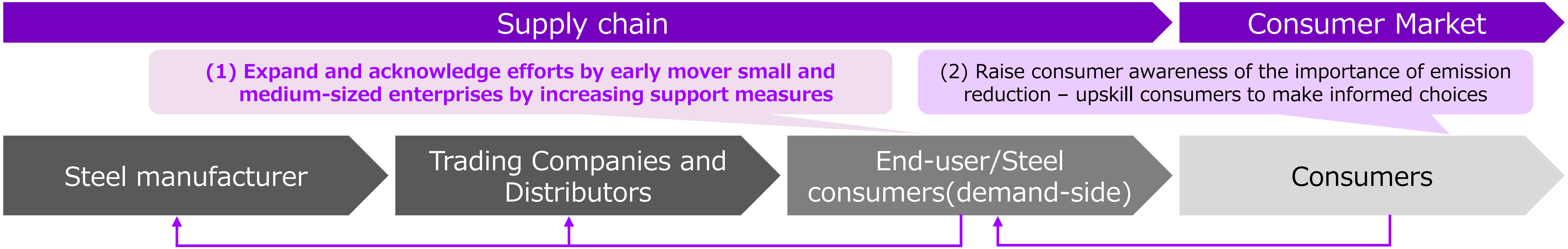
Source: Press Releases

2.4. Demand side trends - measuring GHG emissions and green steel uptake

Status of other ways to promote GS use: CFP labelling, green procurement, supplier engagement and branding

Other drivers for consumers		What is happening?
(1) Green procurement/ supplier engagement	Incentivise prioritisation of procurement from suppliers who are actively engaged in products and services with low-emission and environmentally responsible actions. ⇨Procurement actions by end-users/consumers incentivise their suppliers to carry out CFP calculations and disclose emissions reductions.	Driven by the growing demand for supply chain decarbonisation, particularly among leading companies, an increasing number of companies are requesting that suppliers visualise and reduce CO_2 emissions and are increasingly utilising CFP and EPDs when selecting suppliers.
(2) Branding/ marketing	Initiatives to voluntarily use CFP to promote the company's environmental value (focus on environmental initiatives and GHG emission reductions) as a differentiating factor to customers/consumers. ⇨Enhancing the company's image among consumers motivates them to reduce their CFP.	Examples of using CFP for labelling are starting to emerge in consumer goods and B2C sectors. In contrast, industries with steel demand—such as consumer electronics and machinery—have yet to see widespread adoption of CFP labelling practices.

Key market enablers



Source: Ministry of the Environment, Japan Environment Association

2.5. Trends in domestic and international policy and measures

Government measures around the labelling of low-emission products

Both METI and MOE have been holding study groups to promote GX steel products, advancing rule-making and environmental support. Activities relating to CFP and LCA rule development are summarised below.

Discussions on development of rulemaking and infrastructure for GX promotion

Ministry	Type	Initiative	Description
MOE	Rule development through study groups	Study Group on Decarbonizing the Entire Value Chain by Creating Demand for Green Products	• In collaboration with public and private stakeholders, efforts are underway to develop definitions for the evaluation and labelling of green products and services. • Examining how to stimulate demand among governments, companies, and consumers; how to promote value chain collaboration, supplier engagement and how to support decarbonisation of SMEs.
METI	Rule development through study groups	**Study Group on Green Steel for Green Transformation**	• The study group proposed rules for product-level CFP calculation for steel, integration into national guidelines, adoption in building LCA, data disclosure, and non-fossil certification. It emphasised visualising GX value, buyer incentives, and global standards. • These discussions led to the 2025 cabinet approval of the GX 2040 Vision strategy. • Steel mills, trading companies, industry associations (supply/demand side) and academia attended as committee members and observers.
METI	Rule development through study groups	Study Group on Carbon Footprint Utilisation for Achieving GX	• To reflect upstream GHG reduction efforts in downstream GX value, the study promotes: data infrastructure for primary data exchange; secondary database development for CFP calculation; rule-setting and global alignment; and SME support for GHG accounting know-how, human resources, and incentives.
METI	Infrastructure development	Ouranos Ecosystem	• By developing the *Ouranos Ecosystem* (a data space), data sharing across the supply chain including GHG emissions information is promoted to incentivise corporate decarbonisation efforts. Initially driven by METI. • In response to the EU Battery Regulation, the initiative began with the automotive industry and transitioned to private-sector operation (ABtC) in 2024.

Source: Study group website, the Ministry of the Environment website, METI website

2.5. Trends in domestic and international policy and measures

Government financial incentives for steel decarbonisation

The government has been progressively supporting the steel industry's decarbonisation R&D and new facility investments. However, further support is necessary for commercial deployment.

① Support for decarbonisation of the steel industry by government

	Policies	Jurisdiction	Time period	Amount	Target projects	Details of measures
Tax	Tax incentives to promote domestic production in strategic sectors	METI	2025 Up to 10 years	Green steel: JPY20,000/t tax credit for the production of low-carbon steel by new EAF transitioned from BF	Project for transition of manufacturing processes with significant GHG emission reductions.	• A corporate tax credit scheme proportional to production and sales volume to promote domestic investment in strategic areas such as GX, Digital Transformation, and economic security, including green steel. • Establishing a support framework for strategic sectors with high-cost GHG reduction technologies (e.g., shift to EAF), aiming to maintain and enhance global competitiveness.
Project Support	Green Innovation Fund Projects	NEDO (led by METI)	2020 – 2030	Total JPY2.8 trillion (For the steel business Total support: JPY449.9 billion)	Initiative requiring long-term, continuous support from research and development, demonstration to social implementation.	• To achieve CN by 2050, the government provides comprehensive support including standardisation, regulatory reform, and international collaboration to promote structural shifts in the energy and industrial sectors. • ¥449.9 billion allocated to hydrogen-based steelmaking projects (e.g., COURSE50, Super COURSE50)* involving Nippon Steel, JFE Steel, and Kobe Steel.
	Support for challenging energy and manufacturing process conversion (Project I)	METI	Phase 1: 2024–2029 Phase 2: 2025–2030	Total: JPY400 billion (Total of Projects I&II, Budget for each year JPY30 billion)	Transition from conventional BF–BOF processes to innovative EAF that significantly reduce GHG emissions.	• As part of the GX Economic Transition Bonds subsidy program, support is provided for early deployment investments that reduce emissions and strengthen competitiveness in hard-to-abate industries. • In the steel sector, support focuses on shifting from BF and BOF to innovative EAF and introducing hydrogen-based steelmaking processes.

*Hydrogen from BF gas have been used in COURSE50. In Super COURSE50 as 2nd phase, external hydrogen which doesn’t to have to be RE hydrogen (Green hydrogen) is used.
Source: Green Innovation Fund HP, METI HP

2.5. Trends in domestic and international policy and measures

Government policy for steel decarbonisation

Discussions on GX products, including green steel, started in the early 2020s. However, mandatory regulations and strong incentives for green steel are still lagging.

② Regulations and Incentives

Regulations/frameworks	Duty	GX Promotion Act*	Revised in 2025	From FY2026, companies with an average annual direct CO_2 emission exceeding 100,000 tonnes over three years will be required to participate in an emissions trading scheme. * "Act on Promotion of a Smooth Transition to a Decarbonised Growth-Oriented Economic Structure"
Regulations/frameworks	Duty	SSBJ (with Obligation to disclose PDS)	2027	The Financial Services Agency is considering adopting the SSBJ as the sustainability disclosure standard in securities reports, with mandatory disclosure potentially starting from 2027. The requirements would initially apply to Prime Market-listed companies with a market capitalisation of ¥3 trillion or more, expanding to those with ¥1 trillion or more from 2028.
Regulations/frameworks	Duty (plan)	Life Cycle Assessment of Buildings	MLIT 2028	A system is being designed to measure and evaluate the environmental impact, including CO_2 emissions, across the entire lifecycle of buildings—from planning to demolition. The system aims to encourage behavioural changes to reduce emissions. The basic plan was approved, targeting implementation by fiscal year 2028.
Regulations/frameworks	Guideline	Green Purchasing Law*	Revised in 2025	Products using steel that meet two criteria—(1) steel with verified emission reduction (in accordance with JISF' GS guideline methods) and (2) disclosed CFP of the steel used—will be promoted for government procurement, provided there are no supply constraints or procurement obstacles. Preferential procurement of **green steel** by the government. * "Act on Promotion of Procurement of Eco-Friendly Goods and Services by the State and Other Entities"
Regulations/frameworks	Guideline	Basic Guidelines*	MOE (2024)	A wide range of businesses deepen their understanding of supply chain emissions and are provided with GHG calculation methods aligned with the GHG Protocol and tailored for easy use by Japanese companies. * "Basic Guidelines on Accounting for Greenhouse Gas Emissions Throughout the Supply Chain"
Regulations/frameworks	Guideline	CFP Guidelines	MOE/METI (2023)	To support companies in conducting fair and reliable CFP calculations, guidelines are provided on CFP calculation and labelling methods aligned with international standards such as ISO 14067:2018.
Regulations/frameworks	Guideline	Utilizing primary data Emissions Calculation Guidelines	MOE (2025)	Provide guidance on the significance and basic principles of Scope 3 emissions calculation using primary data directly obtained from suppliers, supporting companies' supply chain emissions accounting.
Incentives		Clean Energy Vehicles subsidies	2024 Revised in 2025	To promote demand for steel in GX initiatives, including innovative EAF steel transitioned from BF, automotive OEMs' plans and efforts to reduce environmental impact and adopt GX steel are evaluated, with subsidies increased by up to 50,000 yen based on results.

