TRADE & INDUSTRIAL POLICY STRATEGIES

RESPONDING TO THE EUROPEAN UNION'S CARBON BORDER ADJUSTMENT MECHANISM (CBAM): SOUTH AFRICA'S VULNERABILITY AND RESPONSES

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OVERVIEW

As of 16 May 2023, the European Union (EU) Carbon Border Adjustment Mechanism (CBAM) was fully legislated and is set to enter into force in October 2023. Between October 2023 and end of 2025, a transitional period will unfold. During this initial period, the burden will be administrative rather than financial, as importers will only report direct greenhouse gas GHG emissions embedded in their imports. From 2026, the carbon pricing associated with CBAM will be gradually ramped up, reaching full force in 2034.[1] Importers will have to declare each year the quantity of imports to the EU in the preceding year and their embedded GHG emissions. They will then have to purchase digital CBAM certificates, at a price to be calculated based on the weekly average auction price of the EU Emission Trading System (ETS) allowance expressed in €/tonne of CO_2 emitted (European Commission, 2022).

CBAM is a key policy tool that forms part of the European Green Deal (EGD) to reduce net GHG emissions across Europe and abroad. Within this context, CBAM can be defined as a carbon border tax on embedded GHG emissions of carbon-intensive products imported into the EU. The main intent of CBAM is to equalise the price of carbon between EU products and imports, by ensuring importers face similar conditions to EU manufacturers, and that the European climate objectives are not undermined by carbon leakage.

The CBAM is set to be implemented for all sectors (based on assessments to be done after the transitional period) of the EU ETS by 2030. In its current form, cement, aluminium, fertilisers, electric energy production, hydrogen, iron and steel, as well as some precursors (input materials, i.e., iron ore) and a limited number of downstream products are targeted. Other products are set to be added after the transitional period. These products remain highly exposed in terms of international climate change policies.

In South Africa, a total of US$2.8 billion (About R52.4 billion) of South African exports (based on 2022 data) are at risk in the short term, with this number set to increase as the CBAM covers more and more products. The iron and steel (including iron ore) and aluminium industries are particularly at jeopardy, in the short term.

This paper provides an augmented analyses of the policy brief done by Monaisa and Maimele (2023), entitled The European Union's Carbon Border Adjustment Mechanism and implications for South African exports. It updates analysis post the adoption of CBAM on 10 May 2023, reflecting on the vulnerability of the South African economy.

[1] As the CBAM ramps up free allocations for European industries under the EU ETS, which have to date been the mechanism used to soften the impact of carbon pricing on local firms, will be phased out.

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Abbreviations and Acronyms

AMSA	ArcelorMittal South Africa
BF	Blast Furnace (process)
BRICS	Brazil, Russia, India, China and South Africa
CBAM	Carbon Border Adjustment Mechanism
CBDR	Common but Differentiated Responsibilities
CN	Combined Nomenclature
DFFE	Department of Forestry, Fisheries and the Environment
dtic (the)	Department of Trade, Industry and Competition
DRI	Direct Reduced Iron
EAF	Electric Arc Furnace (process)
EGD	European Green Deal
ENVI	European Parliamentary Committee on Environment
ETS	Emission Trading System
EU	European Union
GATT	General Agreement on Tariffs and Trade
GDP	Gross Domestic Product
GHG	Greenhouse Gas emissions
IPPU	Industrial Processes and Product Use
MRV	Monitoring, Reporting and Verification
NDC	Nationally Determined Contribution
S&DT	Special and Differential Treatment
TRIPS	Trade-Related Aspects of Intellectual Property Rights
UNFCCC	United Nations Framework Convention on Climate Change
WTO	World Trade Organization

1. INTRODUCTION

The European Green Deal (EGD), introduced in 2019, aims to reduce European Union (EU) greenhouse gas emissions by 55% by 2030 compared to 1990 levels and achieve carbon neutrality by 2050. Included in the EGD is the Carbon Border Adjustment Mechanism (CBAM), a carbon border tax on embedded GHGs of carbon-intensive products imported into the EU. The CBAM will mirror and function in parallel with the EU Emissions Trading Scheme (ETS[2]). It is intended to equalise the price of carbon between EU products and imports, ensuring importers face similar conditions to EU manufacturers and that the EU climate objectives are not undermined by carbon leakage (Monaisa, 2021).

Carbon leakage occurs when industries relocate to jurisdictions with weaker climate change policies or stay put and lose domestic and foreign market share due to increased carbon prices (Lo, 2021). Free allocations[3] under the EU ETS have, to date, been the mechanisms used to address carbon leakage. With the introduction of the CBAM, free allocations will gradually be phased out in sectors covered by the EU ETS (Magacho et al., 2022).

The CBAM will have a negative impact on South Africa, along with other countries in the Global South, including many African economies. Carbon-intensive exports to the EU will become increasingly costly, due to the added carbon pricing, and therefore uncompetitive (Montmasson-Clair and Monaisa, 2022). Companies from non-EU countries will have to proactively prepare for the CBAM and align their business models to a low-carbon future.

In the same context, after several deliberations of CBAM, the first proposal was published in July 2021. Since July 2021, the CBAM has undergone significant changes. In May 2022, the European Parliamentary Committee on Environment (ENVI), the implementing agent of the CBAM, published amendments to the mechanisms. In June 2022, the European Parliament voted on and approved these amendments. In December 2022, members of the European Parliament reached a provisional and conditional agreement with the European Council on CBAM. The agreement was endorsed by the ENVI in February 2023. In April 2023, the European Council[4] adopted the mechanism, before publishing the regulation in the Official Journal of the European Union. After CBAM was finally adopted as law on 10 May 2023, on 16 May 2023, the regulation was finally published in the Official Journal of the European Union.

[2] The ETS is a GHG cap-and-trade scheme that contributes toward emissions reduction targets by setting a cap on the maximum level of emissions for several sectors and allows the trading of emission permits at a market-generated price.

[3] Free allocations allow industries to emit a percentage of GHG emissions freely under an overall emissions budget that caps total emissions across all sources combined.

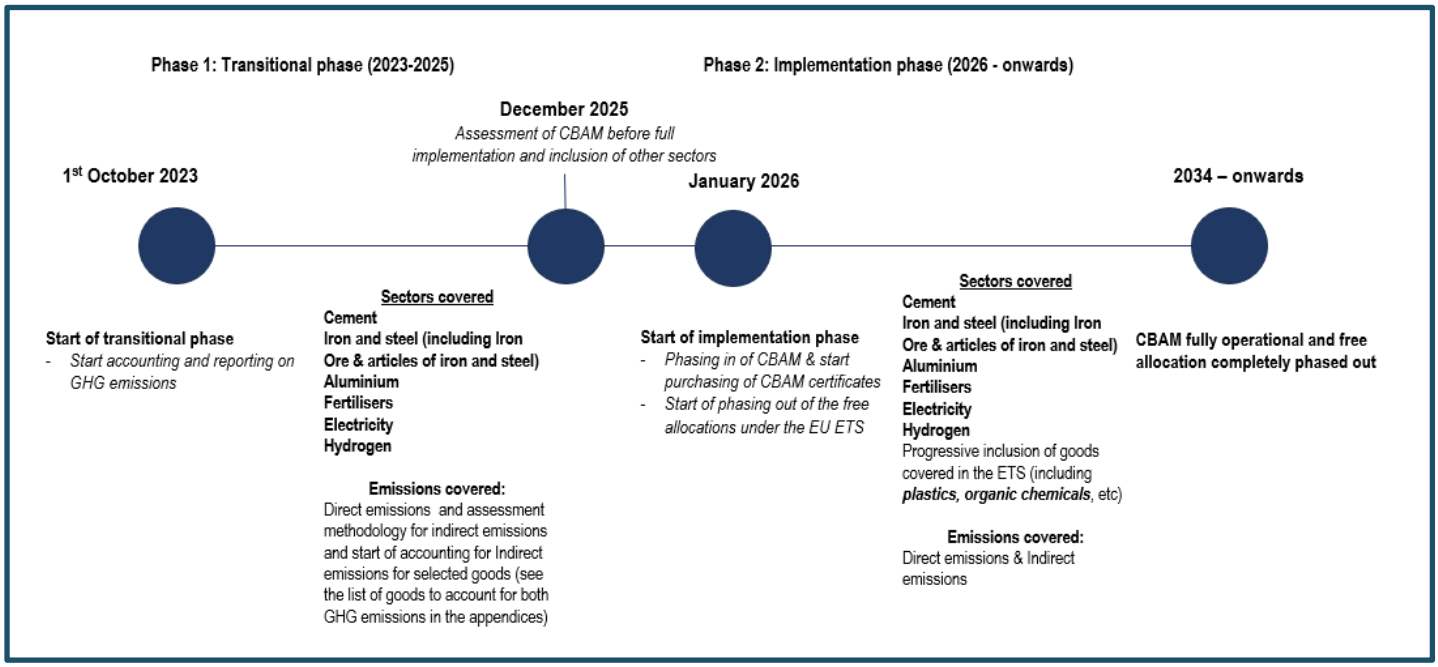
[4] The vote in the European Council is the last step of the decision-making procedure. Once the proposed law is adopted, then it will be published in the Official Journal of the European Union before it enters into force.

2. OVERVIEW OF THE CBAM

The initial CBAM proposal only covered direct emissions from electricity and 29 product categories from the cement, fertilisers, iron and steel, and aluminium sectors. In the adopted legislation, the scope has been extended to include hydrogen as well as indirect emissions (to be included in a well-circumscribed manner by 2026). The adopted legislation also includes certain precursors (input materials) for production of the covered products such as iron ore as well as some downstream products such as screws and bolts and similar articles of iron and steel.

