TransitionAsia
ACCELERATING EAST ASIAN CORPORATE CLIMATE ACTION

MALAYSIAN IRON AND STEEL SECTOR OVERVIEW - THE CHALLENGE OF DECARBONISATION

Feb 2025

INTRODUCTION

Malaysia's steel industry is a driver of the nation's economic and industrial development, playing an important role in supporting infrastructure, construction, and manufacturing. However, the sector is currently at a critical juncture, facing challenges such as overcapacity, uneven domestic consumption and the need for modernisation to meet decarbonisation goals.

Over the decades, Malaysia's steel production has been closely tied to its industrialisation and infrastructure expansion. Driven by government-backed projects under frameworks such as the 11th and 12th Malaysia Plans, the industry has experienced significant growth, with steel demand peaking in 2018. However, the subsequent economic slowdown, exacerbated by the COVID-19 pandemic, highlighted the sector's structural inefficiencies and reliance on exports for low-grade steel products while importing higher-grade steel.

This report delves into the current state of Malaysia's steel sector, examining its strengths and weaknesses and exploring opportunities for modernisation and decarbonisation. Key areas of focus include the industry's integration with national strategies like the New Industrial Master Plan 2030 (NIMP 2030) and its potential alignment with global sustainability goals. By leveraging Malaysia's abundant natural resources, adopting new technological processes and ensuring public-private collaboration and cooperation, the industry can reposition itself towards decarbonisation.

OVERVIEW OF MALAYSIA'S STEEL SECTOR

BACKGROUND AND SECTOR GROWTH

Malaysia's steel production has been closely tied to the country's rapid industrialisation and infrastructure development over the past few decades. The growth of the steel industry has been driven by government-backed infrastructure projects, such as highways, railways, ports and urban development initiatives, under programmes like the 11th and 12th Malaysia Plans. These efforts, combined with a rising demand for steel from the construction and manufacturing sectors, fuelled steel consumption, which peaked in 2018 at 9.78 million tonnes.[1]

Until 2014, Malaysia exclusively produced steel using electric arc furnaces (EAFs). However, by 2022, 72% of the country's steel production had shifted to coal-reliant blast furnaces (BFs), leaving much of the EAF capacity idle.[2] In part, this shift has been driven by rapid industrialisation. A shift further occurred in May 2018, when China introduced ultra-low emission standards for steelmakers. This rationalisation move prompted an increase in outward investment driven by Chinese steelmakers, particularly in Southeast Asia, with Malaysia being a prominent destination.

Malaysia's per capita steel consumption remains modest compared to its regional peers, reflecting slower growth in domestic demand. The industry is characterised by a mix of private and state-owned companies, with significant reliance on imported raw materials, as Malaysia lacks substantial reserves of key minerals like nickel, compared to Indonesia. Despite these challenges, the government continues to prioritise the steel industry as a critical component of its economic and infrastructure development.

NATIONAL INDUSTRIAL STRATEGIES - DRIVING STEEL CONSUMPTION

The New Industrial Master Plan 2030 (NIMP 2030) is Malaysia's strategic initiative designed to transform the industrial sector into a more competitive and sustainable powerhouse.[3] It focuses on diversifying and innovating industries, integrating digital technologies to enhance productivity and promoting environmentally-friendly practices to reduce carbon emissions. NIMP 2030 also emphasises strengthening local capabilities to decrease reliance on imports while attracting both foreign and domestic investments to drive growth and create jobs. Overall, the plan aims to position Malaysia as a key player in the global industrial landscape.

Beyond NIMP 2030, the National Automotive Policy (NAP 2020) outlines Malaysia's automotive industrial strategy, aiming to foster a competitive sector.[4] The policy focuses on electric vehicles (EVs) and emphasises advanced technology and local manufacturing. It encourages investment in research and development, innovation and skill enhancement, positioning Malaysia as a hub for automotive manufacturing. If successful, this policy could boost the demand for high-strength steels, particularly automotive-grade flat products, which are currently lacking in Malaysia's steel production capabilities. With its nod to decarbonisation, the

1 https://www.mida.gov.my/mida-news/steelmakers-welcome-governments-two-year-moratorium-on-long-products/
2 https://liewchintong.com/2024/07/01/navigating-the-future-of-malaysias-iron-and-steel-industry/
3 https://www.nimp2030.gov.my/
4 https://www.miti.gov.my/index.php/pages/view/nap2020

policy could stimulate demand for low-carbon steel products and foster partnerships similar to those seen in countries with low-carbon steel capabilities and automotive manufacturing sectors.