Source: METI HP, MOE HP, Nikkei Business Publications

2.5. Trends in domestic and international policy and measures

International policy and regulations

China, which has the world's largest steel industry and is the highest CO_2 emitter, has set policies for decarbonising its steel industry under its 2060 carbon neutrality pledge.

Comparison with other countries

	Europe	United States	China
Features	Legal and institutional frameworks, including public procurement and certification systems, are driving decarbonisation efforts.	Supporting decarbonisation in the steel industry while protecting domestic industries through the Inflation Reduction Act and the Infrastructure Investment and Jobs Act.	Eliminates excess capacity and revises production methods for decarbonisation in the steel industry, where the proportion of BFs exceeds 90%.
Examples	**Carbon Border Adjustment Mechanism (CBAM)** • Tax on carbon emissions from steel products imported from outside the region to ensure European decarbonisation efforts and fair competition from 2026. **Emission Trading System (EU ETS)** • Emissions trading system to promote emission reduction by setting a cap on GHG emissions and allowing trading of emissions credits. The steel industry is one of the target sectors. **European Green Deal** • Comprehensive policy package aimed at achieving CN in Europe by 2050, including supports for the steel industry. **Certification system** **Natureplus, Greenspec pass** • Certified and guaranteed eco-friendly building materials.	**Inflation Reduction Act (IRA)** • The goal is to support decarbonisation efforts by private companies through tax credits and subsidies. Additional tax credits for domestic procurement of raw materials and products. • USD5.46 billion to reduce industrial GHG emissions, including the steel industry. **Infrastructure Investment and Jobs Act (IIJA)** • Investment in domestic infrastructure, including investments in clean energy technologies and sustainable energy. • USD430 million to reduce industrial GHG emissions, including the steel industry. **Resource Conservation and Recovery Act (RCRA)** • Regulates all solid and hazardous wastes throughout the building life cycle, including raw materials such as iron.	**Implementation Measures for Capacity Replacement in the Steel Industry (Revised)** • Strictly restricts the ratio of waste of existing BFs and replacement of production capacity by construction of new production facilities that emit large amounts of CO_2. **Guiding Issued by Three Ministries on Promoting High-Quality Development in the Steel Industry** • Improve at least 80% of steel production facilities with ultra-low carbon emissions, and peak CO_2 emissions by 2030. **General Code for Building Energy Conservation and Renewable Energy Utilisation** • Policies and standards to limit emissions from buildings and construction activities. **2024-2025 Energy conservation and carbon reduction action plan** • Support for the expansion of EAFs by not allowing additional steel capacity until 2025.

Source: SPEEDA, JETRO, Nikkei Business Publications

2.5. Trends in domestic and international policy and measures

Trends in economic and related organisations

Trade associations consider establishing a cross-industry platform for sharing environmental information (including GHG data) and creating rules for green products as essential enablers. These recommendations have been submitted to the government.

Name	Overview		Proposal
Japan Federation of Economic Organisations (Keidanren)	Established 1961 Member companies: 1,500 Member organisations: 150 (as of May 2025)	• One of Japan's top three economic organisations and the most influential. • Aims to promote Japan's economic development and sustainable growth by improving business environments and proposing policies.	**Second Recommendations for Industrial Data Space (May 2025)** • There is currently no cross-sector data collaboration among ministries and private groups. A data platform is needed to visualise and share environmental information across the entire supply chain as essential industrial infrastructure. **Towards Green Transformation (GX; May 2022)** • Decarbonising the steel industry is crucial for GX. Collaboration and disclosure of GHG reductions across the supply chain should be promoted. • Strengthened public support like tax incentives and subsidies is needed to offset rising GX investment costs and maintain competitiveness.
Green xDigital Consortium	Established 2021 Member companies:122 (as of May 2025)	• The largest private-sector cross-industry consortium promoting digital solutions in environmental fields, aiming to contribute to achieving CN by 2050. • Main activities: - Creating CO_2 emission visualisation standards - Encouraging renewable energy use - Building evaluation frameworks for corporate environmental efforts	**Recommendations on GX Product Requirements (April 2025)** • Japan aims to balance decarbonisation, a circular economy, and economic growth. Sustained progress requires demand-side understanding and supportive economic policies. • In the steel industry, growing needs to recover investments and create incentives call for a framework that fairly values eco-friendly products and enables incentives for suppliers and buyers.

Source: Each Organisation's Website

2.6. Trends in financial markets

Trends in financial markets - disclosure requests

Japanese companies have a high participation rate in international initiatives, accelerating the disclosure of GHG emissions and other information. Furthermore, the SSBJ's requirement to disclose primary data share for Scope 3 emissions is expected to drive upstream reduction efforts in Scope 1 emissions (use of low-carbon materials).

Disclosure Trends

To reduce GHG emissions, companies must measure their emissions. Monitoring data enables companies to do self-assessment of their business activities and emission reduction efforts. Disclosure promotes more awareness and cooperation among related stakeholders to promote further reduction efforts. Independent assessment is not yet mandatory.

	Overview	Certified companies in Japan
CDP	• Encourages voluntary disclosure of GHG emissions (Scopes 1–3), climate risks and opportunities, mitigation targets and progress, and governance. However, major global investors and financial institutions rely on CDP data, creating strong pressure to disclose.	Climate change A list: 132 companies Ranked 1st by number of member companies (2024)
SBTi	• Encourages companies to set and report science-based GHG reduction targets (e.g., % reduction by 2030) and disclose annual progress. SBTi-certified firms are expected to voluntarily report emissions and progress, influencing investor evaluations.	904 companies Ranked 1st by number of companies (2024)
ISSB	• An international standard for sustainability disclosure, promoting Task Force on Climate Related Financial Disclosures (TCFD)-aligned integrated reporting. Mandatory adoption is expected globally from 2024.	–
SSBJ	• The Japanese version of the ISSB standards was published in March 2025, aligning with ISSB but modified for Japan's business and regulatory environment. **It requires disclosure of Scope 3 emissions with the proportion of primary data used in Scope 3.**	–

Source: CDPHP、ISSBHP、SSBJHP、the Ministry of the Environment HP

2.6. Trends in financial markets

Examples of "ESG" investing (sustainable finance)

To achieve carbon neutrality by 2050, it is said that 150 trillion yen in public-private investment will be required over the next decade, and mobilising private capital will be essential. Starting with initiatives by the Ministry of the Environment, Japan has begun promoting ESG investing to expand investments aimed at achieving carbon neutrality.

Initiatives in Japan	Overview
Financial Support Programme for Green Finance (MOE)	To achieve 46% reduction in GHG emissions by 2030 and fulfill the international commitment to carbon neutrality by 2050, it is essential to promote and expand the green finance market and disseminate and implement ESG finance. This will help mobilise over 150 trillion yen in investment over the next decade.