In its approved form, the list of products covered under CBAM amount to 42 groups of goods, across electricity, cement, fertilisers, iron and steel, aluminium, and hydrogen sectors (European Commission, 2023a). Other products deemed at high risk of carbon leakage, including organic chemicals and polymers, which were included in the initial draft of the CBAM legislation and possibly other goods (notably downstream products) will be assessed for inclusion in the CBAM by the European Commission before the end of the transition period (i.e., the end of 2025) (European Commission, 2022; European Parliament, 2022). The methodology for the indirect emissions will also be drafted and reviewed before the end of a transitional period.

Figure 1: Implementation timeline of CBAM



Source: Author's illustration

A transitional period will apply from 1 October 2023 and CBAM will enter into force in 2026 and be fully operational by 2034, as illustrated in Figure 1. During the transitional period, the burden will be administrative rather than financial, and importers will report only direct GHG emissions[5] embedded in their imports (European Commission, 2022).

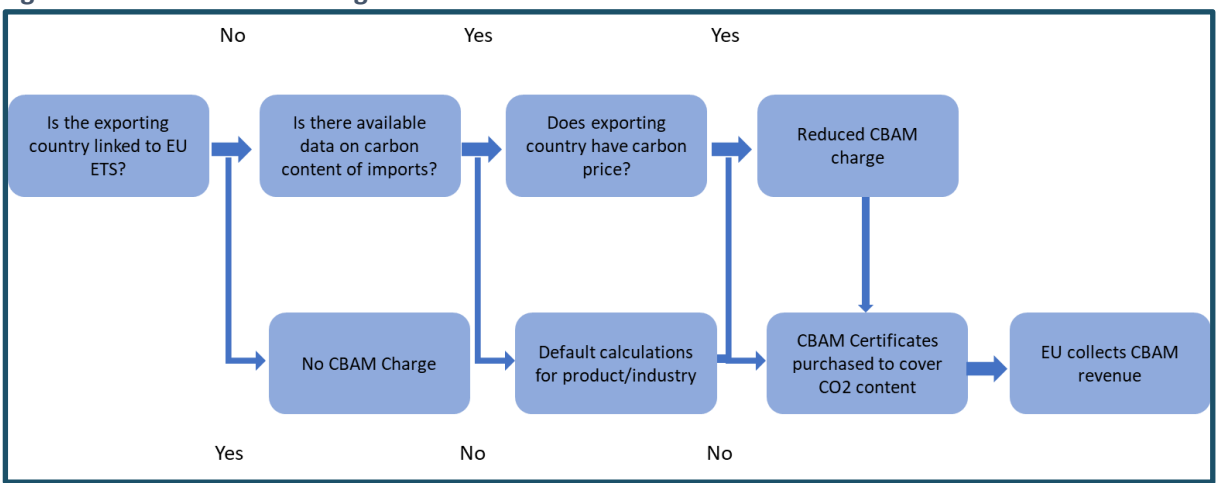
After the transitional period, importers will have to declare each year the quantity of imports to the EU in the preceding year and their embedded GHG emissions. They will then have to purchase digital

[5] The agreement between the European Parliament and the European council on CBAM foresees that indirect emissions will be covered in the scope after the transitional period (2026) based on a methodology to be defined during the transition period. This first draft of the methodology is to be circulated during the mid-year of 2023.

CBAM certificates, at a price to be calculated based on the weekly average auction price of EU ETS allowance expressed in €/tonne of CO_2 emitted (European Commission, 2022). Over time (starting from 2026), the CBAM would be implemented for all sectors covered by the EU ETS, based on assessments to be done after the transitional period. Similarly, free allowances under the EU ETS will be progressively phased out by 2034.

Below is a broad overview of how CBAM will function.

Figure 2: Illustration of the logic behind CBAM



Source: Ancygier et al., 2023

CBAM will function as outlined in Figure 2. For starters, CBAM only applies to exporting countries not linked to the current EU Emission Trading System (non-EU countries are not linked to the EU ETS, with the exception of Iceland, Liechtenstein, Norway, and Switzerland, which are excluded from the implementation of CBAM). If the exporting country has a domestic carbon accounting system or carbon pricing in place, this in effect will reduce the number of CBAM certificates due for submission for a declarant (exporting firm), because carbon price domestically has been paid.

The carbon price of South African (about 10-12 US$/tonne of CO_2 emitted, if applied without exemptions) and EU emissions allowances (about 109 US$/tonne of CO_2 emitted in March 2023) differs by a large degree (World Bank Group, 2023). Therefore, importers of CBAM-covered goods from South Africa will still have to buy and submit CBAM certificates to cover the shortfall and for compliance purposes. However, the total number of certificates to be surrendered will be reduced to reflect the carbon price already paid in South Africa. For jurisdictions that do not have a carbon price in place (i.e. most countries in Africa), exporters will have to pay the full cost of CBAM (Vasilj et al., 2023).

The governance of CBAM will be centralised, with the European Commission responsible for most of the CBAM tasks, including doing assessments and reviewing the CBAM. This centralised governance of CBAM is designed to ensure that the implementation is efficient, transparent, cost-effective and prevents forum shopping from importers (European Parliament, 2021).

The prices of CBAM certificates will be linked to the prices of the emissions allowances under the ETS, calculated as the average closing price of EU ETS certificates for the last week in which auctions have taken place or a default value to be determined.

This will be done to ensure that CBAM declarants are paying a carbon price equivalent to that paid by ETS-covered producers inside the EU. Importers will be required to report on the embedded emissions in their products and surrender a corresponding amount of CBAM certificates that they

would have purchased in advance. Only importers that have met the CBAM requirements will be permitted to import products which fall within the scope of the CBAM (Newman and Chipfupa, 2022).

Importers that do not have independently verifiable carbon-audited supply chains after the transitional period will have to use default values to determine embedded emissions in affected goods. The default values will be set at the average emission intensity of each exporting country for each covered good (European Parliament, 2021). As noted above, importers from countries that have their own carbon prices will be able to claim a reduction in the number of CBAM certificates, although exact modalities are yet to be established (European Parliament, 2021).

From 2027, every year on the 31st of May, importers will be required to declare the amount of GHG emissions embedded in goods imported plus the number of CBAM surrendered in the previous year. The declaration should contain the total quantity of goods imported during the calendar year, expressed in megawatt-hours for electricity and metric tonnes for other goods, multiplied by the embedded emissions of each good (Monaisa, 2021).

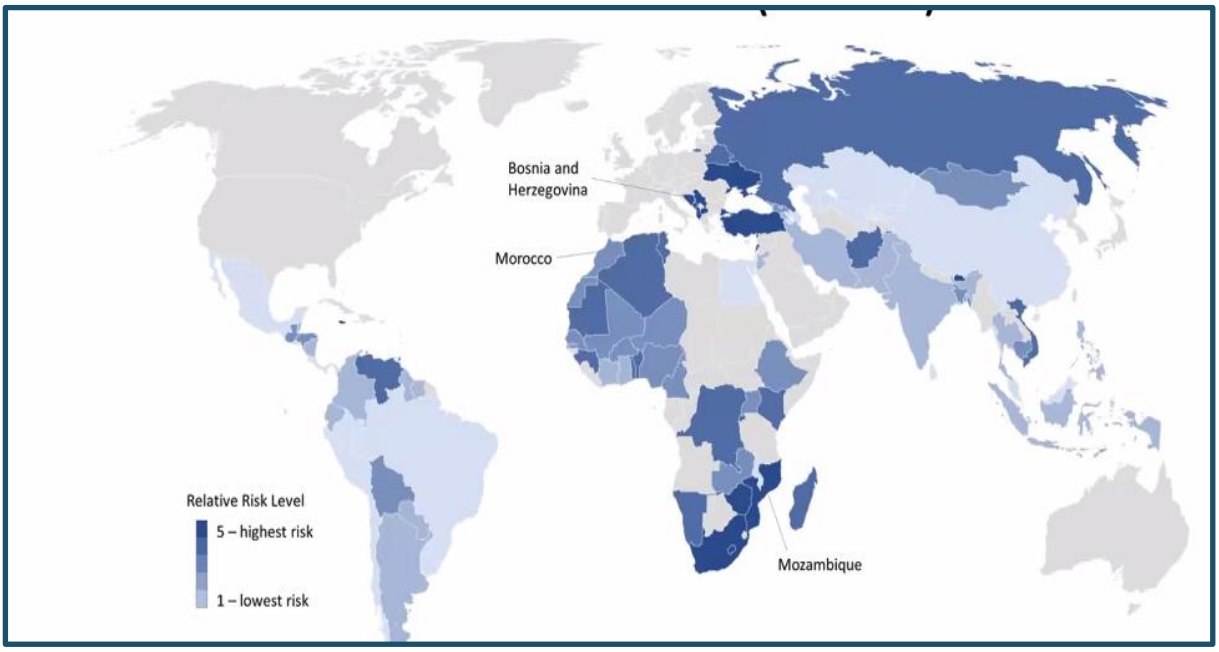
Failure to report the amount of GHG emissions embedded in goods imported and the number of CBAM surrendered in the previous year, or the submission of false information, will result in a penalty. Importers will be liable to pay a penalty for the excess emissions too. The penalty will be €100 for each tonne of CO_2 equivalent emitted. Payment of the penalty will not release the importer from the obligation to surrender the outstanding number of CBAM certificates (European Parliament, 2021). In addition to the fine, Member States may apply administrative or criminal sanctions for failure to comply with the CBAM legislation per their national rules. It is currently unclear how the Member States would enforce these administrative or criminal sanctions on foreign companies (Monaisa, 2021). In the case of circumvention, i.e. slightly modifying the CBAM goods to not be listed in the goods covered under CBAM, those goods will be added to the list of that exporting country.

3. SOUTH AFRICA'S VULNERABILITY

South Africa is one of few countries that has a high apparent vulnerability to the CBAM, as illustrated by the map in Figure 3 which presents countries globally that are most vulnerable to CBAM. The vulnerability stems from the high carbon intensity of exports to the EU and the volume of products covered by CBAM.