OVERCAPACITY

On August 15, 2023, Malaysia's Ministry of Investment, Trade and Industry (MITI) implemented a two-year moratorium on the steel industry. This decision aimed to address existing challenges within the sector and realign its direction with NIMP 2030. The moratorium covers all activities related to applications, licensing, diversification and manufacturing, although exceptions may be granted on a case-by-case basis for licence applications that support the NIMP 2030 agenda.

While Malaysia's steel industry faces overcapacity issues, especially with lower-grade products like rebar and wire rods, there remains a supply gap in flat steel products. Currently, higher-grade steel products, such as hot-rolled coil (HRC), are not produced domestically, leaving the country reliant on imports. The moratorium presents an opportunity for Malaysian steelmakers to enhance their production capabilities, tackling the overcapacity issue while also focusing on higher-value steel products to meet domestic needs. This strategic shift could help reduce Malaysia's dependence on imported steel and strengthen its position in the global steel market.

A key condition for exemptions under the steel sector moratorium is alignment with Malaysia's decarbonisation agenda. Licences that promote the production of low-carbon steel products or the adoption of carbon-reduction technologies are more likely to be approved. A notable example is the 20 billion MYR green steel project launched by Esteel Enterprise Sabah Sdn Bhd, announced in 2022, which aims to reduce emissions by 70% compared to BF-BOF steel.[5]

KEY DEMAND DRIVERS OF THE STEEL SECTOR

Construction

Malaysia's construction market was valued at $49.47 billion in 2024 and is projected to grow to $82.96 billion by 2032, reflecting a CAGR of 9%.[6 7] With the full resumption of infrastructure projects post-pandemic, alongside rising investments and government-sponsored mega projects, the demand for steel in Malaysia is expected to experience significant growth. Key infrastructure initiatives, such as transportation networks, residential developments and commercial buildings are likely to be the main drivers of this increased demand.

Automotive

Malaysia's industrial strategies, including NIMP 2030 and NAP 2020, focus on leveraging the growing demand for EVs, with total automotive industrial volume projection to double to 1.22 million vehicles by 2030.[8] A key priority is localising the supply chain, creating opportunities for the steel sector to align with automotive industry requirements. However, downstream upgrades are essential, as Malaysia's steel industry

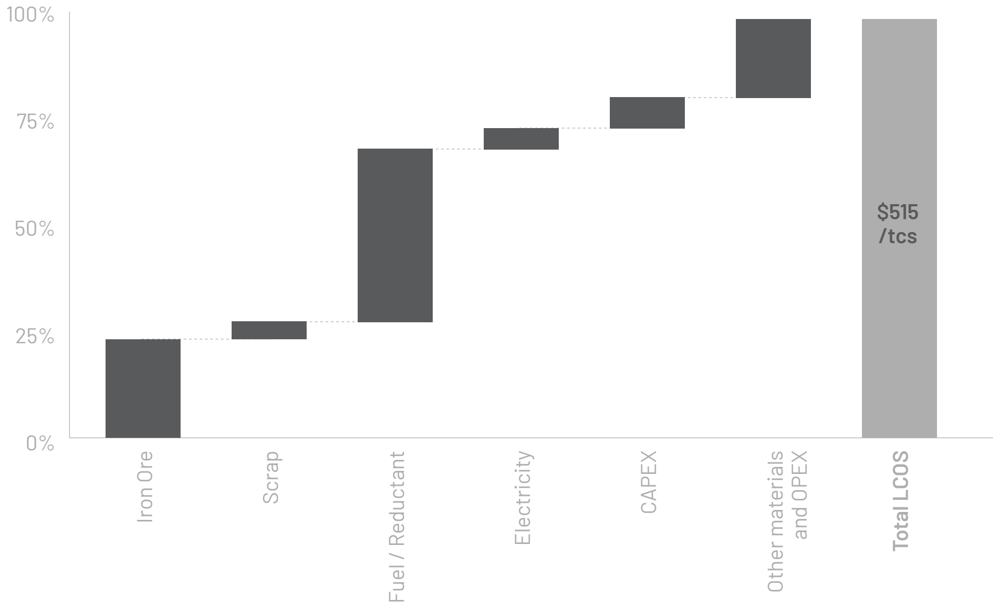
5 https://www.seaisi.org/details/21979?type=news-rooms
6 All currency values in this report are denominated in USD unless otherwise stated.
7 https://www.marketresearchfuture.com/reports/malaysia-construction-market-21317
8 https://www.miti.gov.my/index.php/pages/view/nap2020

currently lacks advanced facilities for producing high-quality flat steel products, critical for automotive manufacturing.