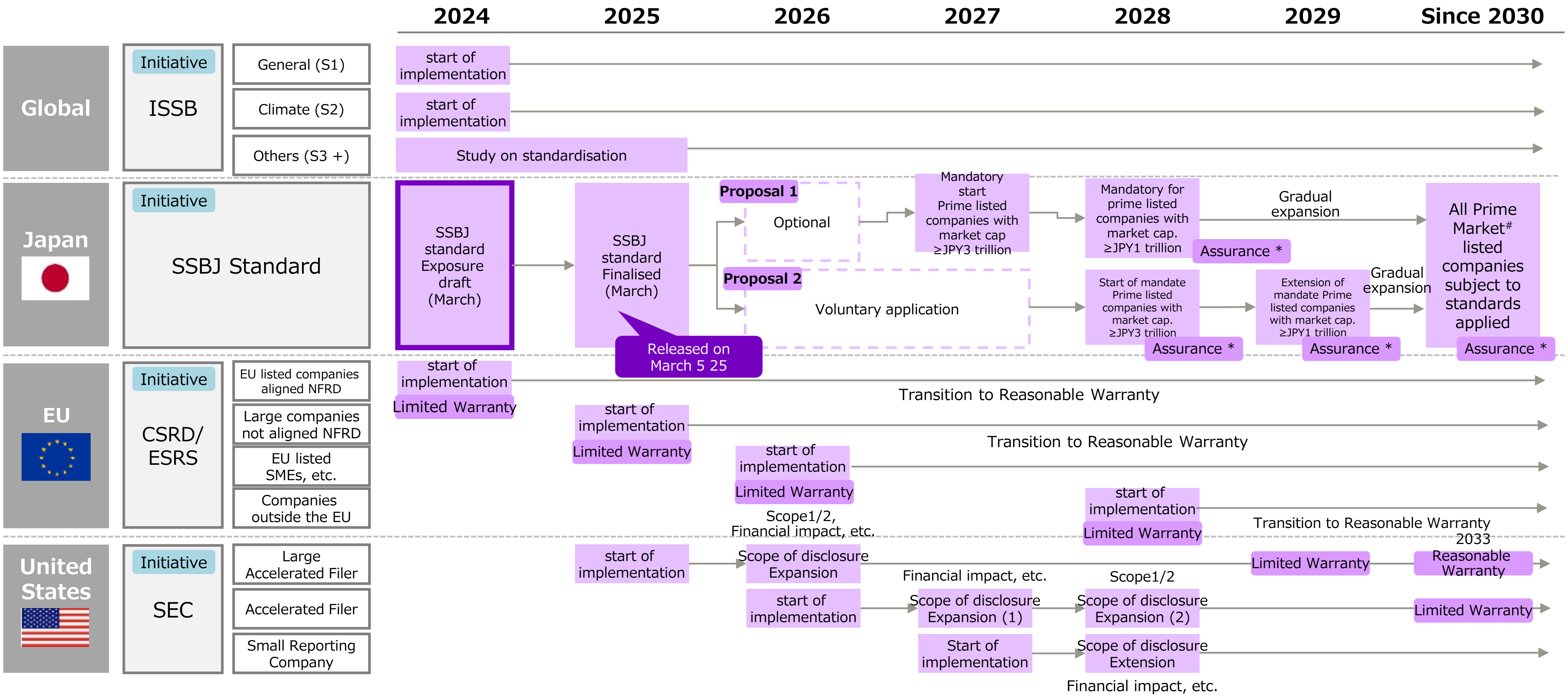
Case Studies

	Nippon Steel	Seiko Epson	Daiei Fudosan
Industry	Steel	Machinery, Instruments	Real estate (SMEs)
Amount	**50 billion yen (Green bond)**	**70 billion yen (Green bond)**	**2.5 billion yen (Green bond & sustainability link loan)**
Purpose	New facility installation to produce environmentally adaptive products, non-oriented electrical steel sheet for drive motors of eco-friendly vehicles	• R&D and production environmentally adaptive products • Renewable energy procurement	For the construction of properties with environmental improvement benefits
Decision on investment	Trying to achieve CN in the steel industry, which is both a core and high-emission industry in Japan, is an effective means of promoting and disseminating CN vision	Defining the investment targets and amounts within the materiality and investment goals tied to the environmental vision	• Defining Sustainability Performance Targets • External appeal effect through green bonds • Aligned with the needs from bank in promoting sustainability financing
Reaction from financial market/ investors	Some investor feedback stating that they bought it because it was a green bond from steel industry - the green label provided assurance and confidence despite being bonds from a high-emission industry	The external PR impact was significantly larger than anticipated, resulting in an expansion of the investment amount and the development of new investor segments such as regional banks	Unclear (unlisted company) but obtained high interest in green finance initiatives from stakeholders

Source: the Ministry of the Environment HP

2.7. International initiatives and mandatory requirements

International initiatives impacting Japan’s steel industry



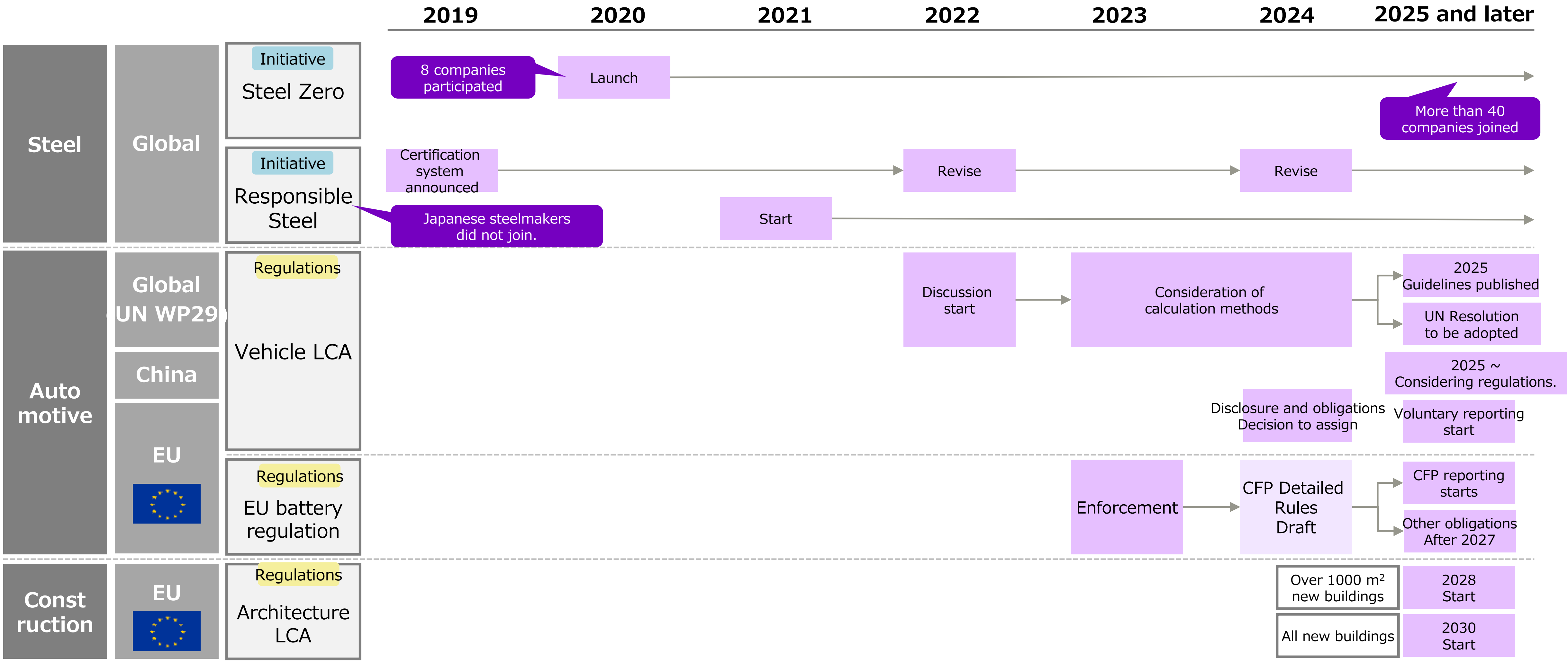
Created by Accenture from the "The 1st Financial System Council Working Group on Sustainability Information Disclosure and Guarantee" document.

*This working group will discuss the assurance of sustainability information in accordance with the SSBJ standards, including standards, scope, and levels. #Devision of the Tokyo Stock Exchange

2.7. International initiatives and mandatory requirements

International initiatives impacting Japan's steel industry (by sector)

Progress in international regulations around LCA helps to advance disclosure efforts in the construction and automobile sectors in Japan.



