Sustainability in the iron and steel industry

South Africa’s Manufacturing Subsectors: Findings from TIPS Research

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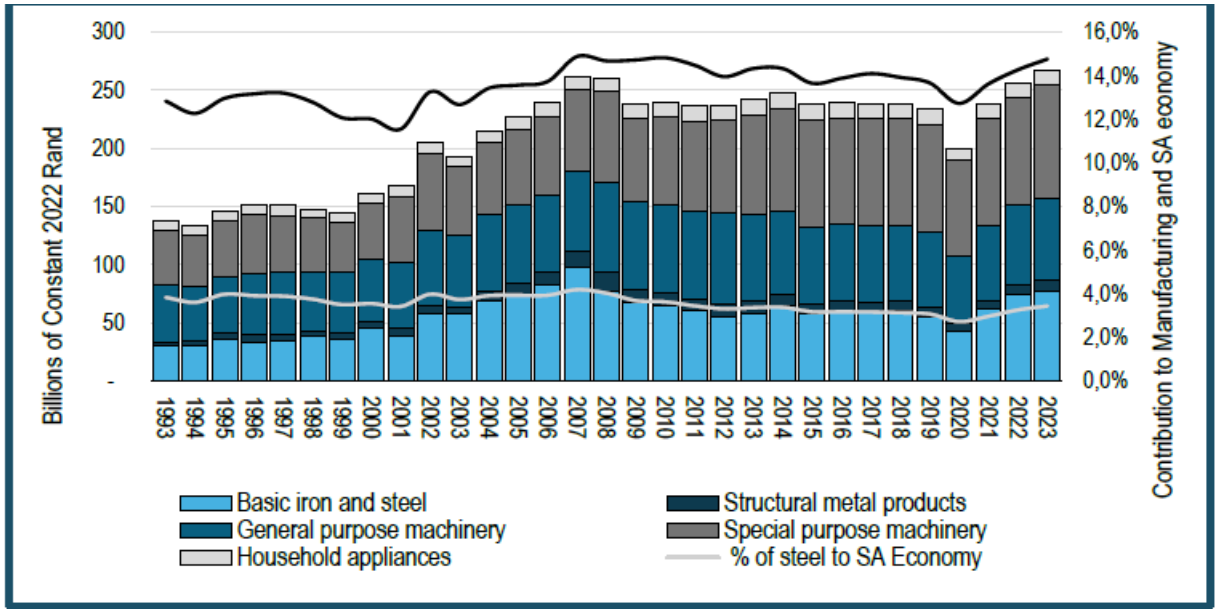
Overview of the steel Industry

Gross Value Added (GVA) in the South African steel industry – by industries from 1993 to 2022



The steel industry has shown consistent performance over time,

- However, it is struggling to adjust to structural changes.
- It continues to produce under capacity, and its share contribution to the economy continues to decline.
- The industry is still dominated by the use of Basic Oxygen Furnace (BOF) which is a technology that is highly reliant on coking coal (mostly imported), iron ore and electricity produced from coal.

The sector's contribution to the South African GDP and manufacturing gross value added (GVA) has stagnated.

