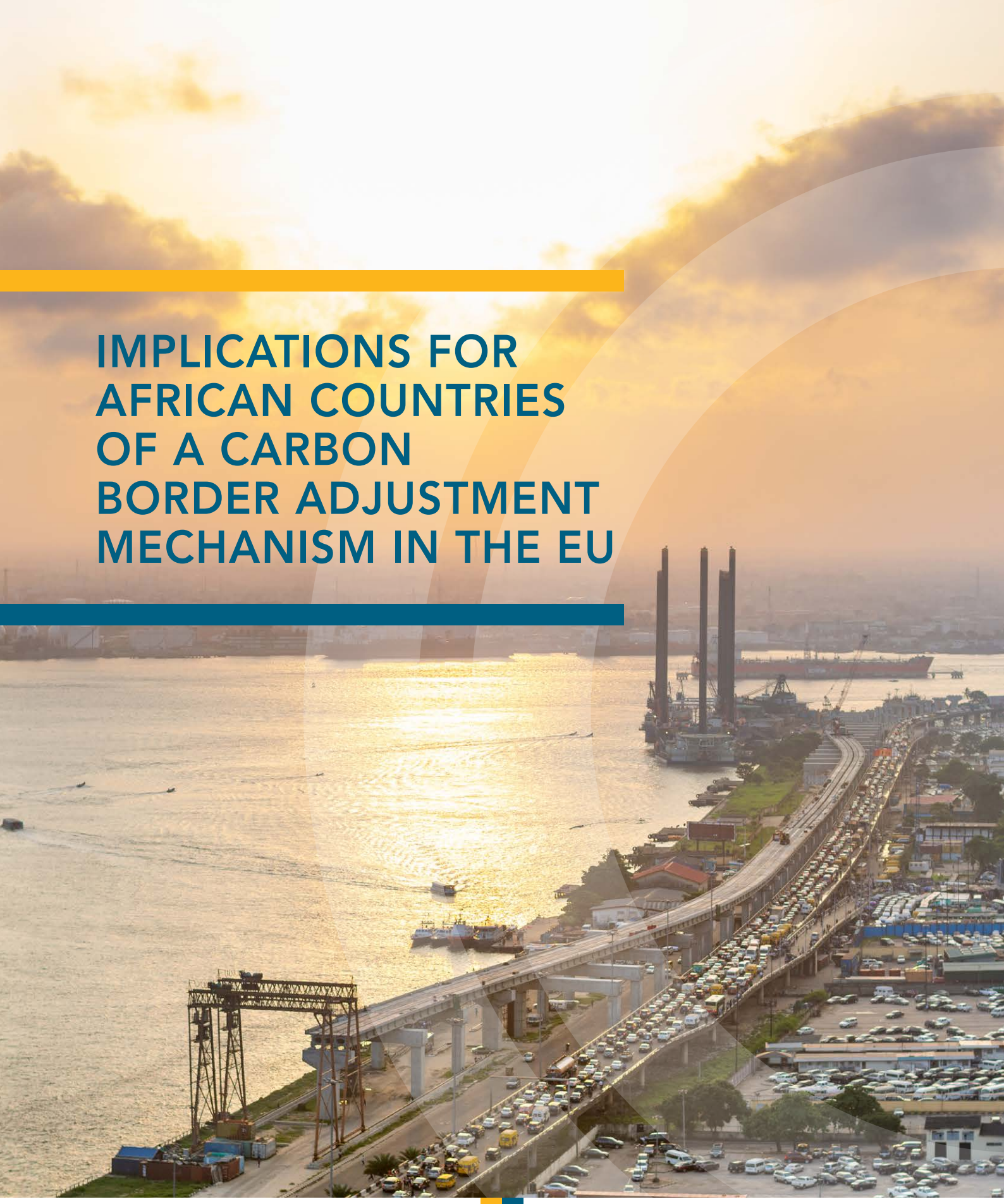
IMPLICATIONS FOR AFRICAN COUNTRIES OF A CARBON BORDER ADJUSTMENT MECHANISM IN THE EU



THE AFRICAN CLIMATE FOUNDATION

LSE Firoz Lalji Institute for Africa

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ACRONYMS

AfCFTA	African Continental Free Trade Area
AfT	Aid for Trade
CBAM	Carbon Border Adjustment Mechanism
CBDR	Common but Differentiated Responsibilities
CES	Constant Elasticity of Substitution
CGE	Computable General Equilibrium
CO_2	Carbon Dioxide
DTIS	Diagnostic Trade Integration Studies
EFTA	European Free Trade Association
EIF	Enhanced Integrated Framework
EST	Environmentally Sound Technology
ETS	Emissions Trading Scheme
EU	European Union
GATT	General Agreement on Tariffs and Trade
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GTAP	Global Trade Analysis Project
ICJ	International Court of Justice
IMF	International Monetary Fund
IPR	Intellectual Property Right
LDC	Least Developed Country
MEA	Multilateral Environment Agreement
MFN	Most Favoured Nation
NTQM	New Trade Quantitative Model
OECD	Organisation for Economic Co-operation and Development
PEP	Partnership for Economic Policy
RoW	Rest of World
RTA	Regional Trade Agreement
S&DT	Special and Differential Treatment
SCM	Subsidies and Countervailing Measures
TBT	Technical Barriers to Trade
TESSD	Trade and Environmental Sustainability Structured Discussions
ToT	Terms of Trade
TRIPS	Trade Related Intellectual Property Rights
UNCTAD	United Nations Conference on Trade and Development
UNFCCC	United Nations Framework Convention on Climate Change
VoT	Volume of Trade
WTO	World Trade Organization

PREFACE

The Paris Agreement, approved at the United Nations Framework Convention on Climate Change's 21st Conference of the Parties, emphasises the importance of responding effectively to climate change based on the best available scientific knowledge and the intrinsic relationship between climate action and equitable access to sustainable development and poverty eradication. To scale up global efforts, various regional blocs and individual countries have formulated different mechanisms and initiatives, such as the Carbon Border Adjustment Mechanism (CBAM) introduced by the European Union (EU). The CBAM aims to position the EU as a global leader on climate action and reduce greenhouse gas emissions to 55% below the 1990 levels by 2030. However, the proposal has faced scrutiny from partners like Africa, who question its compliance with Paris commitments and its impact on African exports.

This joint report by the African Climate Foundation and the Firoz Lalji Institute for Africa at the London School of Economics and Political Science (LSE) is the first comprehensive study that focuses on the implications of CBAM on Africa. The report simulates aggregate effects and disaggregated effects of the CBAM on Africa. It raises concerns about the economic ramifications of the CBAM on Africa, as it is likely to hit the competitiveness of African exports, particularly industrial exports if product coverage expands over time. The CBAM process also introduces administrative hurdles to market access by African countries, which historically struggled to access the European market. Moreover, the CBAM departs from the principles of just transition and Common but Differentiated Responsibilities (CBDR) and Respective Capacities. The legal analysis of the report that complements the economic analysis assesses these issues, including compatibility with Word Trade Organization (WTO) rules.

Given the impact of the CBAM on Africa, African-led measures to tackle the negative impact on trade and industrialisation measures will increasingly become pressing, including export mechanisms and the implementation of the African Continental Free Trade Area (AfCFTA).

A major insight that could be drawn from the findings of this authoritative report is that deeper and more meaningful reflections on the wider implications of CBAM are necessary. The risk that CBAM could precipitate trade wars between the EU and its trading partners requires multilateral solutions to decarbonising trade. Furthermore, the overall implications of the CBAM for the CBDR require further reflection.

Considering the issues raised by the joint report, it is essential that key stakeholders engage in a constructive dialogue on the CBAM. The EU must acknowledge the concerns of its partners and work towards mitigating the negative impacts on African economies. At the same time, African countries should also take the lead in formulating measures to protect their interests and ensure their economic development is not hampered by the CBAM.