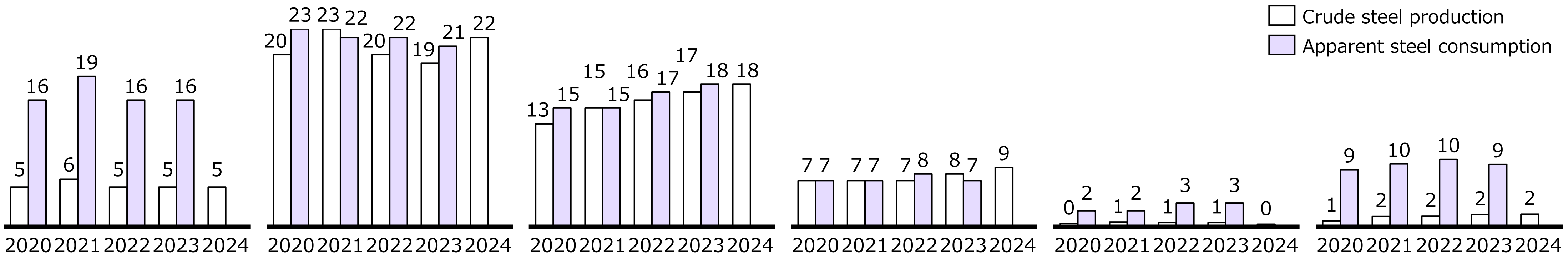
Source: Webpages for each initiative

3. ASEAN steel market overview

3. ASEAN steel market overview

Rising domestic demand in Vietnam and Indonesia drives ASEAN's production and consumption growth. The ASEAN region is a key export market for Japan. ASEAN countries are also heavily influenced by the Chinese steel market.

	Thailand	Vietnam	Indonesia	Malaysia	Singapore	Philippines
Characteristics	Second-largest demand after Vietnam, but limited output (~5 million tonnes) leads to large net imports. Japan supplies many high-grade products.	Both production and consumption exceed 20 million tonnes/year, the highest in ASEAN. Many Japanese steel mills have entered the market targeting stable construction and infrastructure demand.	Annual production just under 20 million tonnes. Domestic supply and demand are balanced. As a growing market, future demand is expected to rapidly rise.	Steel production exceeds domestic demand, making the country a net exporter.	Singapore has only one EAF-based producer of deformed bars, while other steel product categories are predominantly imported.	Demand for infrastructure and construction is firm due to demographics. EAFs only in domestic Industry. Dependent on imports.
Production / Consumption (Unit: 1 million tonnes)	see chart below					
Imports From Japan (2024)	4.28 million tonnes (2nd)	2.26 million tonnes (4th)	2.18 million tonnes (5th)	740,000 tonnes	350,000 tonnes	580,000 tonnes



* WSA has not yet published apparent steel consumption data for 2024.
Source: World Steel Federation, SEAISI

3. ASEAN steel market overview

International operations of Japanese steel makers (+ India)

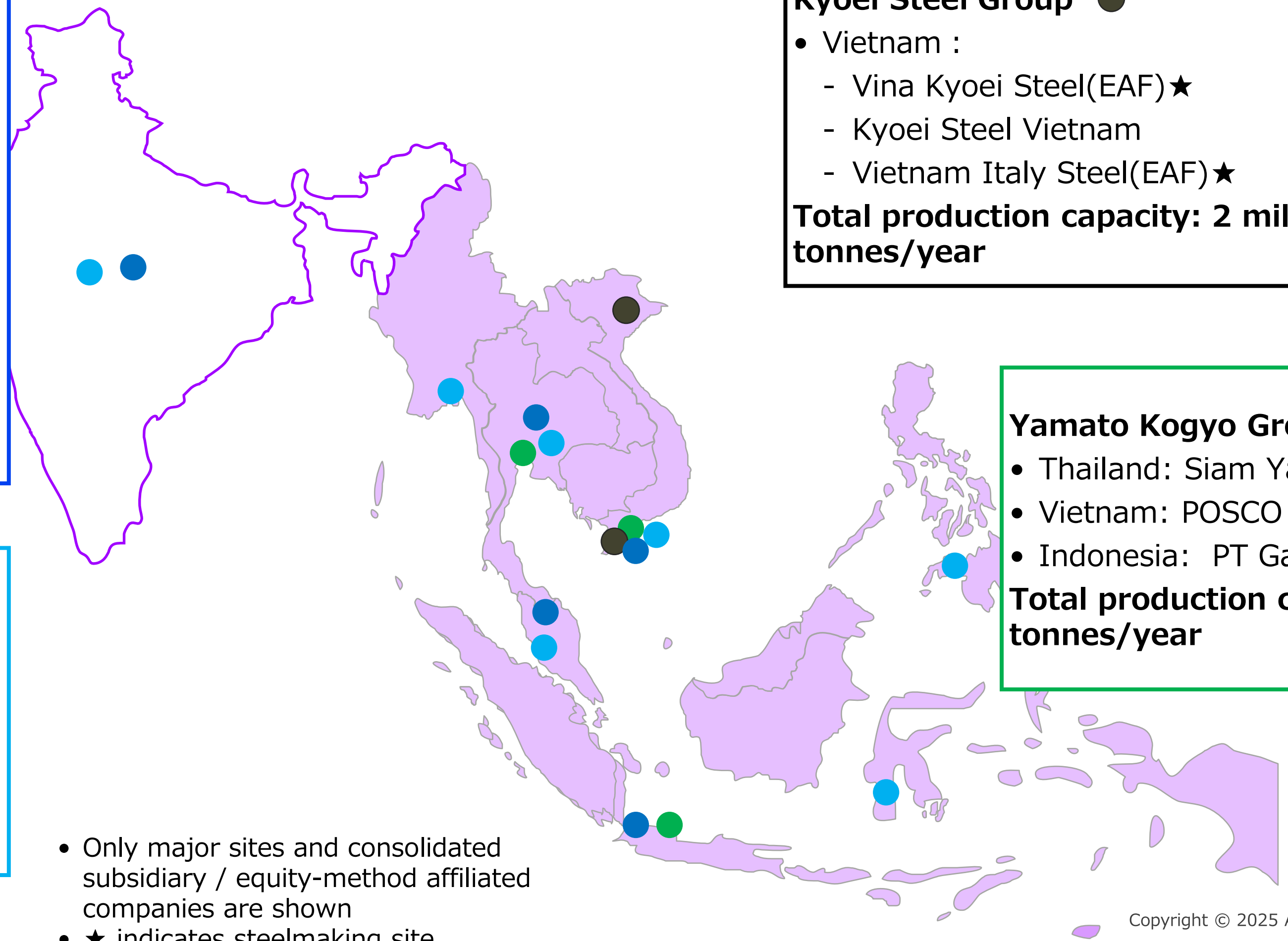
Japanese companies have a long-standing presence in the ASEAN region, especially in Thailand's automotive and construction sectors. Japanese steel mills are deeply integrated across the supply chain in this growing market.

Nippon Steel Group ●

- India: AM/NS India（BF) 7 million tonnes ⇒ 22 million tonnes★
- Thailand
  - G Steel/GJSteel (EAF) 3 million tonnes★
  - NS-SUS 1.28 million tonnes and many other rerollers
- Vietnam: CSVC 1.2 million tonnes and many others
- Indonesia:
  - Krakatau Nippon Steel 480K tonnes
  - Krakatau Osaka Steel (EAF) 500K tonnes and others★
- Multiple countries: NS BlueScope (JV with BlueScope in AU) 920K tonnes

JFE Steel Group ●

- India: JSW Steel (BF) 18 million tonnes★
- Thailand: TCR, TCS, JSGT (all Reroller)
- Indonesia: PT Sermani, JSGI, SPINDO
- Philippines: Phillipine Sinter Corp(Pellet)
- Others: Perstima, J-Spiral, JFE Myanmar Coated Steel, etc.