The EU is a major destination for South African goods, accounting for 21% of South Africa's total exports in 2022 (Trade Map, 2023). Based on the finalised list of goods covered by CBAM, as per the text adopted on 10 May 2023, a total of US$2.8 billion (about R52.4 billion) of South African exports (based on 2022 data) is at risk in the short term. This is about 10.3% of South African exports to the EU, and about 2.2% of South African exports to the world, and around 0.8% of South Africa's gross domestic product (GDP). This is reflected in detail in Figure 4 below, and Table A.1 in the Appendix. This number is set to increase as the CBAM covers more and more products.

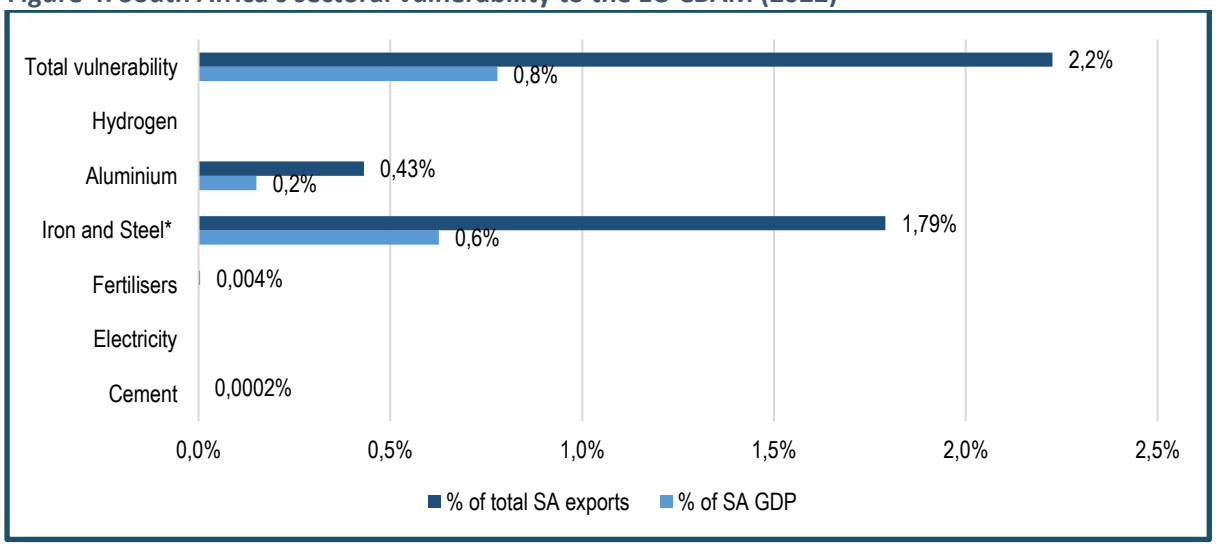
Figure 3: Map of global vulnerability to CBAM



Source: Eicke et al, 2021

As shown in Figure 4, the iron and steel (including iron ore) and aluminium industries are particularly in jeopardy. The risk for fertilisers as well as cement is marginal as the EU accounts for less than 1% of South African exports for both sectors. South Africa does not export hydrogen and electricity to the EU.

Figure 4: South Africa's sectoral vulnerability to the EU CBAM (2022)



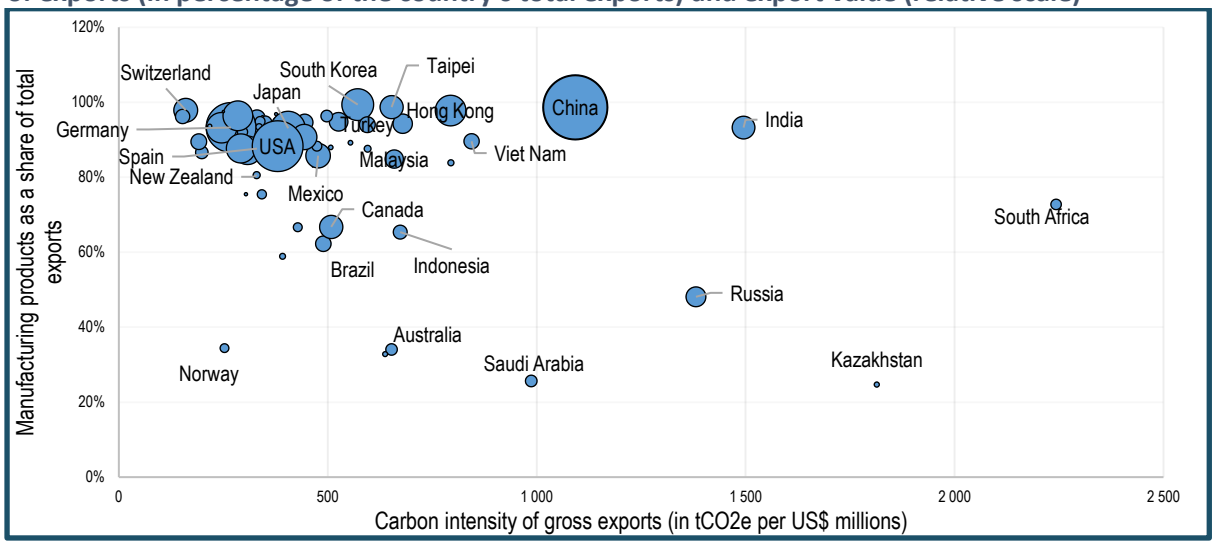
Source: Author, based on Trade Map, 2023. Bilateral trade between South Africa and European Union (EU 27).
*Iron and steel include input materials (also known as precursors, i.e., iron ore) and articles of iron and steel.

The final CBAM regulation includes accounting for only direct GHG emissions for iron and steel and aluminium products. For fertilisers and cement, although they are marginally represented in the South Africa-EU export basket, both direct and indirect GHG emissions need to be accounted for.

The accounting of direct emission targets the reduction of GHG emissions at a production level. The accounting of indirect emissions targets the overall reduction of GHG emissions across the value chain, including energy inputs. South Africa is heavily reliant on coal-based power generation, which

makes it one of the most carbon-intensive exporters in the world (see Figure 5). This in the longer term will be a significant problem if the South African economy does not decarbonise its power generation. In the future, more products and sectors are forecasted to be included in the CBAM, to cover all industries currently under the EU ETS.

Figure 5: Manufacturing export per country per carbon intensity (in tCO_2e per US$ million), share of exports (in percentage of the country's total exports) and export value (relative scale)



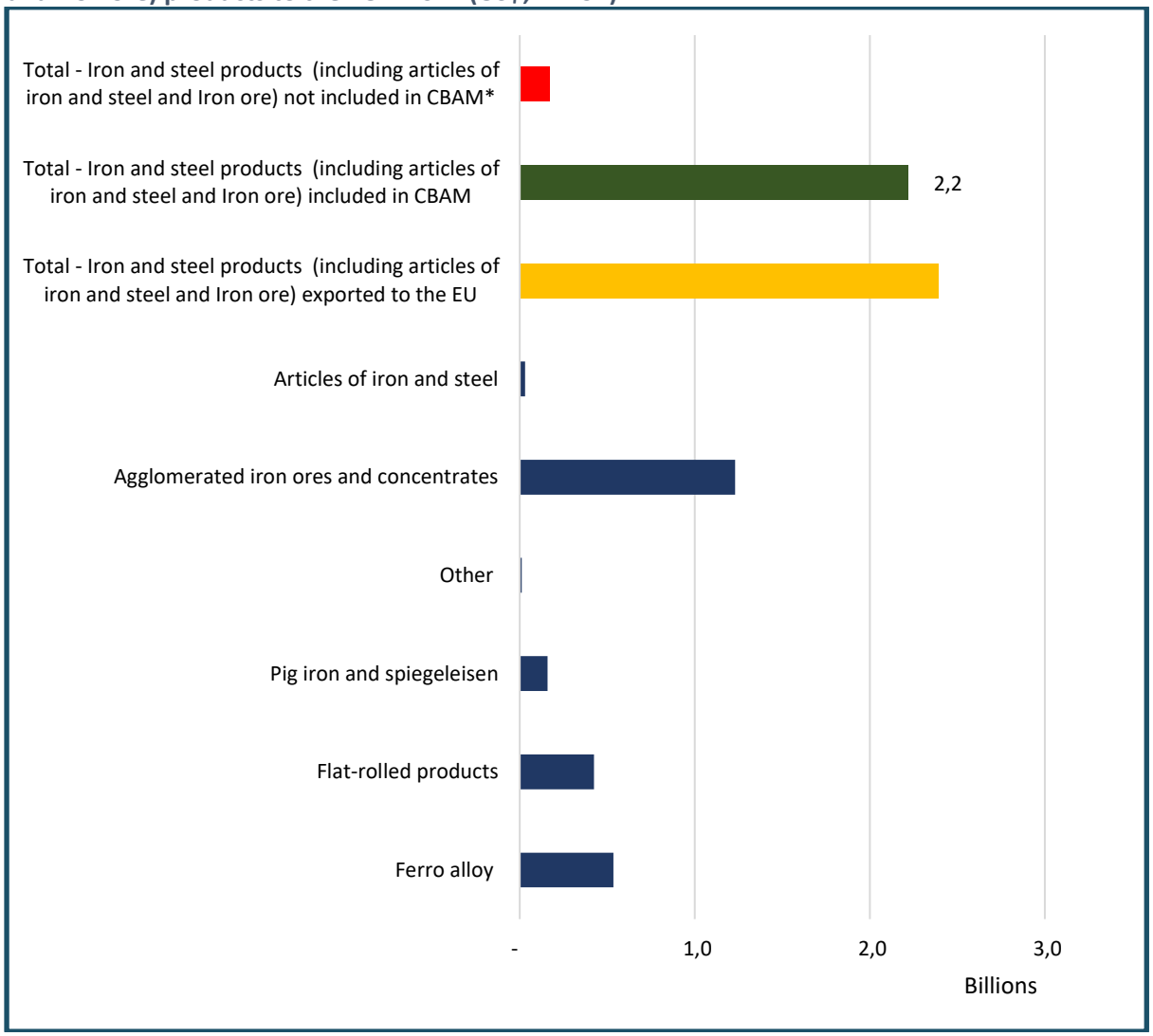
Source: Montmasson-Clair, 2020, based on data from the OECD, dataset on carbon dioxide emissions embodied in international trade, downloaded from https://stats.oecd.org in March 2020.