It is also important to note that the CBAM is just one of many measures needed to address the urgent threat of climate change. While it is commendable that the EU is taking steps to reduce greenhouse gas emissions, more needs to be done. Developed countries must step up their efforts to provide climate finance to developing nations and transfer technology to support their transition to low-carbon economies. The international legal framework for technology transfer is analysed in the report.

Another potential danger of CBAM for Africa is that it may perpetuate existing power imbalances in global trade. The implementation of CBAM could result in a situation where the EU has greater control over the global trading system, further disadvantaging developing economies in Africa. This could potentially lead to a situation where African countries are forced to accept unfavourable terms of trade to maintain access to European markets.

Furthermore, the implementation of CBAM could lead to unintended consequences such as the diversion of Africa's trade with Europe to other regions provided African countries negotiate adequate trade arrangements with other geographies such as China to promote their market access further.

Finally, the CBAM may also exacerbate existing inequalities within Africa. Countries that are more economically developed or have already made progress in transitioning to low-carbon economies may benefit more from the CBAM than less developed countries (LDCs). This could result in a situation where the most vulnerable African countries are left behind in the global effort to combat climate change. The EU initially considered special measures for LDCs but has apparently retreated from them.

Overall, while the CBAM has the potential to be an effective tool in decarbonising trade to reduce global greenhouse gas emissions, it is crucial that its implementation is carefully considered and takes into account the potential negative impacts on African economies and societies. A collaborative and multilateral approach is essential to ensure that the CBAM does not result in unintended consequences and reinforce existing power imbalances in the global trading system.

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EXECUTIVE SUMMARY

This report provides both an economic and legal assessment of the implications of the European Union's (EU) Carbon Border Adjustment Mechanism (CBAM) on African countries. The CBAM is scheduled to be phased in from 2026 to 2034 and initially cover imports of iron and steel, cement, aluminium, fertiliser, hydrogen and electricity.

ECONOMIC ANALYSIS OF THE EU'S CBAM ON AFRICAN COUNTRIES

Across two different modelling approaches, the CBAM is found to have just a moderate impact on the economies of African countries even when carbon is priced at €87/tonne. In one model, the CBAM is forecast to reduce the GDP of no single African country by more than 0.18%. In the other, the effect is larger, with the CBAM forecast to reduce the GDP of the continent by 0.91% (equivalent to a fall of $25 billion at 2021 levels of GDP).

The impact on African countries would be larger, as a share of their GDP, than on all other regions. This is because the EU is a particularly important export market for African countries, accounting for 26% of Africa's exports of fertiliser, 16% of iron and steel, 12% of aluminium and 12% of cement, and because Africa's exports of several important commodities to the EU are relatively more carbon intensive than Africa's competitors.

The CBAM could cause a fall in exports from Africa to the EU of aluminium by up to 13.9%, iron and steel by 8.2%, fertiliser by 3.9% and cement by 3.1%. A reasonable share of those commodity exports would however shift to other destination markets, and especially China and India. The CBAM could also result in an increase in Africa's agricultural exports to the EU as African countries adjust to changes in their relative comparative advantage.

Expansion of the CBAM

The European Commission has specified that 'in the future [...] further products in these sectors as well as other sectors at risk of carbon leakage could be covered by the [CBAM] measure', and that 'the ultimate objective of the CBAM is a broad product coverage'.[1] If the scope of the CBAM is expanded over time, the impact could be more substantial.

In a hypothetical model in which the CBAM is applied to all imports, we forecast it to reduce total exports to the EU from African countries by 5.72% and to reduce Africa's GDP by 1.12% (equivalent to £31 billion at 2021 levels of Africa's GDP).

In another scenario, in which other developed countries follow the EU and equivalent regimes to the CBAM are imposed in the US, Japan, Canada and UK, alongside the EU, the weight of these regimes would fall less proportionately on African countries than on other economies in the world, such as China and India. This is mainly due to the relatively smaller share of those countries in Africa's total exports. The EU market, and by implication the CBAM, is especially important to African countries.

The implications of the CBAM further depend on the determined carbon embedded in production in each country. The lack of carbon markets and established systems for monitoring and measuring carbon content in production on the continent (outside of South Africa) could see producers in many African countries assessed at higher default rates of emissions intensity and forced into paying higher CBAM tariffs. African countries could consider developing their carbon monitoring systems, and potentially regional carbon markets, to better prepare for the EU CBAM.

Implications for least developed countries

Africa is home to 33 of the world's 46 least developed countries (LDCs), identified as highly economically vulnerable and confronting severe structural impediments to sustainable development. When the CBAM was under consideration, an exemption for LDCs and vulnerable economies was considered, but ultimately decided against by the EU. Instead, the European Parliament, in May 2022, called for the EU to 'provide financial support, at least equivalent in financial value to the revenues generated by the sale of CBAM certificates, to support least developed countries' efforts towards the decarbonisation of the manufacturing industries'.[2] More recently, the EU statement to the 73rd UNCTAD Trade and Development Board, in February 2023, noted that the EU support 'could include technical and financial assistance to support climate mitigation and adaption in LDCs'.[3] Concrete commitments to LDCs affected by the CBAM are yet to be made. Indeed, the EU has committed CBAM revenues to its Innovation Fund, which seeks to 'support innovative techniques, processes and technologies, including the scaling up of such techniques, processes and technologies, with a view to their broad roll-out across the EU'.[4] This contradicts an earlier EU proposal to finance LDC efforts towards the decarbonisation of their manufacturing industries at the level of revenues generated by the sale of CBAM certificates.

In our modelling, a number of African LDCs would be among those most impacted by the application of the CBAM (notably the Gambia and Mozambique); however, the effect on no African LDC would be expected to exceed 0.17% of GDP. In a hypothetical scenario in which the CBAM was applied to all imported products, 11 African LDCs would be forecast to experience a moderate to large negative impact to their GDP by more than 1.5% and up to 8.4%.

1 European Commission. (2022). Draft regulation of the European Parliament and of the Council establishing a carbon border adjustment mechanism – General approach.

2 European Parliament. (2022, May 17). CBAM: MEPs push for higher ambition in new carbon leakage instrument [Press release]. Available at: https://www.europarl.europa.eu/news/en/press-room/20220516IPR29647/cbam-meps-push-for-higher-ambition-in-new-carbon-leakage-instrument.

3 EU Delegation to UNCTAD. (2023, February 13). UNCTAD Trade and Development Board, Seventy-third executive session, Agenda Item 3, EU statement. https://www.eeas.europa.eu/delegations/un-geneva/united-nations-conference-trade-and-development-trade-and-development-board_en?s=62

4 Council of the European Union. (2023, February 8). Available at: https://data.consilium.europa.eu/doc/document/ST-6210-2023-INIT/en/pdf, p.87.

LEGAL ANALYSIS OF THE EU'S CBAM ON AFRICAN COUNTRIES

This report sets out the implications of the CBAM for Africa regarding relevant obligations under international legal frameworks, viewed from three angles: (i) the legal implications of the CBAM under World Trade Organization (WTO) rules, and specifically, the General Agreement on Tariffs and Trade (GATT); (ii) the role of technology transfer provisions set out in the WTO's Trade Related Intellectual Property Rights (TRIPS) Agreement vis-à-vis supporting clean-energy technology transfer; and (iii) the enforceability of climate finance obligations under relevant international legal frameworks, with a focus on the WTO and the Paris Agreement. Main findings are summarised below.