Kyoei Steel Group ●

- Vietnam :
  - Vina Kyoei Steel(EAF)★
  - Kyoei Steel Vietnam
  - Vietnam Italy Steel(EAF)★

Total production capacity: 2 million tonnes/year

Yamato Kogyo Group ●

- Thailand: Siam Yamato Steel (EAF)★
- Vietnam: POSCO Yamato Vina (EAF)★
- Indonesia: PT Garuda Yamato (EAF)★

Total production capacity: 2.5 million tonnes/year

- Only major sites and consolidated subsidiary / equity-method affiliated companies are shown
- ★ indicates steelmaking site

3. ASEAN steel market overview

ASEAN countries are advancing ETSs, carbon taxes, and CO_2 emissions reporting mandates toward CN by 2050–2060, with active government support for low-carbon steel production technology development.

	Thailand	Vietnam	Indonesia	Malaysia	Singapore	Philippines
CN-Related Policy	• The Climate Change Bill plans to mandate GHG reporting and support green technology investments, including in steel industry. • The TGO will develop GHG emissions management and trading systems, including in steel industry. • The ThaiCI Fund supports SMEs in transitioning to low-carbon manufacturing.	• The 2025–2029 ETS pilot will set emission caps and require producers, including in the steel industry, to purchase permits. • VNSteel etc. promote decarbonisation through tech transfer and financing with Germany and others. • The government plans to set targets for green steel and domestic production in the national strategy for the steel industry.	• The Indonesian government aims to achieve net-zero GHG emissions by 2060. • The Green Mobility policy establishes tax incentives to promote EVs and biofuel vehicles. • A steel decarbonisation roadmap is being developed with OECD and IEA, alongside plans for Green Industry Standards (SIH) and GHG emission regulations.	• Twelfth Malaysia Plan, 2021-2025, sets a target of net-zero GHG emissions by 2050. • The National Energy Transition Roadmap (NETR) aims to phase out coal and shift to renewables by 2050, focusing on green mobility and carbon capture, utilisation, and storage (CCUS).	• The carbon tax installed in 2019 will be rising gradually to encourage emission cuts. • From 2025, listed companies must disclose ISSB-compliant data, with plans to expand. • Monetary Authority of Singapore (MAS) supports industrial decarbonisation, including steel, via its Finance for Net Zero Action Plan.	• In 2022, cap on foreign investment in RE-related businesses was lifted. • In 2024, "the Philippine Energy Plan 2023-2050" was announced. Calls for reducing the use of coal, halting the construction of new oil-fired power plants, and increasing the use of LNG sets a target to increase the ratio of RE to more than 35% by 2030 and 50% by 2050.
Industry Trends in GS Market	• The Meranti Green Steel project (EAF + green hydrogen) plans to produce green steel with over 70% CO_2 reduction compared to conventional steel. • Automotive demand for green-certified products and CFP reduction is rising, with a shift to EV manufacturing.	• Major producers like Hoa Phat and VNSteel are advancing low-carbon steel production through GHG management and renewable energy adoption.	• Gunung Raja Paksi (GRP), Indonesia's largest steelmaker, received a USD60 million loan from IFC and aims to halve CO_2 emissions by 2050 through EAF adoption and phasing out high-carbon furnaces.	• Malaysia Steel Works has partnered with Kelington Group and Universiti Tunku Abdul Rahman (UTAR) to research CO_2 capture and storage technologies during steel production.	• Priority given to green certified companies in government procurement. • JTC promotes the standardisation of carbon accounting by developing an online calculation tool for carbon accounting in 2023.	• New plant by Steel Asia, (largest domestic steel manufacturer), total investment 30 billion pesos. Scheduled operation by 2027. Will reduce GHG emissions by approx. 90% through European manufacturing technology and utilisation of waste metal recycling.

Source: S & P GlobalHP, JICAHP, press releases from various companies

TGO:Thailand Greenhouse Gas Management Organisation
JTC: Jurong Town Corporation is a Singapore government agency under the Ministry of Trade and Industry, responsible for industrial infrastructure and sustainability. It is not a private company.

3. ASEAN steel market overview

Impact on the Japanese Steel Industry

The ASEAN market accounts for one third of Japan's steel exports. Demand from this market is expected to increase. GS demand has not materialised yet in these countries.

Summary of trends in ASEAN countries

Market trends and growth

- As the ASEAN region has a population of about 700 million and a high economic growth rate, demand for steel products will be continue to grow.
- Demand for steel products will increase, especially in the construction and automotive industries, as infrastructure development and manufacturing industries are growing rapidly.
- Currently, there is little demand for GS, with limited adoption occurring mainly in Singapore's construction sector and by a few end users actively pursuing emissions reduction. However, there is potential for growth in the future depending on policy trends in ASEAN countries.

Progress of CN Policy

- ASEAN countries face growing pressure to align with international regulations (e.g., CBAM), through ETS, carbon taxes, and other measures toward CN by 2050. The steel industry is a primary target.
- Financial support policies for technical development for decarbonisation—particularly for low-carbon steel—are increasing in the region.

Potential GS market

- Japan is expected to **accelerate decarbonisation initiatives in technology development and production facilities both domestically and across ASEAN, to strengthen the presence of Japanese steel** in the ASEAN market.
  - ASEAN made up approx. 35% of Japan's steel exports in 2024.
  - Depending on international climate frameworks and regulations, the policies of countries focused on CN, and trends in carbon pricing, demand for GS is expected to grow, leading to increased exports from Japan, as well as expanded local production at Japanese mills in ASEAN countries.

4. Role of green steel, barriers to market expansion and drivers for the adoption of green steel.

Findings from interviews with key stakeholders

4.1. Perspectives on steel decarbonisation – What do key stakeholders think?

Japanese Government

Because of the significance of steel for industries, the government sees investment in BF decarbonisation as essential. Therefore, government support also focuses on the decarbonisation of BFs. Mass balance products are seen as the best way to create an initial market and transactions for GS, and the government believes that these products will appeal to buyers with high environmental consciousness. The broader plan is to start with mass balance products, then move towards an improved definition for GS over time.

Issues and strategies on decarbonisation achievement	• Steel is an essential material for industry. Even in the future, ironmaking through the reduction of iron ore will remain necessary to maintain the global supply-demand balance. Moreover, high-quality steel products are primarily produced by BFs. It is crucial to determine how to encourage these manufacturers to invest in decarbonisation. "The Study Group on Green Steel for GX" focuses on the decarbonisation of BFs, a hard-to-abate sector, due to their large contribution to emissions. • GS production is expected to entail higher costs, and in addition to technological development, expanding the GS market is also a challenge. The government has been providing support to create initial demand with subsidies and understands that support measures are also necessary for consumers. However, it is not sustainable to permanently cover all cost increases from decarbonisation investments through subsidies alone. **The Japanese Government believes that it is necessary to stimulate demand for GS and create commercial transactions that distribute GS.** It is necessary to promote mass balance materials to companies with high environmental consciousness and standardise it in society, and that **users should bear the cost of improved environmental value.** • Government strategy for promotion of GS in the future - Market efforts (supply and demand side) ① Utilisation of subsidies to create initial GS demand ② Procurement by the government - Government initiatives ① Infrastructure development for CFP calculation rule etc; ② Mandatory disclosure of emissions The government aims to normalize the use of GS through these measures and believes that imposing mandatory GS usage through regulatory measures would be premature at this stage
Policy Issues Toward Promotion of GS	• Since it is necessary to secure scrap due to the conversion of BFs to large EAFs, development of sorting technology to improve the quality of scrap is recognised as a policy issue. Securing stable high-grade scrap supply does not compete with ordinary EAFs, but there may be a sense of crisis for specialty steel EAFs. • It is right to aim for decarbonisation using hydrogen from a long-term perspective, but impossible to switch to it immediately after realistic consideration. First of all, technology development for utilising hydrogen should be promoted and efforts should be made to lower the price of hydrogen. Measures are being developed not only for steel but also for energy policy as social infrastructure. • **In the transition period, it is reasonable to utilise mass balance products so that consumers can easily access Japan's green steel. However, consumers are concerned about alignment with international rules, and global dialogue is required to advance standardisation of mass balance.** On the other hand, it is difficult to grasp policy trends during the transition period and the actual conditions of the steel industry in each country. • The global oversupply is also a challenge. If steel products from overseas are distributed domestically at dumping prices, industries will lose operational strength, and it becomes difficult for steel mills to invest in decarbonisation.
Definition of GS	• There is an opinion that GS should be clearly defined, and we understand that it is necessary to do so at the stage where disclosure and reduction obligations are required in the future. However, **at present, opinions are different among stakeholders, and there should be various definitions.** There is **no objection to the fact that EAF products are recognised as green steel in the market due to their low GHG emissions, and the utilisation of them is necessary.** • On the other hand, considering the need for decarbonising BFs, it is **highly necessary to provide policy support for GS that enables BF decarbonisation during the transition period.**

4.1. Perspectives on steel decarbonisation – What do key stakeholders think?

Steel industry (BF producers and industry representatives)

Plan to shift from mass balance to low-emission products in future. See the top priorities in the transition phase as recognising mass balance steel, the provision of policy support focused on green steel for GX, and the creation of a green steel market to stimulate purchasing. These producers want mass balance to be adopted internationally, the definition of green steel to not be limited to "true green" criteria.