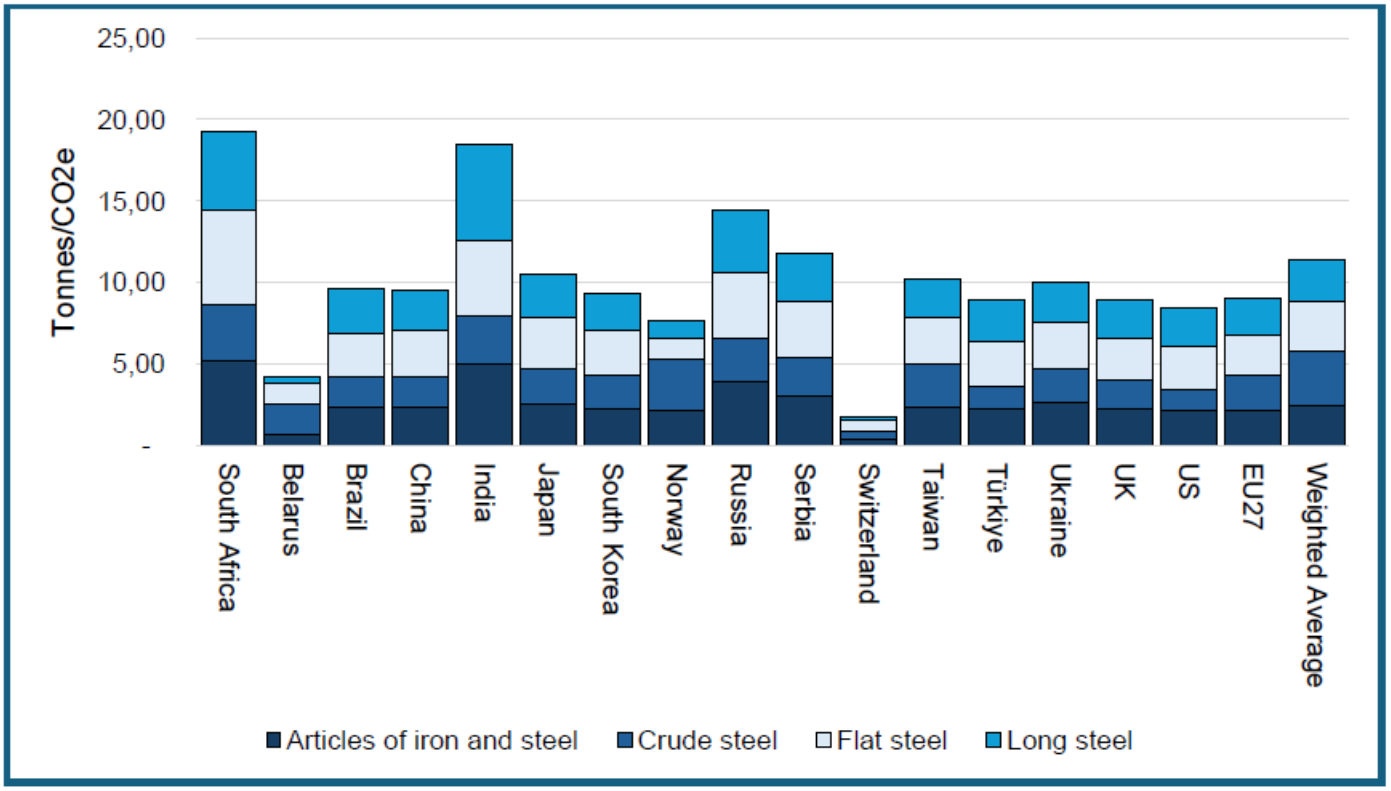
The steel value chain in South Africa contributes around 3.5% to the South African economy on average.

- Basic iron and steel contributes around 1%,
- while the downstream contribute around 2% on average.

In 2022, the steel industry turnover reached R437 billion, in constant 2022 terms, and made a profit after tax and dividend of R22 billion, in constant 2022 terms. The biggest share of both turnover and profits came from machinery and equipment.

Carbon Intensity of the steel industry

Carbon intensity of steel products across selected countries



Source: Adapted from the European Commission, 2023, JRC report.

The South African iron and steel industry emitted 6.3 million tonnes of CO2, accounting for 1.3% of South Africa's total emissions (in 2022).

Globally, South Africa's steel products are considered "***dirty***" due to their high carbon intensity, driven by a heavy reliance on coal, through coal-based electricity and the use of coking coal in blast furnaces, through the BF-BOF route.

- South Africa stands out as an outlier in carbon intensity compared to its competitors.
- Following South Africa are India, Russia, and Serbia, all of which exceed the global weighted average.

Policy landscape [1/3]

The global steel industry is undergoing significant transformation, driven by climate change policies and geopolitical tensions.

- Key factors include the rising demand for green steel and the urgency to decarbonise production, and the introduction of carbon taxes – both domestically and internationally.

1) Border Carbon Adjustments (BCAs)

- The global shift towards low-carbon production processes has intensified, particularly in hard-to-abate sectors such as the iron and steel value chain.
- Decarbonisation of steel production is being explored and implemented worldwide to address the environmental challenges posed by traditional, carbon-intensive methods.
- As the global shift toward sustainability accelerates, South African steel firms are expected to report GHG emissions from their production processes – leading to the creation of a GHG accounting system.
- Additionally, with the introduction of BCAs, they will face import-environmental tariffs imposed by EU and United Kingdom (UK) importers.
- The introduction of BCAs will increase the cost of South African steel products, making them less competitive in international markets (lowering their demand) amid the push for sustainable development.
- This lack of competitiveness could lead to market fragmentation, where late adopters struggle to keep pace, ultimately impacting their socio-economic stability.