GREEN STEEL ECONOMICS

Understanding the economic feasibility of low-carbon steel production is crucial for informed decision-making. Detailed below is a techno-economic analysis comparing the costs associated with different steel production methods. This assessment evaluates the financial implications of green scrap-EAF and green hydrogen-DRI-EAF processes relative to the traditional BF-BOF route.[9]

Figure 1: BF-BOF LCOS Bridge in Malaysia

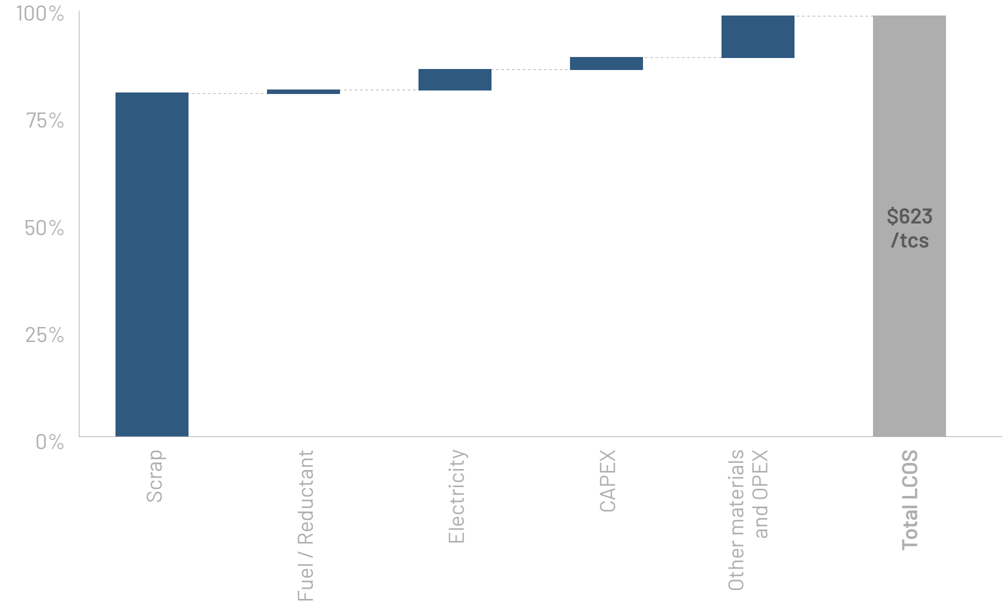


Source: TA analysis

Transition Asia's analysis indicates that the levelised cost of steel from a greenfield BF-BOF plant is $515. The largest portion of this cost comes from fuel and reductants, primarily coal and natural gas (NG), which account for about 42% of total expenditures. Iron ore represents approximately 23% of the overall costs, while miscellaneous expenses, including OPEX and labour, contribute around 19%. CAPEX is relatively low, making up only 7% of the total cost. Furthermore, because self-generated electricity is widely utilised in the BF-BOF process, the cost of purchased electricity remains minimal, accounting for just 5% of the overall costs.

9 The detailed financial model considers a range of expenses including capital investments, raw materials like iron ore and H_2, fuel, labour and operational and maintenance costs, along with the costs of electricity from various sources. This model is designed to adjust for varying levels of scrap substitution, renewable electricity amongst others. The economic evaluation method applied in the study spreads the initial capital expenditures over the expected lifespan of the facility, utilising net present value (NPV) calculations to assess costs over time, bringing future costs to present value terms. It also projects annual operational costs throughout the plant's operational duration, factoring in different inflation rates for various inputs. The overall production costs are then aggregated annually over a 20-year period.

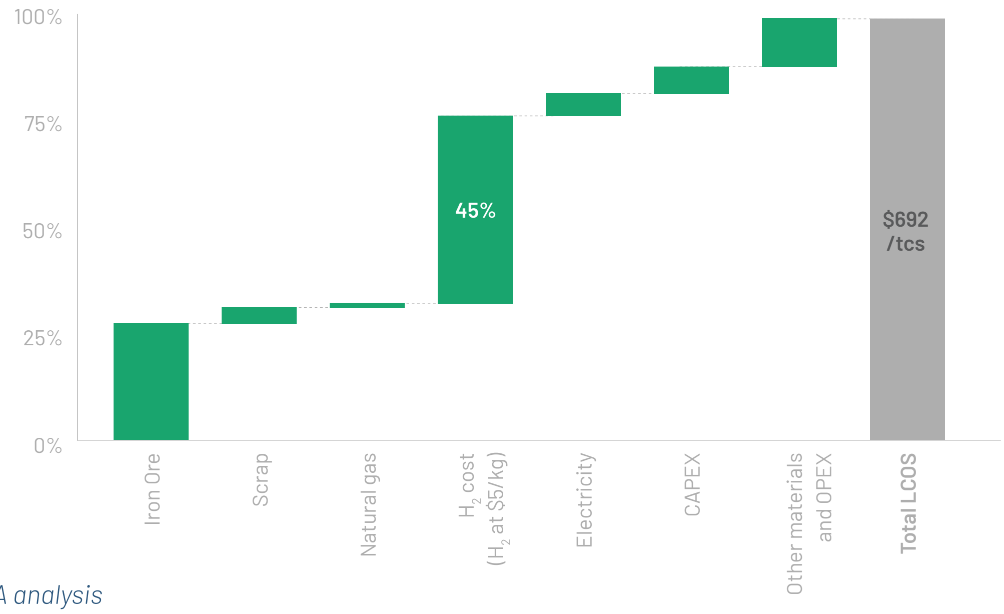
Figure 2: Scrap-EAF LCOS Bridge in Malaysia