Definition of green steel

- Currently, no zero-emission BF products exist globally, and the emission reductions assumed in Europe are not achievable at present. Even European manufacturers have postponed plans toward zero emissions production.
- Until 2040, the R&D stage will continue, and emission reduction in BF primary steelmaking should be limited. While **no true green steel exists, it does not make sense to narrow the definition of green steel based on two categories "true green or not".**
- **In the long term, as technology and markets develop, mass balance can be phased out in favour of zero-emission products.**
- They do not disagree that EAF steel has lower CFP, but promote the importance of maintaining primary steelmaking by assigning emission reduction value to BF steel as important to prevent market disruption at this stage.

Initiatives for the promotion of GS

- Sales Policy
  - The extra costs of mass balance steel have prevented sales expansion from proceeding as planned. Currently, few customers are willing to pay a premium for mass balance products with no functional difference from conventional products. It is reasonable to sell to customers who value the emissions reduction offered by mass balance materials.
  - Efforts to create a market for GS have begun in public procurement, supported by government assistance.
- International standardisation
  - **It is necessary for the emissions reduction value of mass balance to be internationally recognised** and for sales of these products to be promoted. In Japan, the Institute of LCA already accepts the mass balance approach, but **discussions are ongoing to align mass balance evaluation with international initiatives such as the GHG Protocol and ISO etc.** They are already participating in discussions on the revision of the GHG protocol and how to reflect this **CFP calculations/LCA.**
  - Alignment with WSA has been achieved.

Policy expectations

- **The contribution of BFs to emissions justify government support also to contribute the country's emission reduction.** The industry requested predictable assurance from the government that decarbonisation investments could be recovered. The support guaranteed investments and moved decarbonisation forward.
- Direct reduction, including hydrogen-based methods, faces cost challenges and lower production efficiency compared with existing BF production. Each company can advance technology development, but green hydrogen procurement, CCS/CCUS, and infrastructure are a government/national-level responsibility.
- Green steel production is unsustainable unless the market pays a premium. **Creating a market and encouraging purchases is more important than clarifying definitions of GS. Regulation or mandatory procurement is necessary as subsidies for demand stimulation cannot last forever.**

4.1. Perspectives on steel decarbonisation – What do key stakeholders think?

Steel industry (EAF producers)

At present, only GX steel produced by BFs is eligible for government support as green steel. However, to achieve decarbonisation, it is necessary to address both the conversion of BF production processes and the expansion of EAFs. Japan has a low share of EAFs compared to other developed countries - EAF use should be expanded to promote domestic circularity of iron and steel, which are strategic materials.

Toward GS Discussion of Issues	• Currently, in Japan, the definition of GS is structured in a way that favours BFs and BF products. Mass balance products and the transition away from BF process get policy support as GX steel. **Low emission steel products made by conventional EAFs using RE are not recognised as GS in the definition of METI, and conventional EAFs are not subject to public procurement or subsidies even if efforts toward decarbonization are undertaken. To achieve decarbonisation, it is necessary to address both the conversion of BF-based manufacturing processes and the expansion of EAFs.** • Although the WSA is aligned with the mass balance method defined by JISF, the validity of mass balance GS is controversial internationally, and it is not yet confirmed whether emission reductions defined using mass balance products can be included in Scope 3. • In Japan, 1.4 billion tonnes of scrap are accumulated, and the annual amount generated is 40 million tonnes. Of this, less than 30 million tonnes are distributed to the market and 600,000 to 10 million tonnes are exported. In neighbouring countries such as South Korea and Taiwan, domestic iron and steel stock levels are increasing and they are becoming self-sufficient in scrap, leading to an increase in exports. In China, iron and steel stock levels are expected to reach 10 tonnes per capita, and the market will change depending on whether that scrap is exported outside China or utilised in China. **Japan's domestic steel demand can already be largely met by EAF materials derived from steel scrap, making new BFs production using iron ore as the primary raw material unnecessary—excluding certain high value-added products.** • Even if the demand for iron and steel scrap increases in the future due to the expansion of conventional EAFs and the conversion of BF to large EAFs, there is little concern about competition in securing scrap in the market because new large EAFs basically use high-grade scrap. On the other hand, specialty steel EAFs require high-grade scrap and may compete with BF manufacturers in securing high-grade scrap.
Requests and recommendations for policy	• The large-scale transition of the BF supply chain, which has a vast industrial base and a large population involved, will have a significant impact on society and the economy. It is not easy to produce high-grade steel from low-grade scrap and hydrogen reduction due to technical issues and costs, and government support will be necessary. On the other hand, decarbonisation of EAFs can be easily achieved by replacing the electricity used in production with RE. **If EAF mills, which have lower emission reduction costs than BFs and do not use the mass balance method, are not defined as GS and are treated disadvantageously in the market, it will slow down the progress of the Japanese steel industry toward achieving decarbonisation.** • The share of EAF production in Japan's total steel production is 25%, which is similar to the world average. However, compared with 70% in the United States and 42% in the EU, there is a concern that the share of EAFs is low among developed countries. **Expanding the use of EAF products will contribute to Japan's decarbonisation achievement, promote the domestic circulation of steel scrap, and prevent the outflow of iron sources, which are strategic materials.**
Target market	• The automotive industry secures the quota for GS produced in the EU, and there is demand for GS for building materials. In addition, the EU recognises that EAF materials also contribute to decarbonisation and is active in utilising EAF products for CBAM compliance, so inquiries are recently increasing. On the other hand, it is difficult to significantly expand exports due to the long distance from Japan and high transportation costs. • In the ASEAN region, there is demand for GS as a building material in Singapore, where decarbonisation is advocated for by policy. On the other hand, there is still little demand in Thailand, Vietnam, Indonesia, and other countries, where there is no increase in the market for purchasing GS. • Although we will continue to export, we intend to expand our domestic market share to contribute to CN and retain scrap in Japan. Currently, we are focusing on expanding transactions with customers who are working to reduce emissions by utilising EAF products, such as the construction, automotive, and electrical equipment industries, and developing a scrap utilisation scheme.

4.1. Perspectives on steel decarbonisation – What do key stakeholders think?

Trading companies and distributors

Domestic policies focus on supporting the steel supply side and remain insufficient for the demand side. To achieve decarbonisation, regulations on the demand side are required. It is also important to enhance policy predictability surrounding the introduction of future regulations to ensure customers develop systems and prepare for future cost burdens.