The following subsections primarily look at iron and steel and aluminium. Organic chemicals and plastics, despite their exclusion in the final CBAM text, are likely to be included in the CBAM list after the transitional period of CBAM. In this context, they have been included in the analysis. Cement and fertilisers are not discussed as they constitute a marginal proportion of South African exports to the EU. Electricity and hydrogen are also not discussed as there are no direct exports of these products from South Africa to the EU. However, the underlying developments in the (green) hydrogen space in South Africa opens the doors for export opportunities, depending on the acceleration of policy implementation.

3.1. Iron and steel

South Africa is the largest steel producer in Africa (benefiting from its natural endowment of iron ore), and ranks 35th globally (World Steel Association, 2021). The iron and steel value chain plays a key role in the South African economy. Steelmaking contributed 1.5% to South African GDP in 2015 (Joint Steel Task Team, 2015). In 2022, the entire value chain employed 261 598 people. South Africa has both primary and secondary steel producers. South Africa has a primary production capacity of 6.5 million tonnes per annum. However, in 2022, only 4.4 million tonnes of primary steel were produced in South Africa.

Figure 6: Disaggregated South African exports of iron and steel (including articles of iron and steel and Iron ore) products to the EU – 2022 (US$, Billion)



Source: Author, based on Trade Map, 2023. Bilateral trade between South Africa and European Union (EU 27).
*Note:**Products not included in the CBAM include selected ferro alloy, all iron and steel waste and scrap, and selected articles of iron and steel. (See the Appendix for a detailed list of products included in the CBAM).

South Africa's iron and steel exports face significant risk. About 19% (in value) of South African iron and steel exports (including articles of iron and steel and iron ore – which will be highly impacted) are covered in the EU CBAM. Iron and steel exports covered by the CBAM accounted for 2% of South Africa's total exports in 2022. Importantly, the iron and steel exports covered by CBAM exclude selected ferro-alloys and waste and scrap metals (see the South African disaggregated export of iron and steel (including articles of iron and steel and iron ore) products in Figure 6).

South Africa's iron and steel production is highly carbon intensive. Iron and steel production is the largest source of Industrial Processes and Product Use (IPPU) sector emissions, producing about 24% of IPPU sector emissions in 2017 (7 725 GgCO2e) (DEA, 2017). This is mainly due to the use of coal both as a feedstock (for primary production) and as an energy source (for secondary production). In the short term, only direct GHG emissions will be covered by CBAM. This puts primary production, which relies on coal as a feedstock particularly at risk.

South African metals exports, which include iron and steel, are highly carbon intensive. The carbon intensity of South Africa's metals exports stands at about 5 000 tonnes of carbon dioxide equivalent (tCO2e) per US$ million, far exceeding other metal exporting countries. India, Russia, and China have carbon intensities of 3 500, 2 200 and 2 500 tCO2e per US$ million, respectively. Other South African competitors oscillate between 200 and 1 400 (Montmasson-Clair, 2020).

3.2. Aluminium

Aluminium production, particularly primary aluminium, is highly energy intensive. While South Africa does not have deposits of bauxite (the mineral required to produce primary aluminium), the value chain plays an important role in the domestic economy. The value chain directly contributed 0.7% to South Africa's GDP in 2019 and employed 11 600 people directly and 28 900 people indirectly in 2017 (Monaisa and Montmasson-Clair, 2023). Primary aluminium production has remained relatively flat in South Africa since 2015, at approximately 700 000 tonnes per annum. The secondary aluminium sector in South Africa is well established but relatively small, with at least 30 000 tonnes a year of production capacity (mainly from Zimco Metals, which produces around 50% of secondary aluminium, all from scrap[6] aluminium).

South Africa's aluminium export risk is high, as about 28% of total South African aluminium exports are covered by the EU CBAM. Aluminium exports covered by the EU CBAM accounted for less than 1% of total South African exports in 2022. Importantly, aluminium exports covered by CBAM exclude waste and scrap as well as table, kitchen, or other household articles (see the South African disaggregated export of aluminium products in Figure 7).

The main source of GHG emissions across the South African aluminium value chain is the use of coal-powered electricity. In South Africa, there is only one primary producer of aluminium, South32's Hillside Aluminium smelter in Richards Bay, in KwaZulu-Natal (Monaisa and Montmasson-Clair, 2023). Hillside's production of primary aluminium is dependent on South Africa's power utility (Eskom). As such, electricity accounted for 88% of both Scope 1 and Scope 2 GHG emissions in 2021.

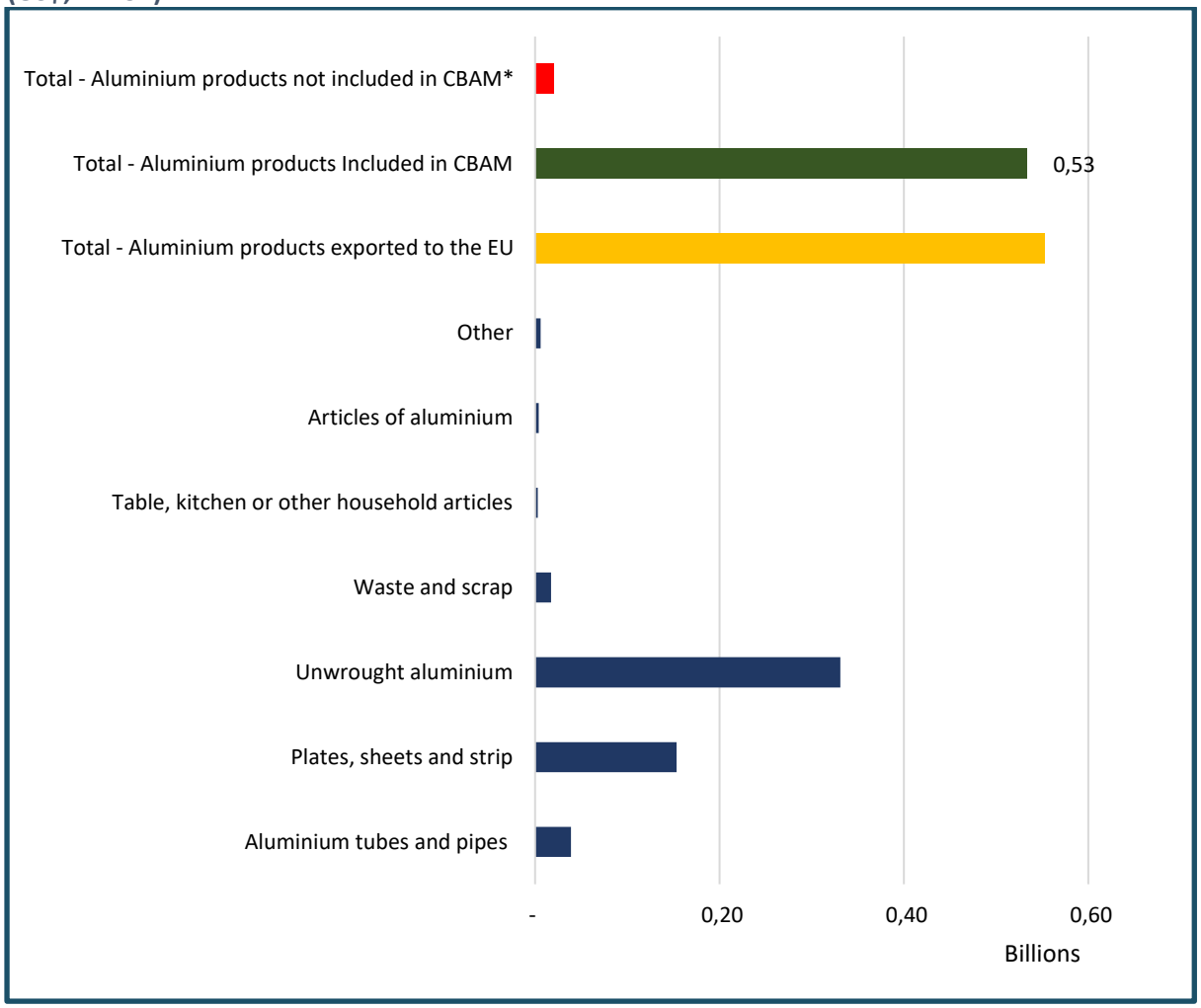
The carbon intensity of the smelter also reflects the dichotomy between a heavy carbon-intensive electricity supply and an energy efficient plant. In 2021, the smelter's indirect (Scope 2) carbon intensity stood at 14.9 tCO2e/t of aluminium, which is significantly higher than the global average of 1.6 tCO2e/t of aluminium, while its direct (Scope 1) carbon intensity was 1.4 tCO2e/t of aluminium, far below the global average of 8.5 tCO2e/t aluminium (South32, 2021).

Similarly, electricity-related emissions accounted for 71% of emissions of aluminum semi-fabricator and recycler Hulamin in 2021 (Monaisa, 2022).

The focus on direct emissions in the initial phase of the CBAM, while still a problem for South Africa's export of aluminium products, does provide some reprieve to the value chain. The inclusion of indirect emissions would be highly problematic for the industry.

[6] Aluminium waste and scrap is not covered under CBAM, meaning Zimco Metals and other secondary aluminium producers in South Africa will not be affected by CBAM in the short term.

Figure 7. Disaggregated South African exports of aluminium products to the EU – 2022 (US$, Billion)



Source: Author, based on Trade Map, 2023. Bilateral trade between South Africa and European Union (EU 27)
Note: *Products not included in the CBAM include aluminium waste and scrap and aluminium table, kitchen, or other household articles

3.3. Chemicals

Organic chemicals

The chemical sector in South Africa plays an important role in the local economy. The chemical sector consists of petroleum, basic, pharmaceuticals, plastic, and cosmetics chemicals, with organic chemicals cross cutting. The chemical sector contributed 2.9% to the South African GDP in 2017 and created 106 000 direct jobs excluding plastics (see the economic contribution of the plastic sector in the subsector below).