Source: TA analysis

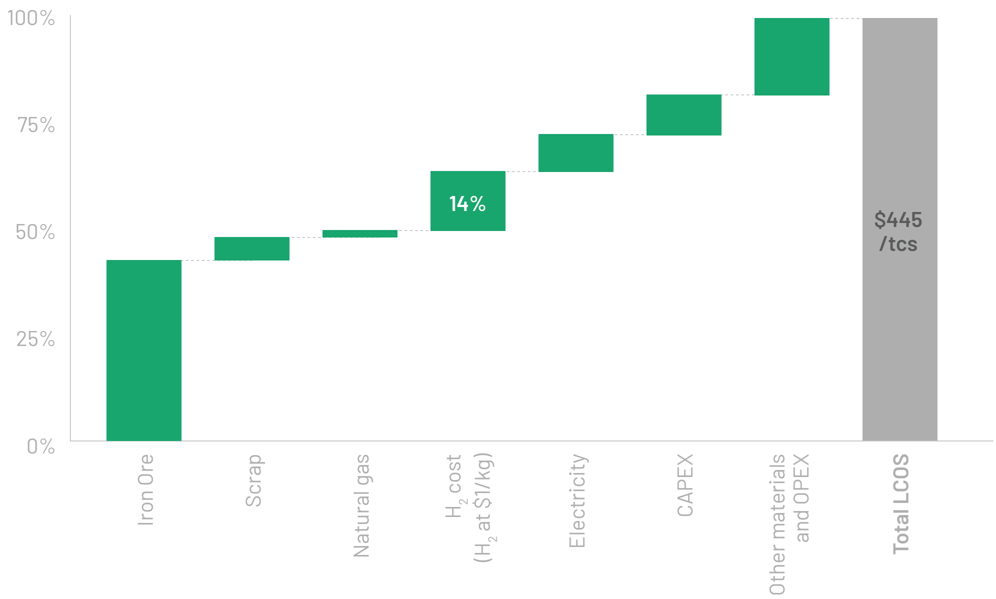
In Malaysia, the levelised cost of steel produced from a 100% scrap-EAF model is significantly higher at $623 compared to BF-BOF steel. In this model, the cost of scrap constitutes the largest share of total expenses, accounting for as much as 81%. CAPEX is minimal, representing only 3% of the overall cost, while the use of 100% RE contributes approximately 5% to total expenditures.

Figure 3: H_2-DRI-EAF LCOS Bridge in Malaysia ($) at H_2 price of $5/kg



Source: TA analysis

Figure 4: H_2-DRI-EAF LCOS Bridge in Malaysia ($) at H_2 price of $1/kg



Source: TA analysis

In the DRI-EAF process using 100% green hydrogen, the price of hydrogen significantly affects production costs. When the hydrogen price is $5/kg, it accounts for 45% of the total cost, meaning nearly half of the expense of producing one tonne of steel is attributed to green hydrogen. Conversely, if the hydrogen price decreases to $1/kg, its cost proportion drops to only 14%, resulting in a LCOS of only $445, significantly lower than current BF-BOF costs in Malaysia.

COSTS AND KEY DRIVERS

From a resource perspective, BF-BOF steel production in Malaysia is primarily driven by locally sourced iron ore. Domestic iron ore production stands at approximately 6 mtpa, with a significant portion requiring beneficiation before it can be utilised in steelmaking. Malaysia also imports around 5 mtpa of iron ore to meet its demands. Malaysia also has a small number of coking coal mines, however the majority is imported for use in BFs. Additionally, Malaysia's rich deposits of auxiliary materials, such as bauxite and tin provide a resource base for primary iron and steel manufacturing.