Legal implications of the CBAM under the WTO

Under the GATT, there are four sets of relevant rules that could be invoked to challenge the CBAM. The applicability of these provisions for the CBAM would depend, in part, on whether the CBAM would be considered an internal tax or regulation, or rather a border measure.[5]

- If the CBAM were construed an internal tax or regulation, it would be subject to **national treatment provisions under GATT Articles III:2 and/or III:4**, which requires that WTO members do not discriminate between imported products and 'like' domestic products. In particular, three factors related to the design and implementation of the CBAM will play an important role in the national treatment discrimination analysis, including price of carbon, the determination of carbon content, and the phasing out of allowances under the EU Emissions Trading Scheme (ETS).
- If the CBAM were construed as a border measure, it would be subject to **tariff bindings under GATT Article II**. In this case, the CBAM could be considered as an 'other duty or charge' in violation of the GATT, as the EU's consolidated Schedule of Concessions does not contain any scheduled 'other duties or charges' for the products covered by the CBAM.
- If the CBAM were construed as a border measure that limits imports, it would be subject to **GATT Article XI, which sets out a prohibition on quantitative import restrictions**. Arguments that the CBAM constitutes a *de facto* violation of GATT Article XI could be made, if it can be established that the CBAM, by rendering import conditional upon CBAM certificates, creates a disincentive to import and has a limiting effect on the quantities imported.
- Irrespective of whether the CBAM is construed as an internal tax or regulation or a border measure, it will be subject to the **Most Favoured Nation (MFN) provision under GATT Article I,** prohibiting discrimination between 'like' products from different trading partners. Based on the existing jurisprudence, products with different carbon intensities will likely be considered 'like' products. The CBAM could be found inconsistent with the MFN principle, both *de jure* and *de facto*. By exempting European Free Trade Association (EFTA) countries that are already a part of the ETS or that have agreements to the same effect as the CBAM, the CBAM discriminates on the basis of origin. At the same time, a *de facto* violation my arise as it could distort competition between goods of different WTO members.

Even if the CBAM is found to violate one or more of these provisions, it can still be justified under the exceptions clause set out in GATT Article XX. While the CBAM will likely be considered either necessary to protect human, animal or plant life or health under Article XX(b), or related to the conservation of exhaustible natural resources under Article XX(g), it will be challenging for the EU to argue that the CBAM complies with the chapeau of Article XX, which requires that a measure does not arbitrarily or unjustifiably discriminate between countries where the same conditions prevail, or function as a disguised restriction on trade.

5 Other GATT provisions that could have implications for the CBAM are the GATT Articles VIII on 'Fees and Formalities connected with Importation and Exportation' and X on 'Publication and Administration of Trade Regulations'. Due to space constraints, however, these provisions are not analysed further in this paper.

Strategic considerations

Should African countries want to ensure that the CBAM is designed and implemented in a way that is neither more trade restrictive than necessary nor discriminatory, African Member States could bring a case challenging the EU CBAM using the WTO dispute settlement system. This could be done with the support of the Advisory Centre on WTO Law. Alternatively, African countries could consider signing up as third parties to a WTO dispute against the CBAM initiated by another WTO member. The latter option would enable participation in legal challenges brought against the CBAM, while not shouldering the burden of the significant resources that are typically required to bring a dispute at the WTO. In considering engaging with the WTO dispute settlement system, it would be important to keep in mind that the WTO's appeal mechanism is not currently functioning, which risks that panel reports are appealed 'into the void', and thus that a dispute remains unresolved.

Leveraging the TRIPS Agreement to facilitate access of African countries to ESTs

Accessing environmentally sound technologies (EST) would minimise the potential negative effects of the CBAM on African exports to the EU, as it would enable a transition to production processes with a lower carbon usage. Such benefits will be particularly pronounced if African countries are able to access technologies relevant to producing products covered under the CBAM – both currently and potentially – with an eye towards an expanded scope.

Both the Trade-Related Aspects of Intellectual Property Rights (TRIPS) provisions on compulsory licensing and technology transfer could enable African countries to access EST. However, it would be imperative for African countries to build a coalition with developing countries and LDCs to seek clarifications on the applicability of compulsory licensing to EST, and/or a review of the appropriateness of existing restrictions in compulsory licensing provisions as applied to EST. With regards to technology transfer of EST, African LDCs must adopt a proactive stance and identify the types of technologies that would be critical to enable a green transition, with a focus on technologies relevant to greening products covered by the CBAM. Focus on strengthening monitoring commitments would be another way to enhance implementation of TRIPS flexibilities.

Enforceability of climate finance obligations under the Paris Agreement and the WTO

There is a lack of clarity in the provisions that could be invoked to ensure compliance with climate financing commitments under the Paris Agreement. That said, using CBAM revenues to contribute to climate funds for developing countries would strengthen, not weaken, arguments the EU could make under GATT Article XX to justify the CBAM. While the WTO's existing jurisprudence does not place much emphasis on obligations countries have undertaken as part of their multilateral environment agreements (MEAs), momentum is building in EU Regional Trade Agreements (RTAs) to increase the consequences of a breach of the Paris Agreement by elevating it to an essential element clause.

It is expected that discussions and developments at the intersection between climate change finance obligations and trade law will become more frequent in the years to come. African countries should closely follow developments in all relevant fora to ensure they influence these discussions and that their interests are taken into account.

INTRODUCTION

This report provides an economic and legal assessment of the Carbon Border Adjustment Mechanism (CBAM) proposed by the European Union (EU). It first identifies what the impact of the EU's CBAM might be on African countries and then how African countries might approach the issues that arise under international legal frameworks.

Before evaluating the CBAM from these two perspectives, an overview is provided of the rationale and functioning of the CBAM; the determination of carbon content; the product scope; the geographic scope; the use of revenues; export rebates; and the phasing out of free allowances under the EU's Emissions Trading Scheme (ETS). These elements guide the analytical choices made in the economic and legal assessments which constitute the remainder of the report. They also help to set out what the CBAM looks like and how it may evolve over time.

The economic analysis is divided into two sections. Two different modelling approaches are used to understand a variety of scenarios that cover the scope of the CBAM and variables that may change over time, such as the implied carbon price and product coverage of the reform, and whether other similar-minded countries follow the EU in adopting equivalent regimes. The legal analysis comprises three sections: the legal implications of the CBAM under the World Trade Organization (WTO), options for using the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) to improve Africa's access to environmental technologies, and the enforceability of climate finance obligations under the Paris Agreement and the WTO.

ELEMENTS OF THE EU CBAM

The design of the CBAM has gradually evolved over time to reflect reprioritisations, changes in product coverage and the clarification of timelines. The core milestones in the development of the CBAM followed by this report at the time of publication are outlined in Box 1.

Box 1. Evolution of the CBAM

The process of developing EU legislation involves interinstitutional negotiations between the EU Parliament, the EU Council and the EU Commission. These negotiations generally take the form of tripartite meetings ('trilogues'). Once a provisional agreement is reached in trilogues, it is subject to a formal approval procedure culminating in a vote in the EU Parliament. This means that as the EU proposal has developed, different information about its content has evolved. The following are the key sources considered in this report:

- 14 July 2021 – European Commission Proposal for a 'Regulation of the European Parliament and of the Council establishing a carbon border adjustment mechanism'. The proposed scope is cement, electricity, fertilisers, iron and steel, and aluminium.
- 14 June 2022 – EU Committee on Environment, Public Health and Food Safety report on the regulation establishing a CBAM. Report argues for the CBAM to additionally include hydrogen, refineries and organic basic chemics, and to include indirect emissions, 'ie. emissions deriving from the electricity used by manufacturers'.[6]
- 13 December 2022 – European Parliament reaches provisional agreement with the Council on an EU CBAM. The scope is agreed to cover iron and steel, cement, aluminium, fertiliser, hydrogen and electricity.
- 18 December 2022 – European Parliament and the Council reach agreement on EU ETS reform for the phasing out of free allowances, from 2026 to 2034, and the expansion of the scope of the ETS to include maritime transport and municipal waste incineration. A parallel carbon market (EU ETS II) was agreed to cover buildings and road transport by 2027.

Source: EU Parliament. n.d. Interinstitutional negotiations. Available at: https://www.europarl.europa.eu/olp/en/interinstitutional-negotiations.

6 European Parliament. (2022, May 17). CBAM: MEPs push for higher ambition in new carbon leakage instrument [Press release]. Available at: https://www.europarl.europa.eu/news/en/press-room/20220516IPR29647/cbam-meps-push-for-higher-ambition-in-new-carbon-leakage-instrument.