The chemicals industry produced about 2.8% of South Africa's IPPU sector emissions in 2017 (893 GgCO2e) (DEA, 2017). The largest contributors to GHG emissions are ammonia production and nitric acid production. South Africa's chemicals and pharmaceutical products exports are more carbon intensive than most other countries, with a carbon intensity of exports at almost 1 200 tCO2e per US$ million (Montmasson-Clair, 2020).

Within this context, the organic chemicals sector's potential exposure to the CBAM is high (see the disaggregated list of organic chemicals likely to be covered in the CBAM in the Appendix). Although

they are not included in the initial list of products covered by CBAM, organic chemicals are earmarked for inclusion following a review. In 2022, about 27% (in value) of South African exports of organic chemicals are likely to be covered by the CBAM (based on lists included in draft versions of the CBAM texts). Exports of organic chemicals to be potentially covered by the CBAM accounted for 1% of total South African exports in 2022.

Plastics

In addition to organic chemicals, the exposure of plastic exports to the CBAM is also high. Although plastics have also not been included in the final CBAM text, plastics are likely to be included during the implementation period of CBAM (after assessments to be conducted during the transitional period). Within this context, the plastic value chain plays an important role in the local economy, and the associated risks that arise as the results of CBAM need to be understood (see the disaggregated list of plastics likely to be covered in the CBAM in the appendices).

The plastic value chain contributes at least 0.4% (2022) to South Africa's GDP, amounting to more than 2% of the country's manufacturing Gross Value Added. The industry also employs about 60 000 people directly, and at least 90 000 people indirectly, across the value chain.

About 10% (in 2022 value) of plastic products exported to the EU are forecasted to be covered by the CBAM (based on previous CBAM drafts). Plastics exports to be covered by the CBAM accounted for 1% of South Africa's total exports in 2022.

In South Africa, coal is not only used to supply electricity and heat but is also as a feedstock for plastic production, making this sector at risk of global climate change policies such as CBAM. Emissions data from Sasol, South Africa's largest plastic chemical producer and second largest GHG emitter (after power utility Eskom), shows prevalent Scope 1 emissions – direct emissions accounted for more than 50% of the company's GHG emissions in 2021 (Sasol, 2021). Also, in 2019, Scope 1 emissions made up 20% of virgin polymer producer Safripol's GHG emissions, while the remaining 80% was from electricity and steam consumption (Safripol, 2021).

South Africa's rubber and plastics products are also, comparatively, highly carbon intensive. At about 2 500 tCO2e per US$ million, the carbon intensity of South Africa's rubber and plastics exports is higher than China's (at 1 300 tCO2e per US$ million) and most plastic exporting countries (between 150 and 600 tCO2e per US$ million) (Montmasson-Clair, 2020).

4. INTERNATIONAL RESPONSE AND IMPLICATIONS FOR THE GLOBAL ECONOMY

Countries across the world have had mixed reactions to the CBAM. Arguments in favour of the CBAM are that it could encourage investment in energy-efficient technologies, cleaner energy sources, and technologies that reduce GHG emissions from production (De Jager, 2022). If a country's carbon intensive sectors make up a significant proportion of their exports (to the EU) and domestic demand is not sufficient to absorb the products, then the CBAM could shift resources to lower-carbon sectors.

As climate action intensifies, especially the adoption of CBAM, it could inspire other jurisdictions to implement mechanisms of their own or apply standards on carbon intensity to both domestic and foreign products. Already, countries, such as Japan, UK, Canada, and the US[7] are moving towards

[7] The US introduced the PROVE IT Act to the Senate in June 2023, which could lead to a CBAM-like mechanism in response to the EU CBAM in the near future.

introducing CBAM-like mechanisms (Monaisa and Maimele, 2023; Muthusame and Maimele, 2023, PwC, 2021; Monkelbaan and Figures, 2022). These measures are considered protectionist to discriminate against foreign commercial interests, and are deemed to be violating the World Trade Organization (WTO). Countries globally, especially developed countries, are moving inwards (Hinrich Foundation, 2023). In addition, countries in the Global North, led by the EU and the US, have developed extensive policy packages to support the transition of their domestic industries.

By contrast, strong opposition to the introduction of CBAM has been witnessed in the Global South. Brazil, Russia, India, China and South Africa (BRICS) have opposed the proposed CBAM. The BRICS countries' primary concern is that the risks associated with the CBAM will not be equally distributed across the globe and may disproportionately impact the Global South. The extent of the risk not only depends on the policy exposure (the proportion of a country's exports to the EU) but also on the country's vulnerability (ability to adapt by shifting trade flows) and its ability to reduce and report emissions (Eicke et al., 2021). India, for example, is already engaging the EU bilaterally on finding ways to limit the potential impact of CBAM on its domestic industries, especially the iron and steel sector (European Commission, 2023b). China during the WTO's 15th Trade Policy Review meeting for the EU formally opposed CBAM (Carbon Credits, 2023). Former South African Minister of Trade and Industry Rob Davies (2023) noted that the use of protectionist measures justified in the name of climate action, such as the CBAM, should be rejected, opposed, and challenged in any way or forum possible by developing countries.

General concerns about the CBAM are that it will not only distort international trade but could also shift the burden of addressing climate change to low- and middle-income countries, thus making the objective of limiting carbon leakage difficult to reach. Many low-income countries, while having very low GHG emissions (and an even lower historical responsibility for climate change), rely on energy-inefficient technologies. As such, their exports can be carbon intensive.

Another key concern is the policy's alignment with the Paris Agreement, specifically the principles of equity and of Common but Differentiated Responsibilities (CBDR) in addressing climate change. The CBAM could conflict with these principles in that it expects countries to align with the EU or bear additional charges on their exports to the EU (Monaisa 2021).

There is also the risk that the CBAM could result in resource shuffling, in which corporations could export lower-carbon products to the EU and export the rest of their production to countries with laxer carbon laws (White and Van Den Hende, 2021).

Non-EU countries also have concerns over the CBAM's WTO compatibility. The CBAM's WTO compatibility will depend on its implementation and notably whether it meets the General Agreement on Tariffs and Trade (GATT) test of double non-discrimination: non-discrimination between domestic and foreign suppliers, and non-discrimination between foreign suppliers (Sapir, 2021).

5. RESPONDING TO CBAM: POTENTIAL MITIGATION MEASURES

Responses to CBAM have increased since the adoption of the legislation. It is, therefore, important for Global South countries (especially South Africa) and firms to start reacting to the regulation. The absence of response from countries and firms alike would lead to a dramatic loss of competitiveness on the export market. Below are recommendations on what South Africa could do in the short to medium term in response to the CBAM.

5.1. Short-term interventions

The creation of a domestic monitoring, reporting and verification system of GHG emissions at a product level, the creation and funding of capacity building and technical assistance programmes to comply with CBAM, and the start of negotiations to reform the WTO to reflect on issues of green trade, with South Africa leading the Africa group at the WTO, are necessary steps to responding to CBAM in the short term.

5.1.1. Prepare a domestic Monitoring, Reporting and Verification system (MRV)

The CBAM will impose significant financial and compliance costs on both exporting firms and the South African government. Exporting firms will have to account for, report and verify the embedded emissions in their products. The CBAM requires third-party verifiable carbon audits which can be costly – even for large firms (European Parliament, 2021). As the capacity for tracking and reporting carbon content differ by industry, a domestic carbon reporting system, which could be led by the Department of Forestry, Fisheries and the Environment (DFFE), could ease the administrative burden of South African firms. South Africa already has a Greenhouse Gas Emissions Reporting System in place. This system can be leveraged to align to the proposed CBAM and identify possible entry points to be leveraged to help both firms and the government in reprieving the compliance cost. The system could prioritise iron and steel (including iron ore) and aluminium industries in the short term. This could also include chemical products as CBAM is envisioned to include the industry in the near future.

A domestic MRV system that allows exporting firms to report at a product and company level could facilitate the design and adoption of standardised carbon accounting methodologies and standardise the reporting of GHG emissions for the country. These standardised carbon accounting methodologies could potentially have benefits for enabling climate policies to be deployed more effectively. In turn, if firms procure their own renewable energy technologies, and can prove that their emissions are lower than the rest of the country (through their MRV system), they could significantly reduce their exposure to CBAM.

The creation of a domestic MRV system in response to CBAM will require capacity building and technical assistance. Knowledge sharing, capacity building, as well as technical assistance therefore constitute an important layer in the response to the CBAM (Vasilj et al., 2023). The EU in support of developing countries should provide direct capacity building support and technical assistance on both country and company levels. This should include extensive capacity building and technical assistance programmes during the transitional period.

5.1.2. Engage the EU on CBAM issues and an open door for concessions

The CBAM regulation encourages a dialogue between the EU and third countries. This aims to create a space for cooperation and solutions that could inform specific choices on the implementation of CBAM, in particular during the transitional period. Already, India is engaging with the EU on issues of CBAM specifically on how CBAM will impact its domestic iron and steel industry and how the EU can help mitigate these impacts. Within the same context, South Africa could engage with the EU bilaterally on issues of CBAM (to be added as an agenda item) in the forthcoming South Africa-EU Summit.[8] This could look at the iron and steel (including iron ore) and aluminium industries and how

[8] This will be the 8th bilateral engagement between the European Union and South Africa. A date for the summit is yet to be determined.

certain concessions (such as providing support to ensuring comparability and quality of the MRV system) can be made that consider South Africa's climate change mechanisms (i.e., carbon tax).