Scrap-based EAF process costs are almost entirely driven by the cost of scrap. Scrap prices follow a hot metal substitution logic; when the costs of scrap are favourable to producing hot metal from ore, production of scrap-based EAF steel increases and vice versa when the costs of producing hot metal from ore are favourable to that of scrap prices.

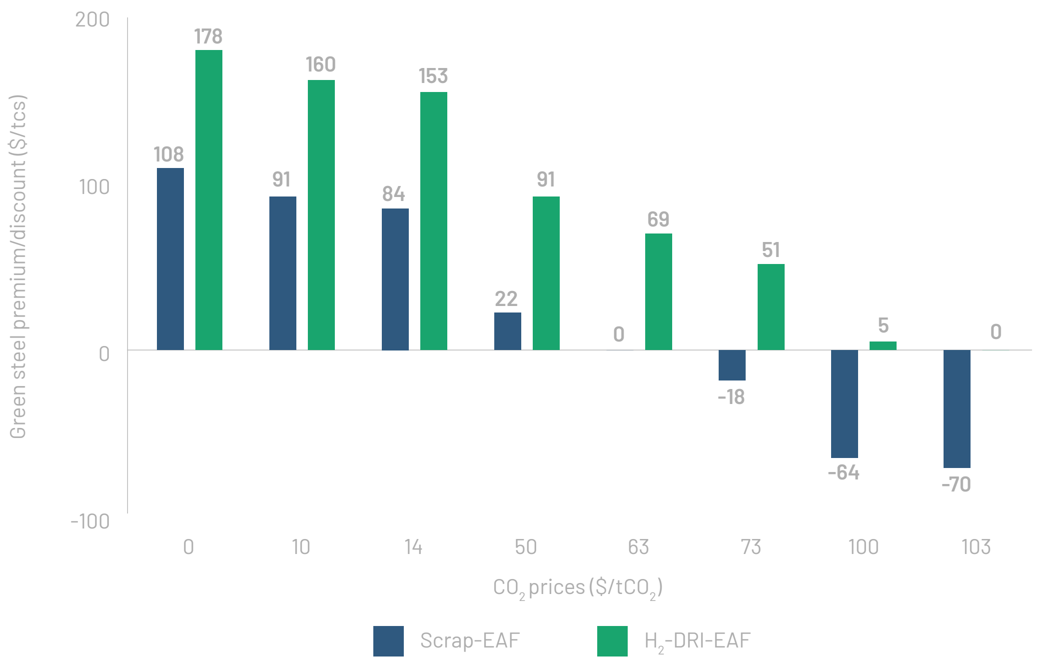
Electricity prices typically account for 5-10% for EAF-based steel production. In Malaysia, renewable electricity prices are cheaper to grid tariffs if using islanded energy systems as modelled.

Malaysia has abundant natural gas resources, with fossil fuel playing a central role in its economy as a key industry and one of the country's top exports. Countries such as the USA and Iran have used their respective natural gas reserves to drive DRI production leading to steel sectors with competitively priced steel at lower emissions compared to Malaysia. Although DR-grade iron ore is needed for the DRI-EAF route, Malaysia has usable magnetite deposits, so in theory, DR-grade ores can be produced with relatively little beneficiation processes. With plentiful gas resources and poor coking coal resources, a move to DRI-based steel production could have been achieved however the industry was subject to Chinese technology exports, becoming reliant on BF-BOF processes. Moving forward, Malaysia should seek to leapfrog a move to natural gas as a reducing agent and leverage the available resources and infrastructure for green hydrogen-DRI.

SENSITIVITY TO CARBON PRICES

Although Malaysian policymakers have suggested carbon pricing as a near-term possibility, its implementation in the iron and steel industry appears unlikely in the immediate future. Nevertheless, as carbon borders adjustment mechanisms evolve and regional neighbours adopt their own for heavy industries, the introduction of carbon pricing mechanisms cannot be ruled out.

Figure 5: Sensitivity Analysis of CO_2 Prices in Malaysia: Cost Delta of Scrap-EAF and H_2-DRI-EAF ($5kg) Compared to BF-BOF Steel at Different Carbon Prices



Source: TA analysis

The price of CO_2 significantly influences the premium of low-carbon steel. Assuming that carbon credits can be sold, providing additional revenue for low carbon, at $10/tCO_2$, the LCOS for Scrap-EAF and H_2-DRI-EAF decreases slightly by 2.7% and 2.5%, respectively, though a premium remains for all three lower-carbon production methods.