RATIONALE

The CBAM is part of the EU's 'fit for 55 in 2030' package, aiming to reduce net GHG emissions by 55% by 2030, from 1990 levels.[7] On 13 December 2022, the Council of the EU (the Council) and the European Parliament reached a provisional agreement on the final text of the CBAM. A provisional agreement on a set of complementary reforms to the ETS was also reached, on 18 December 2022. While at the time of writing the texts of these final proposals have not been publicly released, this factual overview of the CBAM builds on the press releases put out by the institutions that outline the agreement reached.[8]

The provisional agreement builds on the European Commission's CBAM proposal,[9] which aims to control the risk of 'carbon leakage'. Many goods produced within the EU are subject to the ETS – a cap-and-trade system – that caps the total amount of overall emissions, lowers that cap over time, and sells the right to emit carbon.[10] Because the cap on total emissions lowers over time, the price of each right (or permit) to emit carbon is expected to increase over time. The ETS is not applied to imported goods. As a result, imported products enjoy a price advantage at the expense of the environment. This risks 'carbon leakage', wherein due to international differences in climate policies, companies relocate emissions-intensive operations to jurisdictions with weaker emission regulations. This can furthermore undermine the effectiveness of mitigation policies as well as the legitimacy of claimed national emissions reductions.[11] The aim of the CBAM is to ensure that the carbon price of imports is equivalent to the carbon price of domestic production within the EU. At the same time, the CBAM seeks to 'motivate foreign producers and EU importers to reduce their carbon emissions', by raising the price on carbon imported into the EU[12] (see Box 2).

Box 2. Aligning internal and external requirements of the EU carbon market

The design of the CBAM is strongly connected to the EU's ETS, which covers around 40% of the carbon emissions of firms located in the EU. The ETS is a cap-and-trade market. The level of GHG is limited by an industry-specific 'cap' on the number of emission allowances, which decrease over time to reach the EU target. The objective is to reduce the level of emissions to 60% by 2030 from a 2005 baseline. Within the cap, emission allowances are traded on the ETS market, which determines the price of carbon. To guard against carbon leakage, 40% of the emission allowances are freely distributed to firms (the remaining is acquired through auctioning). A major objective of the EU proposal is to progressively replace the free allowance of quotas (which has the drawback of reducing the incentives to combat emissions) by the CBAM and align the internal features of the EU's carbon market with its requirements from external partners.

7 European Council. (2022, October 31). Fit for 55. Available at: https://www.consilium.europa.eu/en/policies/green-deal/fit-for-55-the-eu-plan-for-a-green-transition/.

8 European Parliament. (2022, December 18). Climate change: Deal on a more ambitious Emissions Trade System (ETS) [Press release]. Available at: https://www.europarl.europa.eu/news/en/press-room/20221212IPR64527/climate-change-deal-on-a-more-ambitious-emissions-trading-system-ets; European Parliament. (2022, December 13). Deal reached on new carbon leakage instrument to raise global climate ambition [Press release]. Available at: https://www.europarl.europa.eu/news/en/press-room/20221212IPR64509/deal-reached-on-new-carbon-leakage-instrument-to-raise-global-climate-ambition. See also, Council of the European Union, 'Fit for 55': Council and Parliament reach provisional deal on EU emissions trading system and the Social Climate Fund, 18 December 2022; and, EU climate action: Provisional agreement reached on Carbon Border Adjustment Mechanism (CBAM), 13 December 2022.

9 European Commission, *Proposal for a Regulation of the European Parliament and of the Council establishing a carbon border adjustment mechanism*, 14 July 2021, COM(2021)564 final. Available at: https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX:52021PC0564. Hereinafter referred to as 'the Proposal'.

10 EU Emissions Trading System (EU ETS). Available at: https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets_en#a-cap-and-trade-system.

11 Infographic – Fit for 55: How does the EU intend to address the emissions outside of the EU? Available at: https://www.consilium.europa.eu/en/infographics/fit-for-55-cbam-carbon-border-adjustment-mechanism/#:~:text=On%2013%20December%202022%2C%20the,the%20Council%20and%20the%20Parliament.

12 State of the Union Address by President von der Leyen at the European Parliament Plenary on 16 September 2020, as quoted in the Proposal. Available at: https://ec.europa.eu/commission/presscorner/detail/en/SPEECH_20_1655.

THE DETERMINATION OF CARBON CONTENT

The CBAM aims to mirror and complement the ETS by creating what is intended to be a 'level playing field' between EU producers and exporters from third countries. In particular, the CBAM would require EU importers to buy CBAM certificates to cover the price difference between the carbon price that is paid in the country of production (if one is indeed paid) and the price of carbon allowances in the EU ETS. The carbon price of imports will be based on the weekly average auction price of EU ETS allowances and applied to actual emissions as declared by importers where feasible. However, when actual emissions cannot be adequately determined by the authorised declarant, default (or fallback) values are to be used. These are to be based on average emission intensity of *exporting countries* for particular goods. In the absence of information on the carbon intensity of exports of particular goods from certain countries, a default value will instead be based on the average emission intensity of the *10% worst-performing installations in each exporting country* for that type of goods. When reliable data for that country cannot be applied more generally, the default would be set at the average emissions intensity of the 5% worst-performing EU installations.

OFFSETS

The declarant can also claim a reduction in the number of certificates to be surrendered, to offset any carbon price that may have been already paid in the country of origin (which also includes any carbon price that may have been made without rebates in third countries).

PRODUCT SCOPE[13]

The measure will initially apply to a select number of goods deemed to be at high risk of carbon leakage. In the provisional deal reached between the EU Parliament and Council, the product scope was determined to cover: iron and steel, cement, aluminium, fertiliser, hydrogen and electricity.[14] Under certain conditions, the CBAM will also include indirect emissions, certain precursors and some downstream products such as screws and bolts and similar articles of iron and steel.[15] A review is envisioned before the end of a transition period to assess whether to extend the product scope, such as to additionally include organic chemicals and polymers and possibly other products, and to include further downstream products.

GEOGRAPHIC SCOPE

The CBAM is to be applied on imports from all countries to the EU, except for those countries that are already applying the EU ETS, or that have in place a carbon pricing system that is fully linked to the EU ETS. Specifically, it lists the European Free Trade Association (EFTA) countries as exempt from the CBAM, as well as products originating in a list of small territories.

13 European Parliament. (2022, December 13). Deal reached on new carbon leakage instrument to raise global climate ambition [Press release]. Available at: https://www.europarl.europa.eu/news/en/press-room/20221212IPR64509/deal-reached-on-new-carbon-leakage-instrument-to-raise-global-climate-ambition.

14 Ibid.

15 Ibid.

Earlier in the process of designing the CBAM, an exemption for least developed countries (LDCs) and vulnerable economies was considered by the EU.[16] This was emphasised as crucial by analysts and stakeholders for protecting LDCs (and small island developing states, or SIDS), which were argued to pose little comparative risk of carbon leakage and so have little impact on the environmental benefits of the CBAM.[17] That could have reduced the impact of the measure on the 33 African countries that are LDCs. However, by May 2022 the LDC exclusion had been dropped from the report of the EU Committee on Environment, Public Health and Food Safety on the regulation establishing the CBAM. Instead, the European Parliament called for the EU to 'provide financial support, at least equivalent in financial value to the revenues generated by the sale of CBAM certificates, to support least developed countries' efforts towards the decarbonisation of the manufacturing industries'.[18] More recently, the EU statement to the 73rd UNCTAD Trade and Development Board, in February 2023, noted that the EU support 'could include technical and financial assistance to support climate mitigation and adaption in LDCs'.[19] Concrete commitments to LDCs affected by the CBAM are yet to be made.