Policy landscape [2/3]

2) South Africa's Carbon Tax

- In 2019, South Africa introduced a carbon tax, a tax on the CO2 equivalent of greenhouse gas emissions, emitted in sectors that emit CO2 emissions (Iron and Steel is included).

- The main objective of the tax is to limit or disincentivise emitting sectors and internalise the cost emitting of carbon dioxide.

- The South African Carbon Tax Act No. 15 or 2019 covers a wide range of sectors – covering 80% of the country's emissions (a significantly higher share than many other carbon pricing schemes worldwide).

- With the introduction of BCAs and the expected shifts associated with carbon taxation, South Africa's carbon tax remains relatively low by both global and EU standards, in both nominal and effective terms.

    - Currently, the nominal carbon tax in South Africa stands at R190 tCO_2e (approximately US\$10/tCO_2e)

3) Rising Green steel demand

- Amid the technological advancements in the steel industry, incorporating green hydrogen into steelmaking is a promising and close-to-commercial option.

- This includes the Green Hydrogen Direct Reduced Iron-Electric Arc Furnace) process - This technology significantly reduces emission intensity in steel production, utilising green hydrogen produced from renewable energy or zero-carbon electricity. It offers a transformative pathway for greener steel production with substantial emission reductions.

Policy landscape [3/3]

4) Decarbonisation and the rise of the mini mills

Decarbonisation of the largest steel producer

- In 2023, AMSA, the largest steel producer in the country, unveiled its decarbonisation roadmap aimed at achieving carbon neutrality.
    - The roadmap sets ambitious targets, including a 25% reduction in carbon intensity by 2030, from a 2018 baseline of 2.90 tCO_2e per tonne of crude steel to 2.16 tCO_2e/t.
    - By 2050, AMSA aims to reduce carbon intensity by 86%, reaching 0.40 tCO_2e/t of crude steel.

Rise of Mini mills

- South Africa's steel industry is experiencing a rise in mini mills, reflecting a global trend outside China and India.
- These mini mills, if they utilise scrap and renewable energy, could produce significantly lower greenhouse gas emissions.
    - Since 2013, their adoption has been supported by several policies, including the introduction of a price preference system (PPS) to prioritise local scrap metal buyers, a temporary ban on scrap exports in 2020 to address domestic shortages, an export tax in 2021, and additional measures implemented from 2022 onwards.

Implications going forward [1/2]

BCAs

- To mitigate these challenges, South Africa is developing infrastructure to monitor, report, and verify embedded GHG emissions in products like steel.

- However, further efforts are needed in diplomacy, economic policy, energy policy, and international trade regulations to ensure a smooth transition and maintain competitiveness of steel products

Carbon Tax

- To fully leverage the opportunities presented by BCAs, South Africa should align its carbon pricing with the levels set by jurisdictions implementing these measures.

- In addition, ring-fencing revenues from carbon taxes and levies for green industrialisation initiatives should be considered to support a sustainable transition.

Rising green steel demand

- This indicates that, while the global potential for cost competitiveness exists, the economic viability of this technology heavily depends on local hydrogen costs and the comparative costs of steel production using traditional methods. So, despite increasing demand in green steel, it is not economically and commercially feasible.

Implications going forward [2/2]

Decarbonisation

- Decarbonising AMSA – AMSA faces structural challenges driven by rising costs, particularly higher input costs (import parity prices on coal and iron ore), as well as escalating logistical and energy expenses.

- Mini mills, despite their growth, mini mills in South Africa face significant challenges. The rising cost of electricity during the 2010s hampered the adoption of electric arc furnaces, with AMSA notably shutting down some of its electric arc furnace operations. However, this trend began to reverse nationally in the late 2010s.

- Financing decarbonisation remains key in both upstream and downstream decarbonisation of the steel.

Conclusion

Despite declining economic performance and undercapacity, the South African steel industry remains crucial for industrialisation and job creation.

It must adapt to the evolving global steel landscape by shifting towards green steel and cleaner production processes, such as adopting Electric Arc Furnace technologies in mini mills and prioritising decarbonisation investments in the primary steel production.

Thank You.