When the CO_2 price rises to $50/tCO_2$, Scrap-EAF steel shows only a minimal GSP of $22/tcs. The GSP of scrap-EAF reaches zero when the carbon price rises to $63/tCO_2$ — representing the price parity point. The LCOS for the more expensive H_2-DRI-EAF also drops by about 15.8%.

At a CO_2 price of $73/tCO_2$ (the average carbon price for 2024 EU ETS), the LCOS of Scrap-EAF falls below

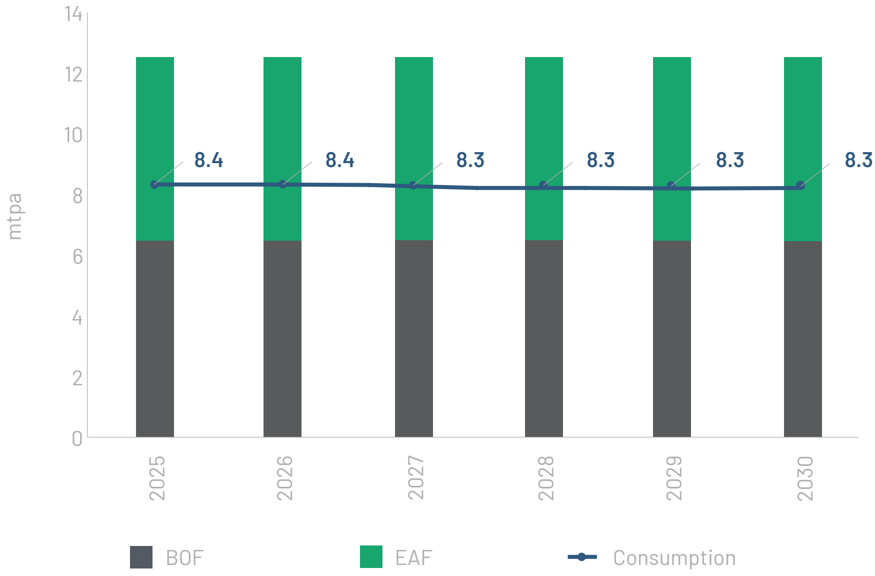
$500/tcs. Meanwhile, the LCOS of H_2-DRI-EAF decreases to $566/tcs, resulting in a GSP of $51/tcs—a 9.9% premium.

At $100/tCO_2$, the LCOS for H_2-DRI-EAF decreases to $519/tcs with a GSP of only $5/tcs. The GSP becomes zero when the carbon price is $103/tCO_2$.

CHALLENGES FOR MALAYSIA'S IRON STEEL SECTOR

Malaysia's iron and steel sector is suffering from acute overcapacity and flatlining demand. This defines corporate activity and appetite for decarbonisation initiatives. Corporates are largely not concerned with decarbonisation measures and are only focused on surviving the current economic situation brought on by stagnating consumption and global steel overcapacity.