GS demand trends	• In Japan, green steel is currently being purchased as a trial - both EAF (with certificates and credits) and BF products. We are still trying to expand sales of GS but there are not many long-term contracts. There are more contract records for global markets (especially in Europe) than for domestic markets. Premiums for mass balance materials is too high, and EAFs products sales are better both in Japan and for exports. • Due to the effects of CEV subsidies, the automotive industry, led by Toyota, has adopted a policy of procuring mass balance materials, but only Nissan has a clear policy to increase the purchase volume of GS. • From the perspective of consumers, it is natural that demand will focus on inexpensive EAFs, and from the standpoint of trading companies and distributors, EAFs products provide a business opportunity. • The ASEAN region currently has only green building in Singapore to affect GS demand. There is currently no demand, but market trends in Indonesia and Thailand, where policies are being implemented, should be closely watched.
Policy expectations	• The gap between BF mills and EAF mills is caused by the low value of scrap in CFP and the ease of decarbonisation. Circularity allocation rules should be determined through international discussions. • If demand trends are left to consumers, **demand will be concentrated on EAF materials due to the emphasis on cost. To achieve sustainable growth of the steel industry and related demand industries and essentially reduce GHG emissions, policies should create demand for green products including BF products.** • It is clear that EAF products are green steel in the market, and **it is appropriate to include them in the definition of GS in the Study Group on GS for GX and include them in government support.** It is **reasonable for the government to support mainly BFs, which have high transition costs for decarbonisation**, and **mass balance is necessary in the transition period.** However, if the government supports the large EAF development of BF manufacturers, **incentives should also be designed to include existing EAF manufacturers.** • **Domestic policies are biased toward supporting the steel supply side, and approaches to the demand side are not sufficient. In particular, regulations on the demand side (such as emission trading and carbon pricing) are necessary to realise decarbonisation, but discussions are delayed. It is important to provide policy predictability for the introduction of future regulations at an early stage in order to promote cost sharing by demand industries and the development of systems.** Japan has decided to introduce carbon pricing, so the details of this should be presented as soon as possible to prepare target companies for the future burden, rather than releasing information in small pieces. • For Japan to participate in international rulemaking on decarbonisation, the government needs to clearly present a timeline and guidelines not only for support measures, but also for regulatory policies within its industrial and environmental strategies.
Global pressure	• The EU's CBAM provides policy predictability, so it is expected to exert a certain amount of pressure on consumers in industries such as the automotive industry. On the other hand, there is a free allowance for downstream products, which does not exert pressure. If each industry becomes subject to the regulation in the future, domestic companies' efforts to decarbonise may advance. • Even now, companies with local factories in countries and regions subject to these regulation are under pressure to respond to them.

4.1. Perspectives on steel decarbonisation – What do key stakeholders think?

Consumers

Although the need for transitional BF-based green steel is understood, its higher cost for a product of the same quality as existing products remains a challenge. Promoting GS requires evaluation criteria aligned with international standards and additional incentives and regulations to drive awareness and to cover costs throughout the whole supply chain.

Trends and issues for adoption of GS

- **As mass balance BF materials have the same quality and functionality as existed products, its high premium is the issue. Motivations and the pace of initiatives differ across industries.**

  Automotive
  - The automotive industry faces global competition and feels compelled to pursue decarbonisation in response to overseas regulations. While OEMs differ in strategies and policies, they are advancing discussions on green steel in partnership with BF mills, with the understanding of the need to support decarbonisation investments.
  - As emissions during the use phase account for the majority of CFP/LCA, the reduction of upstream material emissions is currently a lower priority.

  Construction
  - The construction sector has just established a system for calculating building emissions, and few companies are currently engaged in calculation and disclosure. It is also difficult to get client acceptance for the higher costs of low-carbon materials, and emissions rarely serve as criteria at the design or procurement stage.
  - With no obligation to implement green steel at present, the usage of GS is not being accelerated. The direction will be considered once mandatory building LCA disclosure comes into effect.

  Real estate
  - Emission reduction methodologies are currently under consideration, led primarily by companies participating in SBT and other international disclosure initiatives.

  Electronics/machinery
  - The industry is in the process of formulating common CFP calculation rules, and the use of low-emission materials, including GS, is still at an early stage across the sector.
  - As switching from BF steel to EAF steel can significantly reduce CFP, they prefer to actively adopt EAF steel, which enables corporate branding opportunities through circularity and recycled material use. More costly mass balance steel offers no performance advantages.
- Definition of GS and the position of EAF materials
  - The definition of the Study Group on GS for GX is oriented towards BF mills but the definition of GS should be broader.
  - Some EAF steel, depending on type of grade, can be of comparable quality to BF steel and offers substantial cost benefits. Some EAF steel has mechanical property limitations compared to BF steel. Therefore, the adoption of EAF steel depends on conditions such as design and use.
- Needs for international standardisation
  - In the highly export-oriented automotive industry, it is difficult to adopt mass balance materials because **their evaluation and CFP calculation rules are not internationally standardised.**
  - Given the lack of performance differences, international certification and assurance are essential to convince clients and investors both in Japan and abroad of the value of adopting green steel.

Policy expectations

- Japan's institutional development on carbon neutrality is lagging. In Europe, strong end-user awareness of GS provides a foundation for supply chain-wide action.
- **In the long-term, costs must be shared across the supply chain. Initial subsidies for end-users, such as CEV subsidies, are effective.** Frameworks and subsidies that recognise resource circularity through EAF steel, in addition to emissions reduction, are also valuable.
- **Without mechanisms such as labelling and assurance that allow end-users to convey the value of environmental efforts to the market, investment will not progress.** Corporate investment in GS and other initiatives is also driven by rising compliance awareness through regulation and pressure from society.

4.1. Perspectives on steel decarbonisation – What do key stakeholders think?

Finance sector

Clear evaluation methods for decarbonisation efforts and for corporate valuation in relation to decarbonisation are essential to create a green steel market in Japan.

GS demand issues and measures	• **To create a green steel market in Japan, the most important thing is to convince consumers to purchase green steel.** The market will not move forward even if technological development to increase supply is invested in. "The Study Group on Green Steel for GX"'s initiative to promote the adoption of GS by specifically targeting the automotive industry, and to establish the CEV subsidy scheme, is a commendable effort. • **Pressure from foreign investors interested in GX is not strong. There is pressure from the European market. For consumers, information disclosure such as CFP cannot alone be an incentive to purchase green steel. They will not move without regulatory policies such as mandatory emission reduction and trading. Subsidies may be helpful at the initial stage, but in the long term, mandates will be necessary.**
Issues and measures for financial institutions and investors	• Both foreign investors and domestic analysts are interested in green steel and GX. However, **as there are no easy-to-understand criteria for evaluating decarbonisation efforts on a by product basis as or as a sign of corporate value, investors cannot judge whether efforts are good or bad, resulting in poor investment rates. It is urgent to introduce evaluation indicators to encourage investors to make judgments.** • In developing evaluation indicators, investors' evaluation of corporate value and actual reductions should be considered separately. First of all, it is essential to create a green steel market in Japan by promoting methods to evaluate corporate efforts. For the real estate sector, there is currently a movement in the construction industry to create a calculation method for the actual amount of emission reduction in buildings. • The Japanese government is currently working to institutionalise carbon pricing. Financial markets see public price signals as effective. Is also beneficial to standardise evaluations methods for actual reductions. • In the discussion on the GHG Protocol, there is some movement to establish a framework to evaluate the reduction results with participation of JISF as stakeholder. A definition and evaluation methodology of GS visualisation for financial institutions is expected to be delivered.
International trends	• If decarbonisation is truly advocated internationally, India should also be a target for decarbonisation efforts (more so than the ASEAN region where EAFs are mainstream). • Asia and India are becoming influential as production bases and markets. Japan should first explore the possibility of cooperation within Asia. • In order to promote the transition to green steel as a realistic approach for users and investors, not only **ideals and targets are needed, but also the solution in transition should be discussed** internationally. **As a prelude to use of truly green steel (zero carbon steel), it would be good to categorise transitional materials, including mass balance materials.** • While efforts by users and an evaluation system need to be developed, offsetting carbon credits was criticised by NGOs at the last COP. and will no longer be a mainstay in the future. Efforts and evaluation of actual reductions are more feasible. • One approach, which is being discussed for other materials, is to strengthen regulations on supply so that the production and purchase of green steel will be forced. Although this is not realistic in terms of both cost and functionality, it should be effective to impose regulations that prohibit the use of fossil fuels for steel production as a drastic approach.

4.2. Barriers and drivers for steel suppliers

Amid the high difficulty of achieving return on investment and concerns over potential declines in international competitiveness, the challenges for promoting supply-side initiatives lie in the lack of demand-side regulations and incentives to create a market for green steel (GS), as well as insufficient additional policy support to ensure the execution of such investments.