5.1.3. Start negotiations to reform the World Trade Organization

In parallel with engaging the EU, South Africa could start negotiations to reform the WTO. During the COVID-19 pandemic, South Africa was instrumental in pressing for a waiver from certain provisions of the Trade-Related Aspects of Intellectual Property Rights (TRIPS) Agreement to facilitate access to vaccines and medicines for the prevention, containment and treatment of COVID-19 in African countries (Van der Ven and Luke, 2023). South Africa, especially the Department of Trade, Industry and Competition (the dtic), could lead the Africa group at the WTO, to initiate negotiations to reform the WTO to reflect the lack of fairness and equity portrayed by the current multilateral system, amid the environmental issues on trade. Entry points for the negotiations could include advancing free green technology transfers and allowing flexibility on the TRIPS and streamlining the WTO and United Nations Framework Convention on Climate Change (UNFCCC) principles of Special and Differential Treatment (S&DT) and CBDR. The principles of S&DT as highlighted in the WTO, and CBDR as highlighted in the UNFCCC should be recognised and enforced by Global South countries.

5.2. Medium-term interventions

In the medium term, the scope of the CBAM is set to be expanded to include other sectors and downstream suppliers to the initial list. Also, other key South African exporting destinations are likely to introduce carbon border mechanisms, as efforts to reduce global GHG emissions intensify. Therefore, it is important to have a medium to long term vision in responding to CBAM-like measures. The following medium-term measures could be applied to guide and prepare the South African economy to adapt to the changing landscape of trade amid climate change policies.

5.2.1. Decarbonise industries and the domestic electricity system

Exporters and governments will need to proactively prepare for the CBAM by evaluating the administrative and financial implications of the scheme on their businesses and industries. Firms exporting to the EU will also need to increase efforts to align their business models with a low-carbon future. This will include the government and exporting firms creating climate compatible strategies in the medium term, to show what both the private and public sector can do to decarbonise industries in South Africa. These strategies could include ambitious commitments and targets to reducing GHG emissions as well as measures to support the decarbonisation of the economy. Iron and steel (including iron ore), aluminium and chemical value chains should be prioritised.

In this context, the only viable long-term strategy to protect against carbon border taxes is to accelerate the decarbonisation of carbon-intensive industries. Increasing renewable energy-based power supply in production processes and investing in energy-efficient technologies that will serve to decarbonise industrial sectors form the backbone of such a strategy.

Fundamentally, the South African electricity system need to be decarbonised. South Africa's over-reliance on coal as a feedstock for electricity and liquid fuels production makes it one of the most carbon-intensive economies in the world. Increasing renewable energy in the national grid will decrease the indirect emissions of all sectors, notably those that consume large amounts of electricity. Also, the rollout of energy efficient technologies (notably for core production processes) and the spread of distributed generation need to be accelerated.

Box 1 and Box 2 highlight practical recommendations to decarbonise the South African aluminium and iron and steel value chains.

Box 1. Decarbonisation options for Hillside – The only primary aluminium smelter in South Africa

Primary aluminium producer Hillside Aluminium is entirely dependent on electricity from Eskom. Greening Hillside would require utility-scale renewable energy and storage. South32 could take three approaches to decarbonise electricity supply in its plant in Richards Bay.

1. Hillside could procure electricity independently through Independent Power Producers. This would require up to 5 000MW of renewable energy and large-scale battery storage. The smelter could procure the renewable energy in two ways: block stages, where it procures renewable energy in blocks, or exponentially, where it procures a little at the beginning and more towards the end. The exponential approach would be more suitable as the smelter could take advantage of the declining prices of solar photovoltaic (PV), wind energy and battery storage. However, the scale of the generation capacity to be procured makes it difficult. In addition, this would lead to Eskom losing Hillside as an anchor customer.
2. South32 could enter into a public-private partnership with Eskom to procure renewable energy and storage capacity for Hillside. A new Power Purchase Agreement could be introduced which would leverage the longstanding commercial relationship between Eskom and Hillside. This approach could be the most suitable approach for South32 and Eskom to secure low-carbon power for Hillside. This approach would require amendments to and/or a new Negotiated Pricing Agreement contract between Hillside and Eskom and could, for instance, be implemented through the Tubatse hydro-battery project.
3. Decarbonising the Eskom grid is a longer-term avenue. However, this would not be fast enough for South32's decarbonisation targets. South32 aims to reduce 50% of its group emissions by 2035. Hillside currently accounts for 58% of the group's total GHG emissions. Another concern is that Eskom cannot earmark renewable energy for Hillside. Last, the renewable energy tariff rates might not be financially feasible for Hillside. While the current tariff under the new pricing contract is publicly unknown, the special pricing contract has historically led to the smelter paying lower than Megaflex rates.

Source: Monaisa and Montmasson-Clair, 2023.

Box 2. Decarbonisation options for the South African Iron and steel value chain – Looking into AMSA's decarbonisation roadmap.

ArcelorMittal South Africa (AMSA)'s crude steel production in 2021 amounted to three million tonnes. That is about 60% of domestic steel production in South Africa. In 2021, total greenhouse gas (CO_2 equivalent, Scope 1 and Scope 2) for AMSA amounted to 8.4 million tonnes, with 6.4 million tonnes Scope 1/direct CO_2 equivalent.

To achieve the goals of the 2015 Paris climate agreement, it is estimated that the carbon intensity of steel production must fall from about 1.85t of CO_2 per metric ton of steel to 0.2t of CO_2 per metric ton of steel. As a group, ArcelorMittal is aiming to reduce its carbon intensity by 2030 by 25%, from a baseline of 2.9 tonnes of carbon dioxide per tonne of crude steel (tCO2 /tCS) in 2018 to 2.16 tCO2 /tCS by 2030 and a residual 0.4 tCO2 /tCS by 2050 (AMSA, 2023).

AMSA is committed to at least meeting the ArcelorMittal group target to reduce carbon intensity by 25% by 2030. AMSA already announced a partnership with Sasol in October 2022 to develop carbon capture and utilisation technology using process carbon produced at its Vanderbijlpark Works plant. Sasol and AMSA are also exploring the conversion of captured carbon into sustainable fuels and chemicals using renewable energy and green hydrogen. They are also

exploring the potential of Saldanha as an export hub for green hydrogen and derivatives. AMSA has also launched projects to generate 200 megawatts of renewable power on its premises, as immediate steps to decarbonising the industry. This needs to be accelerated to reduce its direct emissions.

Fundamentally, the need to decarbonise the value chain lies in balancing emission reductions from Basic Oxygen Furnace and Electric Arc Furnace (EAF) production methods, with electricity produced entirely from renewable energy.

Below are some decarbonisation options for the South African Iron and steel value chain to consider;

1. In the short term, the industry need to retrofit existing furnaces with carbon capture systems so that CO_2 released during steelmaking can be stored underground or used to manufacture chemicals like methanol.
2. Increase green hydrogen in both the EAF and Blast Furnace (BF) processes to reduces CO_2 emissions. However, while the use of green hydrogen will result in a net decrease in CO_2 emissions, there is also a limit to the amount of H_2 that can be injected into the BF (i.e., hydrogen can only partially replace coke as a reducing agent). Also, the viability of using green hydrogen to produce direct reduced iron (an example of "green primary iron" or GPI) will ultimately depend on its cost, which in turn depends primarily on the cost of renewable energy. On a like-for-like basis (excluding CO_2 costs), AMSA estimates that the cost of hydrogen would need to fall below US$1/kg to compete with natural gas Direct Reduced Iron (DRI) in Europe, and below US$0.7/kg to compete in the United States. According to AMSA, if renewable energy costs continue to fall, the cost of green hydrogen could drop to approximately US$1.5/kg by 2025-2030. Even at this cost, green hydrogen DRI would require significant public support beyond 2030 to be a viable, carbon neutral steelmaking pathway.
3. Currently, pellets* are manufactured using fossil fuels. Greening the production methods of the pellets, which could involve a bio-oil by-product from papermaking/hydrogen, should be considered. At the moment, these are currently tested.
4. Also, greening the production of pellets should consider iron-bearing metallics to include sinter, pellets, and or calibrated lump ores.
5. Increase renewable energy in the production of iron and steel. It is important to note that renewable electricity itself could be used to reduce iron oxides through a process of molten oxide electrolysis, avoiding the need for hydrogen altogether. However, this option is not commercially viable yet.

** Sinter, pellets and/or calibrated lump ores are the three iron-bearing metallics normally used in a blast furnace. They can be used in any combination and the choice of metallics depends on a variety of factors and varies from plant to plant.*

Source: Steuart, 2023.

5.2.2. Introduce more ambitious climate change policies domestically

South Africa's current climate change policies are not ambitious enough to shield domestic companies from border carbon taxes or achieve global climate goals. To keep below the 1.5˚C temperature limit, analysis by the 1.5°C National Pathways Explorer shows that South Africa's 2030 emissions would need to be around 334 MtCO2e (or 6% below 1990 levels). The current target (with an ambition range of 366-436 MtCO2e by 2030), is too high to reach the 2030 target of 334 MtCO2e,

as highlighted above. This leave a shortfall of about 32 MtCO2e for South Africa to reach its 2030 emission targets at the bottom end of its nationally determined contribution (NDC) range (366 MtCO2e) by 2030. Within this context, South Africa is not on track to reach its targets and for a 1.5°C world. Therefore, introducing more ambitious climate change policies linked to existing carbon pricing mechanisms such as the EU ETS could see some level of exemption from the CBAM. In the South African case, to provide some relief from the CBAM, this would have to translate into a higher carbon price.

The National Treasury could start looking into reforming and increasing the current South Africa's carbon tax to reflect global carbon pricing. This would mean increasing the domestic carbon tax to be within the global carbon price corridor of 50-100 US$/tCO2e. This would be critical to ensure that the country's carbon-intensive products reflect at least the EU price of carbon.

The increased carbon tax will result in retaining the proceeds locally, but this would need to be done in a way that would not impact production for the local market, especially for iron and steel and aluminium products.