PHASING OUT FREE ALLOWANCES UNDER THE ETS IN SECTORS COVERED BY THE CBAM

The CBAM is expected to be introduced on 1 October 2023, with a three-year transition period during which only emissions reporting obligations will apply, without any financial payments or adjustments. After the transition period, the CBAM will be gradually phased in from 2026 to 2034. During the transition period, free allowances under the ETS for sectors covered by the CBAM will be gradually phased out. The CBAM will be phased in at the same speed that free allowances under the ETS are phased out.

USE OF REVENUES

The Parliament's CBAM proposal of June 2022 includes a commitment by the EU to finance LDC efforts towards the decarbonisation of their manufacturing industries, which at the minimum would annually be at the level of revenues generated by the sale of CBAM certificates. The Commission proposal also committed to report annually on the contribution of the CBAM revenues to the decarbonisation of the manufacturing industry in the LDCs.[20] A press release in May 2022 suggests that the EU will fulfil its commitments under the Paris Agreement by providing such financial support to LDCs, presumably under Article 9, which provides that developed country parties to the Paris Agreement shall provide financial resources to less developed countries, in continuation of their obligations under the United Nations Framework Convention on Climate Change (UNFCCC).[21] However, the extent to which the EU will in fact use CBAM revenues to fund LDCs' green transition remains to be seen and no such abovementioned commitment was included in the final agreement between the EU Parliament and Council on the CBAM (announced in December 2022).[22] Indeed, the EU has also committed CBAM revenues to the Innovation Fund, which seeks to 'support innovative techniques, processes and technologies, including the scaling up of such techniques, processes and technologies, with a view to their broad roll-out across the EU'.[23] This contradicts the earlier assurances on the use of CBAM revenues.

16 United Nations. (2021, May 4). Smooth transition for graduating LDCs under the EU Carbon Border Adjustment Mechanism, LDC Portal – International support Measures for Least Developed Countries, https://www.un.org/ldcportal/news/smooth-transition-graduating-ldcs-under-eu-carbon-border-adjustment-mechanism

17 Marcu, A., Mehling, M.A., & Cosbey, A. (2020). Border carbon adjustments in the EU: Issues and options. European Roundtable on Climate Change and Sustainable Transition, Brussels. Available at: https://ercst.org/border-carbon-adjustments-in-the-eu-issues-andoptions.

18 European Parliament. (2022, May 17). CBAM: MEPs push for higher ambition in new carbon leakage instrument [Press release]. Available at: https://www.europarl.europa.eu/news/en/press-room/20220516IPR29647/cbam-meps-push-for-higher-ambition-in-new-carbon-leakage-instrument.

19 EU Delegation to UNCTAD. (2023, February 13). UNCTAD Trade and Development Board, Seventy-third executive session, Agenda Item 3, EU statement. https://www.eeas.europa.eu/delegations/un-geneva/united-nations-conference-trade-and-development-trade-and-development-board_en?s=62

20 Ibid.

21 For a commentary on Article 9 of the Paris Agreement, see Mehling, M. (2021). Article 9: Finance. In *The Paris Agreement on climate change*. Edward Elgar Publishing. Retrieved Nov 4, 2022, https://www.elgaronline.com/view/book/9781788979191/book-part-9781788979191-18.xml.

22 European Parliament. (2022, December 13). Deal reached on new carbon leakage instrument to raise global climate ambition [Press release]. Available at: https://www.europarl.europa.eu/news/en/press-room/20221212IPR64509/deal-reached-on-new-carbon-leakage-instrument-to-raise-global-climate-ambition.

23 Council of the European Union. (2023, February 8). Available at: https://data.consilium.europa.eu/doc/document/ST-6210-2023-INIT/en/pdf.

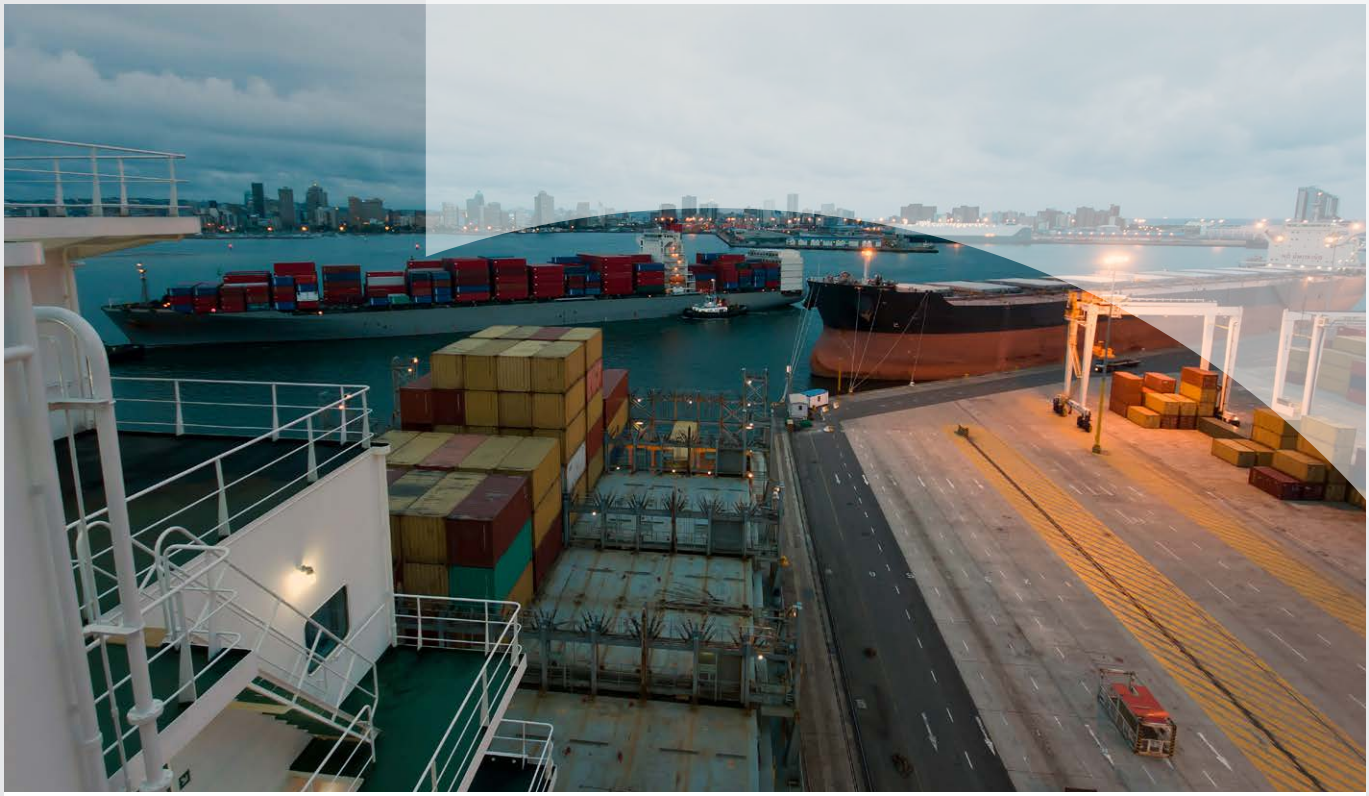
EXPORT REBATES

The CBAM may eventually be accompanied with a rebate of the carbon costs borne by EU producers for their exports.[24] Such rebates would seek to address a problem of the CBAM whereby EU exports of products that rely on imported intermediaries on which CBAM taxes have been levied would be less competitive in international markets. However, export rebates pose several problems (additional administrative tasks, incompatibility with WTO rules) and their application is unlikely for now.[25] However, such rebates might still be added in the future, as the Council's press release on the adoption of the provisional CBAM notes that 'further work is also required on measures to prevent carbon leakage on exports', and highlights that the Commission will assess the risk of carbon leakage for goods produced in the EU intended for export to non-EU countries and, if needed, present a proposal to address the risk of 'export-related carbon leakage'.[26]

24 Korpar, N., Larch, M., & Stolling, R. (2022). Comparing scenarios for a European carbon border adjustment mechanism: Trade, fdi and welfare effects with a focus on the Austrian economy. The Vienna Institute for International Economic Studies. Research Report 460.