Figure 6: Malaysia Capacity and Forecast Consumption



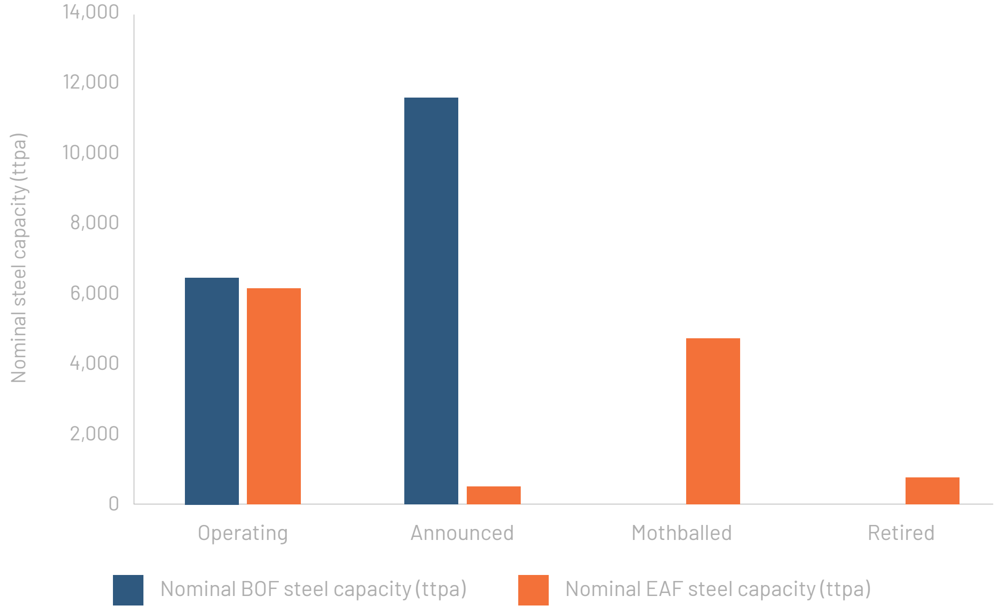
Source: TA analysis

This forecast suggests that steel consumption stagnation will continue to flatline towards 2030 as consumption in the construction sector remains steady and the country continues to remain reliant on imports for steel products in sectors that require higher grades of steel. Consumption is currently dominated by the construction industry which uses large amounts of lower quality, cheaper, long products. Limited flat products are made domestically despite high demand for flat products. Due to the saturated demand, around half of all long products are exported out of the country.[10]

Although the moratorium on new technology is set to expire, Transition Asia believes that it is unlikely that new greenfield plants will enter the market before the end of the decade. While this may help avoid further capacity challenges, it also poses a significant hurdle for decarbonisation efforts.

10 SEAISI Trade and Production Statistics

Figure 7: Malaysia Steel Production by Capacity and Status



Source: GEM, Global Steel Tracker, TA analysis

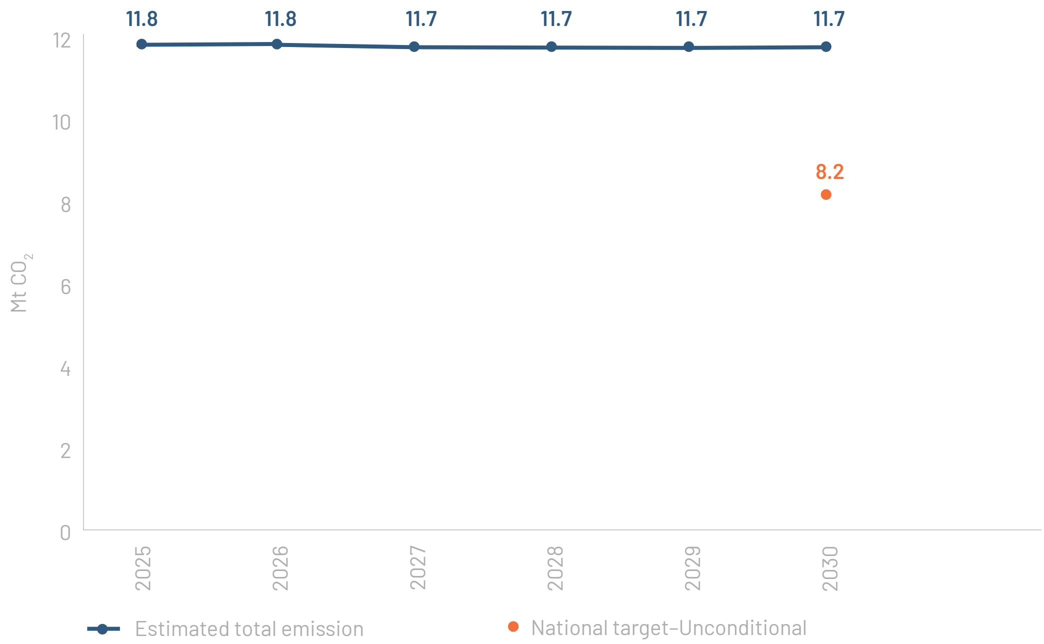
Furthermore, nearly 12 mtpa of BF-BOF mills have been announced. Notably, the 10 mtpa Hebei Xin Wu'an steel plant represents the largest steel project to date. The project, beset by delays and now a stagnant market has still yet to move beyond ground clearance for the initial 5 mtpa stage. Transition Asia understands that the China-based steel plant owner is currently seeking buyers of its licences.

Chinese steel products have also flooded the market as demand domestically plummeted following the real estate downturn, the Chinese sector's largest consumer of steel. Malaysia has not been alone in cheaper Chinese steel products entering the national market at an eyewatering pace, but its effects have been acute as the country's own overcapacity issues have compounded dire economic conditions for the sector. Currently Malaysia has anti-dumping measures in place on both long and flat products from China and such measures on flat products from Japan, India and South Korea.[11] [12]

Levers for decarbonisation are limited as Malaysia grapples with overcapacity and lower than expected consumption growth. Processes related to DRI are attractive although this may be further into the future without policy and financial support.