Increasing the South African carbon price would also stimulate heavy emitters to reform their business models and operations, as well as reduce the exposure to the CBAM. While increasing the domestic carbon tax would have a similar impact to the CBAM on local companies, it would enable South Africa to retain the proceeds of carbon pricing. An increased domestic carbon tax would increase the domestic carbon revenue for South Africa instead of paying carbon tax to the EU. This revenue could be recycled to incentivise the decarbonisation of industries locally.

6. CONCLUSION

The CBAM will undoubtedly have a negative impact on South African exports. The iron and steel and aluminum sectors are particularly at high risk. This is primarily due to the use of coal-powered electricity and coal as feedstock (Gide Loyrette Nouel, 2021). As the EU plans to further expand the sectors covered by the CBAM, and other jurisdictions look to introduce CBAM-like measures, other industries will be at risk.

In the short term, plastics and organic chemicals are expected to be included in the CBAM post assessments by the European Commission after the transitioning phase (European Commission, 2022).

Governments and exporters need to proactively prepare for the CBAM and its financial, administrative, economic, and social implications. Firms need to actively investigate low-carbon energy sources and shift their production methods to align with a low-carbon future. The South African government must increase efforts to decarbonise the electricity mix, lead in the creation of a domestic MRV system (DFFE), lead negotiations to reform the WTO (the dtic) and reform the carbon tax to reflect international carbon pricing (National Treasury).

The global economy needs to prepare for the disruptions in trade flows which may arise from CBAM spillovers. Other markets, such as Canada, United Kingdom and Japan, as well as the United States are planning to implement their own border carbon taxes (Magacho et al., 2022). ///This will make trade increasingly difficult for South Africa if it does not decarbonise its energy and carbon-intensive industries. While CBAM will be ramped up progressively, the timeframes for the CBAM are shorter than initially expected. South Africa needs to take urgent actions to mitigate against the CBAM and other carbon border taxes or be left behind to the detriment of its economy and people.

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APPENDIX

Table A 1. CBAM sectors and South Africa's exports to the EU (2022)

Sectors covered by CBAM	Value of Exports covered by CBAM (US$)	% of exports to the EU	% of overall sector exports (South Africa)	% of South African GDP	% of total South African exports	% of CBAM exports to EU
Cement	300000	0,001%	0,3%	0,0001%	0,0002%	0,0%
Electricity	0	0,0%	0,0%	0,0%	0,00%	0,0%
Fertilisers	5249000	0,02%	0,8%	0,001%	0,004%	0,2%
Iron and Steel*	2218785000	8,3%	19,4%	0,6%	1,79%	80,5%
Aluminium	532985000	2,0%	28,0%	0,2%	0,43%	19,3%
Hydrogen	0	0,0%	0,0%	0,0%	0,00%	0,0%
Total	**2 757 319 000**	**10,3%**		**0,8%**	**2,2%**	

Source: Author, based on Trade Map, 2022. Bilateral trade between South Africa and European Union (EU 27).
*Iron and steel include input materials (also known as precursors, i.e., iron ore) and articles of iron and steel.

Table A 2. List of products covered by CBAM

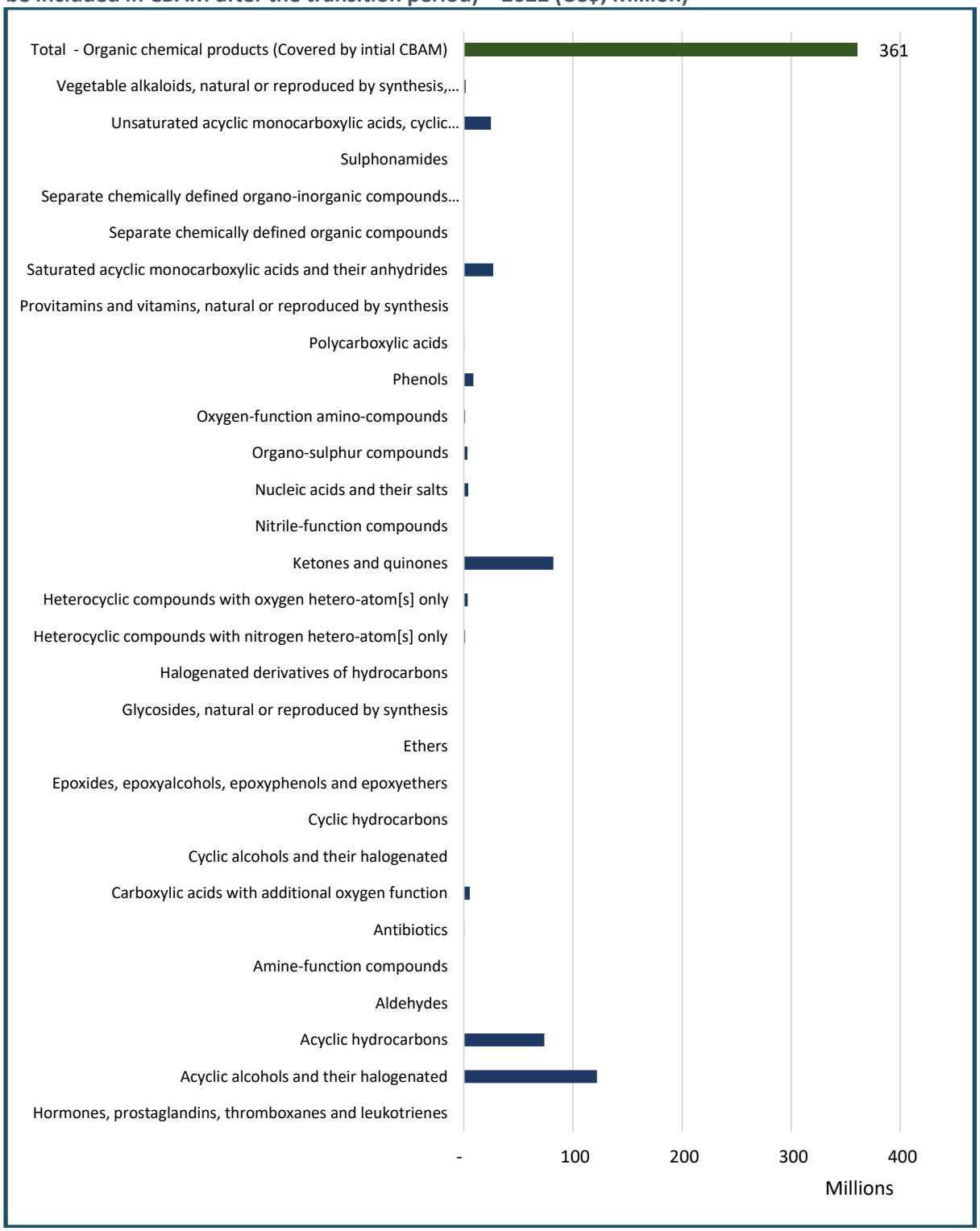
	CN Code	Product	Sector	GHG accounted	GHG emissions accounted (Direct/Indirect)
	2507 00 80	Other kaolinic clays	Cement	Carbon dioxide	Both
	2523 10 00	Cement clinkers	Cement	Carbon dioxide	Both
	2523 21 00	White Portland cement, whether or not artificially coloured	Cement	Carbon dioxide	Both
	2523 29 00	Other Portland cement	Cement	Carbon dioxide	Both
	2523 30 00	Aluminous cement	Cement	Carbon dioxide	Both
	2523 90 00	Other hydraulic cements	Cement	Carbon dioxide	Both
	2716 00 00	Electrical energy	Electricity	Carbon dioxide	Both
	2808 00 00	Nitric acid; sulphonitric acids	Fertilisers	Carbon dioxide and nitrous oxide	Both
	2814	Ammonia, anhydrous or in aqueous solution	Fertilisers	Carbon dioxide	Both
	2834 21 00	Nitrates of potassium	Fertilisers	Carbon dioxide and nitrous oxide	Both
	3102	Mineral or chemical fertilisers, nitrogenous	Fertilisers	Carbon dioxide and nitrous oxide	Both
	3105	Mineral or chemical fertilisers containing two or three of the fertilising elements nitrogen, phosphorus, and potassium; other fertilisers; goods of this chapter in tablets or similar forms or in packages of a gross weight not exceeding 10 kg	Fertilisers	Carbon dioxide and nitrous oxide	Both
Except	*3105 60 00*	*Mineral or chemical fertilisers containing the two fertilising elements phosphorus and potassium*	*Fertilisers*		*Both*
	72	Iron and steel	Iron and steel	Carbon dioxide	Direct emissions
Except	*7202 2*	*Ferro-silicon*	*Iron and steel*		*Direct emissions*
	7202 30 00	*Ferro-silico-manganese*	*Iron and steel*		*Direct emissions*
	7202 50 00	*Ferro-silico-chromium*	*Iron and steel*		*Direct emissions*
	7202 70 00	*Ferro-molybdenum*	*Iron and steel*		*Direct emissions*
	7202 80 00	*Ferro-tungsten and ferro-silico-tungsten*	*Iron and steel*		*Direct emissions*
	7202 91 00	*Ferro-titanium and ferro-silico-titanium*	*Iron and steel*		*Direct emissions*
	7202 92 00	*Ferro-vanadium*	*Iron and steel*		*Direct emissions*
	7202 93 00	*Ferro-niobium*	*Iron and steel*		*Direct emissions*