25 For instance, Art. 29 of 2020/2043(INI) presents many conditions to introduce this trade policy. In particular, proposals supporting export rebates have to 'fully demonstrate their positive impact on climate and their compatibility with WTO rules' and 'any form of potential export support should be transparent, proportionate and not lead to any kind of competitive advantages for EU exporting industries in third countries'.

26 Mizulin, N., Baines, T., Scheuren, P., & Geraets, D. (2022). EU agrees on CBAM and EU ETS reform. (Mayer Brown Perspectives and Events). Available at: https://www.mayerbrown.com/en/perspectives-events/publications/2022/12/eu-agrees-on-cbam-and-eu-ets-reform.



PART I

ECONOMIC ASSESSMENT OF THE IMPACT OF THE CBAM ON AFRICAN COUNTRIES

It takes a pair of eyes to see depth; following that adage, this section assesses the CBAM from two different angles. The first uses a Computable General Equilibrium (CGE) model – more specifically, the PEP-w-1 model developed by Lemelin and colleagues.[27] This is used to analyse questions around the sectoral impact of the CBAM, the consequences for average tariffs, EU CBAM revenues, CO_2 emissions, and the GDP of Africa and other major economies. It also allows the configuration of several scenarios related to the product coverage of the CBAM, the price of carbon established by the CBAM, and whether other partner countries join in implementing similar carbon border taxes alongside the EU. The CGE model can assess the economy-wide effects of the CBAM. However, a major limitation of this static model – to be noted upfront – is its inability to assess the impacts of the CBAM over a long-term period. For instance, the recycling of the expected CBAM revenue (in terms of use to support mitigation efforts in the EU or LDCs that will be adversely affected by the CBAM) is not captured in the model. The baseline scenario in the model also assumes that other countries do not take policy action (yet) in response to the CBAM.

The second angle of assessment relies on the New Trade Quantitative Model (NTQM) as developed by Caliendo and Parro.[28] This model is better able to assess disaggregated individual African countries to identify those that may have vulnerabilities and sensitivities to the EU CBAM. This overcomes some of the weaknesses of the CGE model, including its challenges in terms of data availability and calibration at the country level. The advantages of the NTQM model lie in its parsimony, requiring relatively few data and estimates, and enabling more detailed

27 Lemelin, A., Robichaud, V., Decaluwe, B., & Maisonnave, H. (2013). PWP-w-1: The PEP Standard multi-region, single period world CGE model. Partnership for Economic Policy, Nairobi, Kenya.

28 Caliendo, L. & Parro, F. (2014). Estimates of the trade and welfare effects of NAFTA. *The Review of Economic Studies* 82(1), 1–44.

analysis of the CBAM with better disaggregation of results at the country level, which is helpful for our study. However, those advantages come at the cost of dynamic effects, such as changes to long-run aggregate factor productivities, and analysis on the impact of other environmental elements of interest, such as CO_2 emissions (which are covered by the CGE model). Compared to the CGE model, the NTQM approach trades off accuracy at a general level for precision at a finer, more detailed level.

This 'economic assessment' section of the report belongs to a growing literature that has analysed the effect of the CBAM. Bellora and Fontagné analyse the effect of CBAM on carbon leakages, on the price of carbon quotas in the EU ETS market, and on competitiveness in the EU.[29] The possible implications of the CBAM outside the EU have been analysed by Korpar, Larch and Stolling for Austria, and by Chepeliev for Ukraine (before the war with Russia).[30] These articles find a small effect on GDP per capita (at worst –0.4%) and a significant impact on exports (–4%). While these studies also analyse the consequences of the CBAM on the trading partners of the EU, the focus on African countries has received less attention.

A few studies do, however, include at least some African countries in their analysis. The United Nations Conference on Trade and Development (UNCTAD) uses a CGE model to find a divergent effect between developed and developing partners in general, with income gains in developed countries and losses in developing ones, and identifies India, Brazil and South Africa as most exposed to the CBAM.[31] Baker and colleagues assess the impact of the CBAM on African countries, using a partial equilibrium model (appropriate for detailed but very short-term assessments).[32] They find that South Africa, followed by Egypt and Morocco, would be the most adversely affected countries on the continent, with the iron and steel, followed by aluminium and fertiliser sectors most affected. Zimmer and Holzhausen found that the most affected economies from the EU CBAM would be African fuel-exporting countries such as Cameroon, Egypt and Nigeria.[33] An older literature has also analysed the effect of different carbon tax adjustments on CO_2 emissions and carbon leakages.[34] Bohringer, Carbone and Rutherford analysed the effect of carbon tax adjustment in Organisation for Economic Co-operation and Development (OECD) countries. They emphasised the risk of this policy for developing countries but no results were provided.[35]

This remainder of this section first outlines modelling decisions taken on the price and coverage of the CBAM and gives a brief overview of Africa's exports to the EU, which helps to explain the results. It then assesses the economic impacts of the CBAM using a CGE approach, followed by an examination of the disaggregated country-level implications, using the NTQM modelling approach.

APPROACH TO CARBON PRICING

The first sub-step in calculating the impact of the CBAM is determining the rate at which each tonne of carbon will be taxed. The design of the CBAM is strongly conceptually connected to the EU's ETS. The CBAM is set to be defined on the basis of the carbon price established by firms in the ETS. Products imported by the EU that are within the scope of the CBAM will have to pay for their CO_2 emissions at a rate equivalent to that implied by the ETS. More specifically, the price of the CBAM certificates will be calculated depending on the weekly average auction price of EU ETS allowances expressed in €/tonne of CO_2 emitted.

29 Bellora, C. & Fontagné, L. (2022). EU in search of a WTO-compatible carbon border adjustment mechanism. Available at: SSRN 4168049.

30 Korpar, N., Larch, M., & Stolling, R. (2022). Comparing scenarios for a European carbon border adjustment mechanism: Trade, fdi and welfare effects with a focus on the Austrian economy. The Vienna Institute for International Economic Studies. Research Report 460; Chepeliev, M. (2021). Possible implications of the European Carbon Border Adjustment Mechanism for Ukraine and other EU trading partners. *Energy Research Letters* 2(1).

31 UNCTAD (2021). A European Union Carbon Border Adjustment Mechanism: Implications for developing countries, https://unctad.org/system/files/official-document/osginf2021d2_en.pdf

32 Baker et al. (2022). Designing an African response to Carbon Border Adjustment Mechanisms, https://aec.afdb.org/en/papers/climate-change-poses-significant-risk-african-continent-its-vulnerabilities-are-further-compounded-risks-arise-climate-mitigation-policies-adopted-other-countries-while-many-developed--countries-are-starting-push-m-656

33 Zimmer, M. & Holzhausen, A. (2020). EU carbon border adjustments and developing country exports: Saving the worst for the last. Allianz.

34 Antimiani, A., Costantini, V., Martini, C., Salvatici, L., & Tommasino, M.C. (2013). Assessing alternative solutions to carbon leakage. *Energy Economics* 36, 299–311; Fouré, J., Guimbard, H., & Monjon, S. (2016). Border carbon adjustment and trade retaliation: What would be the cost for the European Union? *Energy Economics* 54, 349–362; Kuik, O. & Hofkes, M. (2010). Border adjustment for European emissions trading: Competitiveness and carbon leakage. *Energy Policy* 38(4), 1741–1748; Weitzel, M., Hübler, M., & Peterson, S. (2012). Fair, optimal or detrimental? Environmental vs. strategic use of border carbon adjustment. *Energy Economics* 34, S198–S207.