11 https://theedgemalaysia.com/node/743316
12 https://www.reuters.com/markets/commodities/malaysia-imposes-anti-dumping-duties-iron-steel-imports-4-countries-2025-01-13/

Figure 8: Steel Sector Emission Forecasts and 2030 Targets



Source: TA analysis

By 2030, Malaysian iron and steel emissions are expected to flatline, reflecting minimal investments in new technologies to either boost production or reduce emissions. Investments that increase energy efficiency are being pushed in the Malaysian market although these technologies will have limited impact on the overall emissions. Large scale BF-BOF efficiency technologies focus predominantly on coke and gas utilisation within integrated mills, commonly promising between 2-5% emissions reduction. The BF-BOF process is the most energy-efficient industrial process globally, operating close to theoretical energy requirements, resulting in a limit to potential efficiency improvements and subsequent emission reductions.

PATHWAYS FOR DECARBONISATION

CORPORATE DECARBONISATION

The steel sector in Malaysia is currently not prioritising decarbonisation, as it faces significant economic challenges that limit the feasibility of pursuing ambitious emission reduction strategies. Steel companies, particularly in emerging markets like Malaysia, are navigating tight profit margins, high competition and volatile market conditions. These factors make it unlikely that corporations will spearhead the transition toward low-carbon operations without substantial external support or incentives. The focus on immediate economic survival often overshadows long-term sustainability goals.

Economic headwinds further exacerbate the challenge of corporate-driven decarbonisation. High capital requirements for advanced technologies, coupled with rising operational costs, create significant financial barriers. For many steelmakers, investing in emission-reduction technologies or shifting to greener operations may seem impractical or too risky given the current market conditions. These limitations suggest that a corporate-led decarbonisation strategy will require careful balancing of economic feasibility with environmental goals.

Given these constraints, any effort to decarbonise the Malaysian steel sector must ensure the sector's economic health. This entails limiting capital and operational expenditures while identifying economically viable pathways for reducing emissions. Solutions must align with the financial realities of the industry, ensuring that proposed measures do not undermine the competitiveness or denting the profitability of steelmakers further.

IMPORTANCE OF POLICY SUPPORT

Policy interventions are essential to advancing decarbonisation in the steel sector, particularly in scenarios where corporate action alone is insufficient. Robust policy frameworks are necessary to establish the financial and operational incentives that facilitate a shift towards lower emissions. Governments and regulatory bodies play a critical role in creating the conditions for change, offering the necessary guidance, support and enforcement to ensure progress toward sustainability goals. Without such measures, progress on decarbonisation is likely to be slow and insufficient to meet the sector's climate targets.

Despite the signal from the Malaysian government that the sector might soon be subject to carbon pricing, the embattled sector is unlikely to face a carbon price related instrument in the near future. This highlights the need for alternative mechanisms to drive emissions reductions and prepare the industry for future regulations.

The impending expiration of the moratorium on certain industry practices in 2025 presents another challenge. Extending this moratorium may be necessary to allow more time for the development and implementation of sustainable transition strategies. Such an extension would provide breathing room for steelmakers to adapt to the evolving regulatory landscape while ensuring that environmental standards are upheld.

Developing a taxonomy of high-priority projects could further enhance policy impact. This taxonomy would identify initiatives that can bypass the moratorium, focusing on those with the highest potential to drive emissions reductions and support long-term industry transformation. By channelling resources and regulatory support toward strategic initiatives, policymakers can ensure that efforts are concentrated on areas that deliver the greatest environmental and economic benefits.

TECHNOLOGY OPPORTUNITIES

The analysis of the cost dynamics between BF-BOF and H_2-DRI-EAF systems indicates that the cost difference is minimal once hydrogen prices decrease substantially. This is largely due to access to high-grade iron ore concentrate and low labour costs, which help offset operational expenses. To fully capitalise on this opportunity, prioritising investment in DRI and EAF infrastructure is essential. These technologies provide a pathway to cleaner steel production while positioning the industry for long-term decarbonisation.

Local initiatives such as the Sarawak State Government's plans to establish a Hydrogen Hub offer an opportunity for future relocation of the steel sector. Set to commence operations in 2028, this initiative aims to produce 240,000 tonnes of green hydrogen annually, creating a foundation for low-carbon industrial activities. Greenfield investments in steelmaking should target such areas, leveraging local hydrogen production to further decarbonise operations.

Lastly, aligning downstream processing with domestic market requirements will be critical for maximising the sector's potential. By focusing on higher grade flat products like hot-rolled and cold-rolled steel, the industry can better meet local demand while driving higher utilisation rates. Strengthening capabilities in these areas will ensure that steelmakers can compete effectively in both local and regional markets.

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OUR TEAM

Head of Impact

Lauren Huleatt lauren@transitionasia.org

Head of Research

Alastair Jackson alastair@transitionasia.org

Communications Specialist

Monica Wong monica@transitionasia.org

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