	CN Code	Product	Sector	GHG accounted	GHG emissions accounted (Direct/Indirect)
	7202 99	*Other:*	*Iron and steel*		*Direct emissions*
	7202 99 10	*Ferro-phosphorus*	*Iron and steel*		*Direct emissions*
	7202 99 30	*Ferro-silico-magnesium*	*Iron and steel*		*Direct emissions*
	7202 99 80	*Other*	*Iron and steel*		*Direct emissions*
	7204	*Ferrous waste and scrap; remelting scrap ingots and steel*	*Iron and steel*		*Direct emissions*
	2601 12 00	Agglomerated iron ores and concentrates, other than roasted iron pyrites	Iron and steel	Carbon dioxide	Both
	7301	Sheet piling of iron or steel, whether or not drilled, punched, or made from assembled elements; welded angles, shapes, and sections, of iron or steel	Iron and steel	Carbon dioxide	Direct emissions
	7302	Railway or tramway track construction material of iron or steel, the following: rails, check-rails and rack rails, switch blades, crossing frogs, point rods and other crossing pieces, sleepers (cross-ties), fish- plates, chairs, chair wedges, sole plates (base plates), rail clips, bedplates, ties and other material specialised for jointing or fixing rails	Iron and steel	Carbon dioxide	Direct emissions
	7303 00	Tubes, pipes, and hollow profiles, of cast iron	Iron and steel	Carbon dioxide	Direct emissions
	7304	Tubes, pipes, and hollow profiles, seamless, of iron (other than cast iron) or steel	Iron and steel	Carbon dioxide	Direct emissions
	7305	Other tubes and pipes (for example, welded, riveted, or similarly closed), having circular cross-sections, the external diameter of which exceeds 406,4 mm of iron or steel	Iron and steel	Carbon dioxide	Direct emissions
	7306	Other tubes, pipes, and hollow profiles (for example, open seam or welded, riveted, or similarly closed), of iron or steel	Iron and steel	Carbon dioxide	Direct emissions
	7307	Tube or pipe fittings (for example, couplings, elbows, sleeves), of iron or steel	Iron and steel	Carbon dioxide	Direct emissions
	7308	Structures (excluding prefabricated buildings of heading 9406) and parts of structures (for example, bridges and bridge-sections, lock- gates, towers, lattice masts, roofs, roofing frameworks, doors and windows and their frames and thresholds for doors, shutters, balustrades, pillars, and columns), of iron or steel; plates, rods, angles, shapes, sections, tubes, and the like, prepared for use in structures, of iron or steel	Iron and steel	Carbon dioxide	Direct emissions
	7309 00	Reservoirs, tanks, vats, and similar containers for any material (other than compressed or liquefied gas), of iron or steel, of a capacity exceeding 300 l, whether or not lined or heat-insulated, but not fitted with mechanical or thermal equipment	Iron and steel	Carbon dioxide	Direct emissions
	7310	Tanks, casks, drums, cans, boxes, and similar containers, for any material (other than compressed or liquefied gas), of iron or steel, of a capacity not exceeding 300 l, whether or not lined or heat-insulated, but not fitted with mechanical or thermal equipment	Iron and steel	Carbon dioxide	Direct emissions
	7311 00	Containers for compressed or liquefied gas, of iron or steel	Iron and steel	Carbon dioxide	Direct emissions
	7318	Screws, bolts, nuts, coach screws, screw hooks, rivets, cotters, cotter pins, washers (including spring washers) and similar articles, of iron or steel	Iron and steel	Carbon dioxide	Direct emissions
	7326	Other articles of iron or steel	Iron and steel	Carbon dioxide	Direct emissions

	CN Code	Product	Sector	GHG accounted	GHG emissions accounted (Direct/Indirect)
	7601	Unwrought aluminium	Aluminium	Carbon dioxide and perfluorocarbons	Direct emissions
	7603	Aluminium powders and flakes	Aluminium	Carbon dioxide and perfluorocarbons	Direct emissions
	7604	Aluminium bars, rods, and profiles	Aluminium	Carbon dioxide and perfluorocarbons	Direct emissions
	7605	Aluminium wire	Aluminium	Carbon dioxide and perfluorocarbons	Direct emissions
	7606	Aluminium plates, sheets, and strip, of a thickness exceeding 0,2 mm	Aluminium	Carbon dioxide and perfluorocarbons	Direct emissions
	7607	Aluminium foil (whether or not printed or backed with paper, paper- board, plastics, or similar backing materials) of a thickness (excluding any backing) not exceeding 0,2 mm	Aluminium	Carbon dioxide and perfluorocarbons	Direct emissions
	7608	Aluminium tubes and pipes	Aluminium	Carbon dioxide and perfluorocarbons	Direct emissions
	7609 00 00	Aluminium tube or pipe fittings (for example, couplings, elbows, sleeves)	Aluminium	Carbon dioxide and perfluorocarbons	Direct emissions
	7610	Aluminium structures (excluding prefabricated buildings of heading 9406) and parts of structures (for example, bridges and bridge-sections, towers, lattice masts, roofs, roofing frameworks, doors and windows and their frames and thresholds for doors, balustrades, pillars, and columns); aluminium plates, rods, profiles, tubes, and the like, prepared for use in structures	Aluminium	Carbon dioxide and perfluorocarbons	Direct emissions
	7611 00 00	Aluminium reservoirs, tanks, vats, and similar containers, for any material (other than compressed or liquefied gas), of a capacity exceeding 300 litres, whether or not lined or heat-insulated, but not fitted with mechanical or thermal equipment	Aluminium	Carbon dioxide and perfluorocarbons	Direct emissions
	7612	Aluminium casks, drums, cans, boxes, and similar containers (including rigid or collapsible tubular containers), for any material (other than compressed or liquefied gas), of a capacity not exceeding 300 litres, whether or not lined or heat-insulated, but not fitted with mechanical or thermal equipment	Aluminium	Carbon dioxide and perfluorocarbons	Direct emissions
	7613 00 00	Aluminium containers for compressed or liquefied gas	Aluminium	Carbon dioxide and perfluorocarbons	Direct emissions
	7614	Stranded wire, cables, plaited bands, and the like, of aluminium, not electrically insulated	Aluminium	Carbon dioxide and perfluorocarbons	Direct emissions
	7616	Other articles of aluminium	Aluminium	Carbon dioxide and perfluorocarbons	Direct emissions
	2804 10 00	Hydrogen	Chemicals	Carbon dioxide	Direct emissions

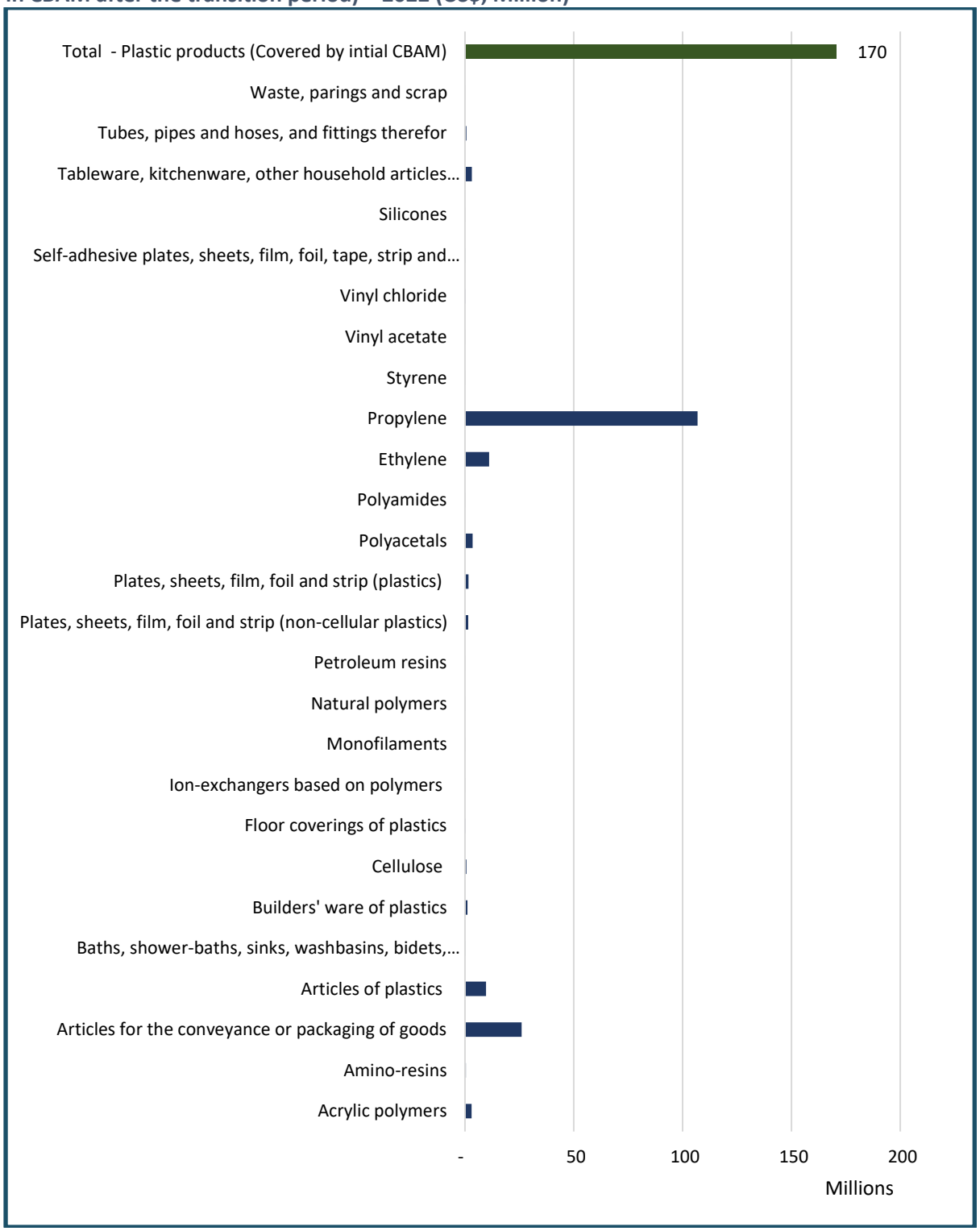
Source: European Commission, 2023a

Figure A.1. Disaggregated South African exports of organic chemicals products to the EU (likely to be included in CBAM after the transition period) – 2022 (US$, Million)



Source: Author, based on Trade Map, 2023. Bilateral trade between South Africa and European Union (EU 27).

Figure A.2. Disaggregated South African exports of plastic products to the EU (likely to be included in CBAM after the transition period) – 2022 (US$, Million)



Source: Author, based on Trade Map, 2023. Bilateral trade between South Africa and European Union (EU 27).