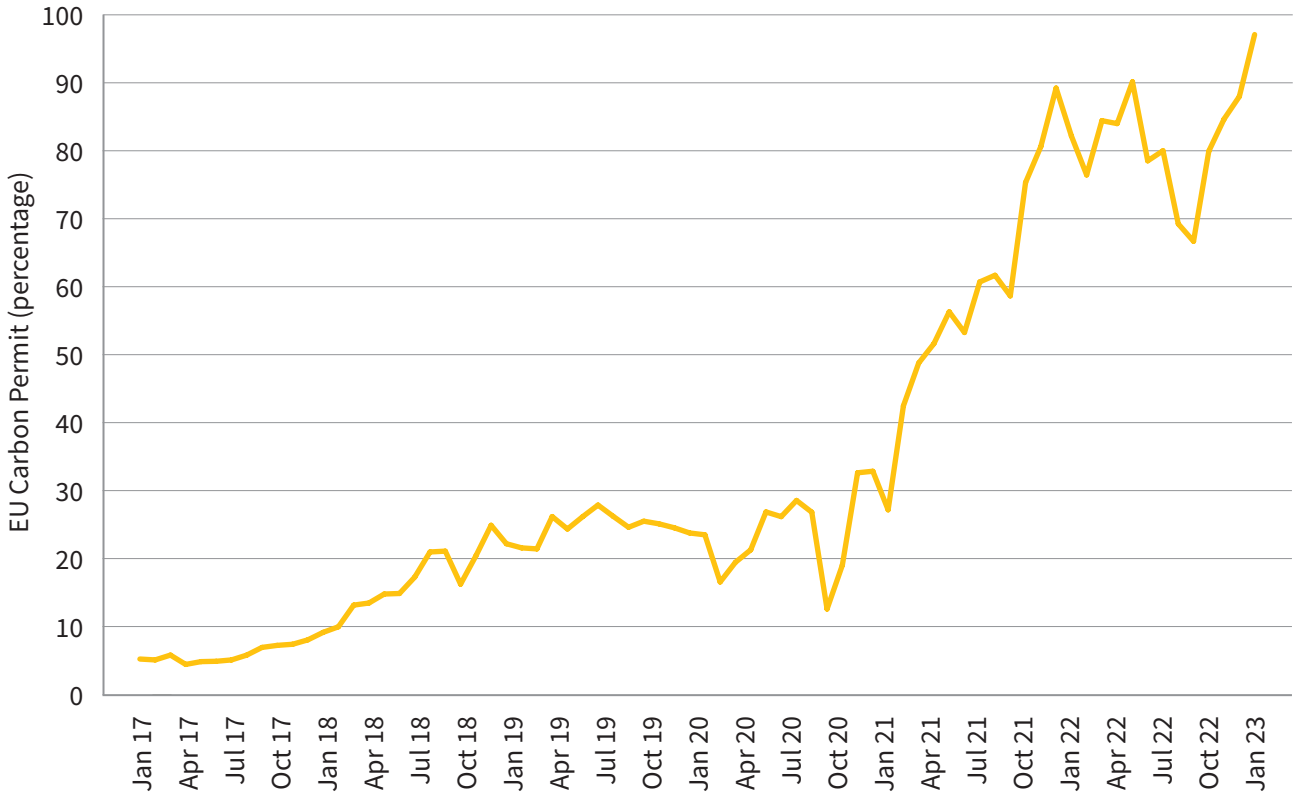
35 Bohringer, C., Carbone, J.C., & Rutherford, T.F. (2017). Embodied carbon tariffs. *The Scandinavian Journal of Economics* 120(1), 183–210.

In practice, this makes it very difficult to forecast the rate at which the CBAM will be applied per tonne of carbon in economic modelling. Emissions trading schemes do not inherently establish a tax per tonne of carbon, but instead create a market within which a price for carbon is indirectly established. This means that the effective price of carbon is unstable, varying over time in response to the market.

We assess the CBAM using two different values: €40/tonne and €87/tonne. Historically, the carbon credit price has been very low (below €10/tonne between 2012 and 2018), but successive phases of reform, and in particular the action of the EU's Market Stability Reserve,[36] led to a significant increase of this price to the value of €40/tonne in February–March 2021 (Figure 1). Since then, the price has increased and averaged €87/tonne in the year preceding this study (2022). We therefore use €40/tonne to represent a lower limit and for comparison with studies such as UNCTAD,[37] alongside a more realistic €87/tonne level. The tariff imposed by the CBAM could be still higher.

How realistic are these price estimates? At the time of writing, in February 2023, EU Carbon Permits were expected to trade at €110.95 in 12 months' time, according to the forecaster Trading Economics global macro models and analysts' expectations. That would of course exceed the price estimates used in this analysis. On the other hand, the International Monetary Fund (IMF) proposal has been for an international carbon price floor of $25/tonne for low-income countries, $50/tonne for middle-income countries and $75/tonne for high-income countries.[38] By providing results for €40/tonne and €87/tonne, this paper covers a reasonable range of carbon prices and shows the sensitivity of the results to price outcomes.

Figure 1: EU Carbon Permit price (Euro), January 2017 to January 2023



Source: Trading Economics, EU Carbon Permits, as sourced from the EU ETS

36 The Market Stability Reserve absorbs surplus allowances to address market imbalances in the ETS. It began operating in January 2019. See https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets/market-stability-reserve_en.

37 UNCTAD (2021). A European Union Carbon Border Adjustment Mechanism: Implications for developing countries, https://unctad.org/system/files/official-document/osginf2021d2_en.pdf

38 Parry, I., Black, S., & Roaf, J. (2021). Proposal for an international carbon price floor among large emitters. IMF Staff Climate Notes 2021/001.

In practice, the tariff rate implied by the CBAM will also depend on the determination of exactly how much carbon is embodied in exports (see above section on determination of carbon content). As noted, where actual emissions cannot be determined, more onerous default values are to be used, such as applying the default emissions intensity at equivalent to the 5% worst-performing EU installations. That may be more likely to apply to exporters from African countries, which do not yet have carbon markets and so are unlikely to have well-established systems in place for monitoring and measuring carbon content in production. The exception is South Africa, which has had a carbon market since 2005, although proposals have already been made to extend that market to the other 15 Southern African Development Community (SADC) countries.[39]

For the modelling work of this section, the determination of carbon content was based on two sources. The CGE model relies on the Global Trade Analysis Project (GTAP) database of CO_2 emission data as reported by the International Energy Agency (see Annex A for more details). The NTQM model uses the Eora 26 environmental extension (satellite account) matrix database PRIMAP-hist, which provides national historical data on emission time series until 2019 (see Annex B for more details).

APPROACH TO PRODUCT COVERAGE

The European Commission has defined a shortlist of initial products to be covered by the CBAM, presented in Table 1. The European Commission also specifies that 'in the future [...] further products in these sectors as well as other sectors at risk of carbon leakage could be covered by the measure' and that 'the ultimate objective of the CBAM is a broad product coverage'.[40]

From the EU's perspective, one of the drawbacks of the CBAM when limited to the shortlist of products in Table 1 is that it has the unintended consequence of diverting carbon leakage to downstream sectors. European producers of final goods would incur a loss of competitiveness because, by importing intermediate inputs covered by the CBAM, their inputs would be more expensive. In comparison, competitor producers operating outside of the EU would be able to produce final goods based on cheaper intermediates, and so be more competitive. European policy makers are likely to eventually respond to this problem by expanding the CBAM list to include downstream goods.

It is therefore very likely that the product coverage of the CBAM will be expanded over time. For instance, the ETS, to which the CBAM is closely related, had its sectoral coverage expanded to include maritime transport in February 2023.[41] The stated objective for the CBAM is for it to eventually have 'broad product coverage'.[42]

We assess the economic implications of the CBAM as applied to two baskets of products. Firstly, we assess a 'targeted' or 'limited' application of the CBAM on the basis of the initial products to be covered in Table 1. We then assess a 'full coverage' model of the CBAM applied to all imports. By modelling the application of the CBAM against a range of products we can better demonstrate the sensitivity of African countries to the product coverage of the CBAM.