Issues on the supply side

Lack of established definitions/ insufficient alignment with international standards	• Although international discussions are progressing and green steel brands have begun to circulate, definitions of GS, emission calculation methods, and evaluation/disclosure standards have not yet been established • At present, CFP calculation rules for Japanese GS are not yet established. As a result, the reduction value of Japanese GS is not appropriately reflected in CFP and it cannot be recognised internationally as a low-CFP product. Standardisation of Japanese GS in alignment with international rules, including ISO and the GHG Protocol, is seen as necessary but remains under development.
Imbalanced policy support and insufficient demand stimulation	• Measures that could stimulate demand for green steel, such as subsidies and funds for decarbonisation process investments, tax incentives, and preferential treatment in public procurement are being put in place. However, these measures primarily target the conversion of BF and do not incorporate a broader definition of GS. • Policies to cover the investment required to promote GS (e.g., increased manufacturing costs), as well as to accelerate and broaden demand to complement such investment, are insufficient.
Lack of enforceable measures to promote action	• There are currently no clear emission regulations for the steel industry or requirements for consumers to use green materials. • Although there is a high possibility that related industries will adopt such products in accordance with the requirement to report emissions at the time of export and international LCA regulations, no emission limits and no active carbon pricing have been introduced in Japan.
Assurance of return on investment for technology, procurement, and infrastructure	• It is difficult to foresee the return on investment and associated production costs for establishing production technology for hydrogen reduction, large-scale innovative EAF and technology of CCUS. • Stable procurement of carbon-free electricity and green hydrogen is not within the scope of a single company and requires national-level initiatives, which are still under development. In addition, securing high-quality iron scrap and iron ore, necessary to contain manufacturing costs, remains a significant challenge.
Insufficient understanding among end-consumers/ customers and financial markets	• Major end-users have begun using green steel (GS) to support supply-chain-wide disclosure and reduction targets, as well as promotion of environmental value; however, these initiatives remain voluntary and are not backed by any obligations or regulations. • The adoption of green steel (GS) for Scope 3 and CFP reductions aligned with disclosure standards, as well as for attracting real estate investment, is awaited, and requires support from policy measures.

4.2. Barriers and drivers for steel suppliers

Steel mills are implementing decarbonisation plans under various government support and measures. However, stronger drivers are required to stimulate demand for GS, accelerate investment payback, and achieve social implementation of low-carbon products as soon as possible.

Issues on the supply side	Possible approaches		Effectiveness as a driver	Key stakeholders
Lack of established definitions/ insufficient alignment with international standards	Establishment of definition and evaluation criteria	Definition/evaluation rule establishment International standardisation	Under discussion in Japan and abroad and is a hurdle now, but is highly likely to become a strong driver for GS diffusion.	• METI • MOE • JISF & Steel Mills
Imbalanced policy support and insufficient demand stimulation	Incentives/ policy support	Decarbonisation of the steel industry Expand demand for GS	It is acting as an effective driver at present, but can be strengthened by additional measures.	• METI • MOE • Consumers
Lack of enforceable measures to promote action	Regulations and mandates	Domestic regulations International rules	It is not yet a strong driver, but is likely to become a strong driver through institutional development.	• METI
Assurance of return on investment for technology, procurement, and infrastructure	Technology development/ procurement of raw materials and energy	Technical issues/ costs External conditions	In order to become a stable driver for achieving the roadmap, it is necessary to continuously resolve hurdles such as time and money through national policy support.	• METI • JISF • Steel Mills
Insufficient understanding among end-consumers/ customers and financial markets	External environment	Market needs Financial markets	Although it is not a strong driver now, it can become an effective driver by developing systems and fostering social awareness.	• Major consumer (International initiative)

4.3. Barriers and drivers for steel buyers

The demand side is concerned about a decline in competitiveness due to the use of high-cost, low-emission steel. To expand the use of green steel, they face challenges stemming from the lack of visibility and proper evaluation of value when GS is incorporated into their products, as well as insufficient external pressure from regulations and mandates.

Issues on the demand side

Insufficient alignment with international standards	• As CO_2 content disclosure requirements are increasing in overseas markets and for investors, international standardisation of Japanese GX products is in progress. • Discussions at home and abroad are in progress. A method for evaluating GX steel as having low CFP has yet to be established internationally.
Lack of policy support to cost coverage	• Since the use of high-cost GS may lead to a decline in the international competitiveness of Japanese companies, visualisation of the value of GS and design of support and incentives schemes for purchasers targeting the automotive and construction industries with large demand are insufficient. • Incentives have been provided to automakers through CEV subsidies, but they are insufficient as a catalyst. Measures to stimulate demand for the use of GS in other demand sectors and the entire supply chain are also insufficient.
Delays due to lack of regulations and mandates	• Listed companies are required to disclose emissions at the organisational level, but companies are not required to reduce or limit emissions. Therefore, disclosure requirements and regulations at the product level (CFP) are not in place in Japan. • Discussions are underway in each industry to establish calculation rules and to improve and disclose CFP data. However, following overseas regulations and building LCAs, there is no disclosure requirement and no obligation for consumers to use CFP and low- environmental impact products, so there is little pressure for action.
Unclear valuation of environmental initiatives	• There is a lack of discussion in Japan and overseas to promote understanding of the importance of reducing CO_2 emissions through GX investment, and there is insufficient appeal of the environmental value of initial GX investment (purchase of low-carbon materials).
Lack of external pressure and stakeholder expectations	• The mandatory disclosure of Scope 3 emissions, which is expected to be a catalyst for both expanding the use of low-carbon environmental impact steel and the market's request for disclosure, are not enforceable now. • It is possible to use GS to implement Scope 3 reductions and the reduction target for the entire supply chain by committing to international initiatives, but it is a challenge to expand the support base for this, including from SMEs.

4.3. Barriers and drivers for steel buyers

To stimulate demand-side GS needs, it is necessary to promote the value of GS, alongside the implementation of strong regulations and incentives. In addition to mandatory emission disclosure, the development of systems for reduction and mandatory use of low-carbon products will be effective as drivers.

Issues on the demand side	Possible approaches	Effectiveness as a driver	Key stakeholders
Insufficient alignment with international standards	Establishment of definition and evaluation criteria	Although it is still under discussion domestically and internally and it is currently a hurdle, it is highly likely to be a strong driver for GS diffusion.	• METI • JISF
Lack of policy support to cost coverage	Incentives/ policy support	Can be a powerful driver for the diffusion of GS, but urgent measures are necessary.	• METI • MOE
Delays due to lack of regulations and mandates	Regulations and mandates	Can be a powerful driver for the promotion of GS, but urgent measures are necessary.	• METI • MOE
Unclear valuation of environmental initiatives	Visualisation of environmental values	Although it is not yet a strong driver, it is highly likely to become a strong driver once rules are developed.	• METI • MOE
Lack of external pressure and stakeholder expectations	External environment: Market needs; Financial markets	Although not yet a strong driver, it can become an effective driver by development of legal systems.	• Leading companies in each industry

5. Findings and recommendations

5. Findings and recommendations

In order to improve the marketability of GS during the transition and until the use of low-emission products becomes normalised, it is necessary for industry and government to work together to take measures to resolve both supply and demand issues. The government also needs to deepen international discussions on decarbonisation.

Effective Drivers	Target	Necessary Initiatives
Establishment of definition and evaluation criteria	Supply	• Diversify definitions and harmonise international standards • Establishment of systems to ensure that CFP is attributed to products. Environmental value needs to be recognised on par with economic value
	Demand	• Standardisation and international standardisation of definitions and evaluation criteria through cooperation between supply and demand
Incentives/ policy support	Supply	• In addition to the current support, support and subsidies need to be provided to the steel industry to implement initiatives that can contribute to decarbonisation in line with the progress of the CN roadmap
	Demand	• Provision of subsidies and tax incentives to support initial investment
Regulations and mandates	Supply	• Establishment of a carbon pricing • Development of a corporate evaluation framework and creation of a trading market based on a carbon pricing
	Demand	• Introduction of emission reduction obligations and emission controls in addition to emission disclosure requirements
Technology development/ procurement of raw materials and energy	Supply	• Building a decarbonisation infrastructure supply chain through international cooperation, free from resource nationalism, and supporting technological development via collaboration with other countries • Expansion of the use of EAFs to promote local production and consumption of steel scrap
External environment	Society/End-Consumers	• Promotion of dialogues between relevant ministries and industries to foster awareness and resolve issues throughout society • Strengthening enlightenment activities to increase understanding of environmental values for end-consumers and customers
	Investors	• Establishment of evaluation indicators to encourage investors to evaluate reductions and environmental values

Goals

Transition period

- End users/consumers purchase GS to benefit from its environmental value. The costs of decarbonisation are shared throughout the supply chain
- GS with various definitions for the transition period becomes common and is utilised by users to reduce emissions
- Environmental value is evaluated in the same way as economic value, driving increased demand and sustainable decarbonisation investment by manufacturers

A world where the distribution of low-zero emission steel and a sound cycle of decarbonisation investment and returns occur

Production and dissemination of green steel that does not rely on fossil fuels

THANK YOU!