39 Elston, L. (2021). Why South Africa's carbon offset market is looking to expand. Energy Monitor.

40 European Commission. (2022). Draft regulation of the European Parliament and of the Council establishing a carbon border adjustment mechanism – General approach.

41 Council of the European Union. (2023). Interinstitutional file 6210/23, 8 February 2023, Brussels.

42 European Commission, *Proposal for a Regulation of the European Parliament and of the Council establishing a Carbon Border Adjustment Mechanism*, COM (2021) 564 final, 14.7.2021 (Proposed Regulation). Available at: https://ec.europa.eu/info/sites/default/files/carbon_border_adjustment_mechanism_0.pdf.

Table 1: Shortlist of product scope for initial phase of CBAM

Sector	Materials or material products
Cement	Clinker
	Portland cement
Iron and steel	Iron and steel primary forms
	Hot rolled and further steps
	Coated hot rolled and further steps
	Forged, extruded and wire
Aluminium	Aluminium unwrought alloyed
	Aluminium products
	Alloyed aluminium products
Fertilisers	Ammonia
	Urea
	Nitric acid
	Ammonium Nitrate
Electricity generation	Electricity

Note: Hydrogen, which tends to be produced with coal outside of the EU, was subsequently announced to be included in the initial product scope in the December 2022 provisional agreement on the CBAM between the EU Parliament and Council. However, modelling work in this report had already concluded by that point and so this product is unfortunately not included in the results.

OVERVIEW OF AFRICA'S EXPORTS TO THE EU

The EU and Africa have a strong trade partnership. According to the European Commission,[43] trade between the two sides amounted to €280 billion in 2019. The EU is also Africa's largest foreign direct investor (FDI), with FDI worth over €212 billion in 2018. Overall, Africa is the fourth largest trading partner of the EU, after the US, China and the United Kingdom. The EU is also the largest export destination of Africa's commodities. In 2019, the EU absorbed about 28% of Africa's total exports.

Africa–EU trade is also increasingly diversified. Africa's exports to the EU historically comprised mostly primary products and raw materials like crude oil and gas, agricultural commodities, and metal and minerals. Africa's exports to the EU now include manufactured products like textiles, processed agriculture and food products and complex products like equipment and machinery. For instance, cars comprise 31% of total South African exports to the EU. Similarly, clothing and textiles account for over 30% of Madagascar's total exports to the EU.

The strong trade relationship between the EU and Africa means that policy changes in the EU, like the CBAM, may have disproportionately significant effects on Africa's economy, as compared to policy changes in other destination markets. Based on GTAP 10.a data, which is used for the CGE model presented in the subsequent section, the destination of Africa's exports is presented in Table 2. The EU accounts for 27.5% of Africa's agriculture exports, 25.6% of fertiliser exports, 15.7% of iron and steel exports, 35.7% of energy exports, 33.1% of manufacturing exports and 30.7% of transport exports. The EU market is relatively less important for electricity and cement exports (most of which are towards intra-Africa destinations). The EU is moderately important as a destination for Africa's aluminium exports, but less so than China and the rest of the world (RoW).

43 European Commission. (2022). The European Union and Africa: Partners in trade. Available at: https://trade.ec.europa.eu/doclib/docs/2022/february/tradoc_160053.pdf.

Table 2: Destination of Africa's exports, by commodity classification (%)

	Intra-Africa	EU	UK	China	India	USA	RoW
Agriculture	13	28	5	10	6	5	34
Fertiliser	32	26	1	2	6	7	26
Electricity	74	7	1	1	1	3	14
Iron and steel	33	16	1	11	5	9	25
Aluminium	5	12	6	12	6	4	54
Cement	60	12	2	2	1	3	20
Energy	7	36	2	15	11	6	22
Manufacturing	25	33	3	12	3	6	18
Transport	2	31	6	8	1	16	36
Other services	3	33	6	10	1	11	36
Public administration	4	23	6	7	1	27	32

Source: Computed from GTAP 10.a database

ECONOMIC IMPACTS

As the above sections have outlined, the EU CBAM is a reform with moving parts and changing dimensions, varying in accordance with policy decisions, like product coverage, and other market aspects, such as the price of carbon determined by the ETS. Accordingly, this section uses an array of scenarios that gradually scale up to provide a fuller impression of the impact of the CBAM. This decomposed approach allows us to understand what is driving the consequences of the CBAM, for instance, whether it is product coverage or price of carbon, and how adjacent policies like the removal of EU ETS allowances or similar CBAMs imposed by other countries may influence the continent.

Scenario 1 models the CBAM with limited product coverage using a €40 per tonne of carbon price, Scenario 2 increases the carbon price to €87 per tonne, while Scenario 3 expands the product coverage to all goods at a €40 per tonne of carbon price. These first three scenarios importantly do not model the phasing out of free allowances under the ETS.

Scenario 4 additionally models the elimination of the EU's ETS free allowances (with the elimination of the EU's ETS free allowance modelled in the CGE as a carbon tax imposed on EU's production), Scenario 5 combines all the previous scenarios into one of full product coverage, a carbon price of €87 per tonne and with the EU ending free ETS allowances. A final 6th scenario looks at the consequences if other countries, namely the US, Japan, UK and Canada, follow through with imposing similar CBAMs alongside the EU. A final section compares the results from each scenario, drawing out conclusions. The modelling is static, meaning that the scenarios can be considered equivalent to what the CBAM would imply on Africa's economy today.

Implied tariff of the CBAM on different products and regions

To understand how the CBAM affects trade it is first helpful to see what it implies for tariffs. Table 3 shows what tariffs on the content of carbon would amount to in *ad valorem* terms. It is based on the carbon intensity of production in the GTAP 10.a database (see Annex A for more details). Note that the CBAM will not initially be applied to *all* of these products (such as agriculture or manufacturing); rather, this table shows what the CBAM would imply were it to be applied to each of these product groups.

Cement, iron and steel, and aluminium are the most carbon-intensive products to produce in most regions. For Africa, the tariff that the CBAM would impose on these products would amount to 6.2% for cement, 5.2% for iron and steel and 3.9% for aluminium, under a scenario in which the carbon is priced at €40/tonne. With carbon priced at €87/tonne, the equivalent tariff on Africa's exports would rise to 13.5% for cement, 11.3% for iron and steel and 8.5% for aluminium.

The impact of the CBAM on patterns of production and trade with the EU will depend on the relative carbon intensity of production between regions. Cement, iron and steel, aluminium and fertiliser are more carbon intensive (and so will face a higher CBAM tariff) than production in all other regions. As a result, the CBAM will make production of these goods in African countries less competitive and see production shift to (and between) competitors. In comparison, the USA is much less carbon intensive in the production of most products while China is relatively less carbon intensive in the production of iron and steel and cement than India and the RoW, but is the most carbon intensive in the production of manufactures.

Table 3: Implied tariff of the CBAM at €40/tonne and €87/tonne, region and commodity (%)

Implied tariff of the CBAM at €40/tonne					
	Africa	China	India	USA	RoW
Agriculture	0.4	1.3	1.9	0.7	0.9
Fertiliser	2.9	2.1	1.4	0.5	2.5
Electricity					
Iron and steel	5.2	2.9	3.5	0.8	3.6
Aluminium	3.9	1.7	3.7	0.6	1.4
Cement	6.2	3.3	4.9	2.4	4.7
Energy	2.2	3.3	1.8	1.1	0.7
Manufacturing	0.8	2.1	1.4	0.6	0.3

Implied tariff of the CBAM at €87/tonne					
	Africa	China	India	USA	RoW
Agriculture	0.9	2.8	4.1	1.5	2
Fertiliser	6.3	4.6	3	1.1	5.4
Electricity					
Iron and steel	11.3	6.3	7.6	1.7	7.8
Aluminium	8.5	3.7	8	1.3	3
Cement	13.5	7.2	10.7	5.2	10.2
Energy	4.8	7.2	3.9	2.4	1.5
Manufacturing	1.7	4.6	3	1.3	0.7

Source: Computed from GTAP 10.a database

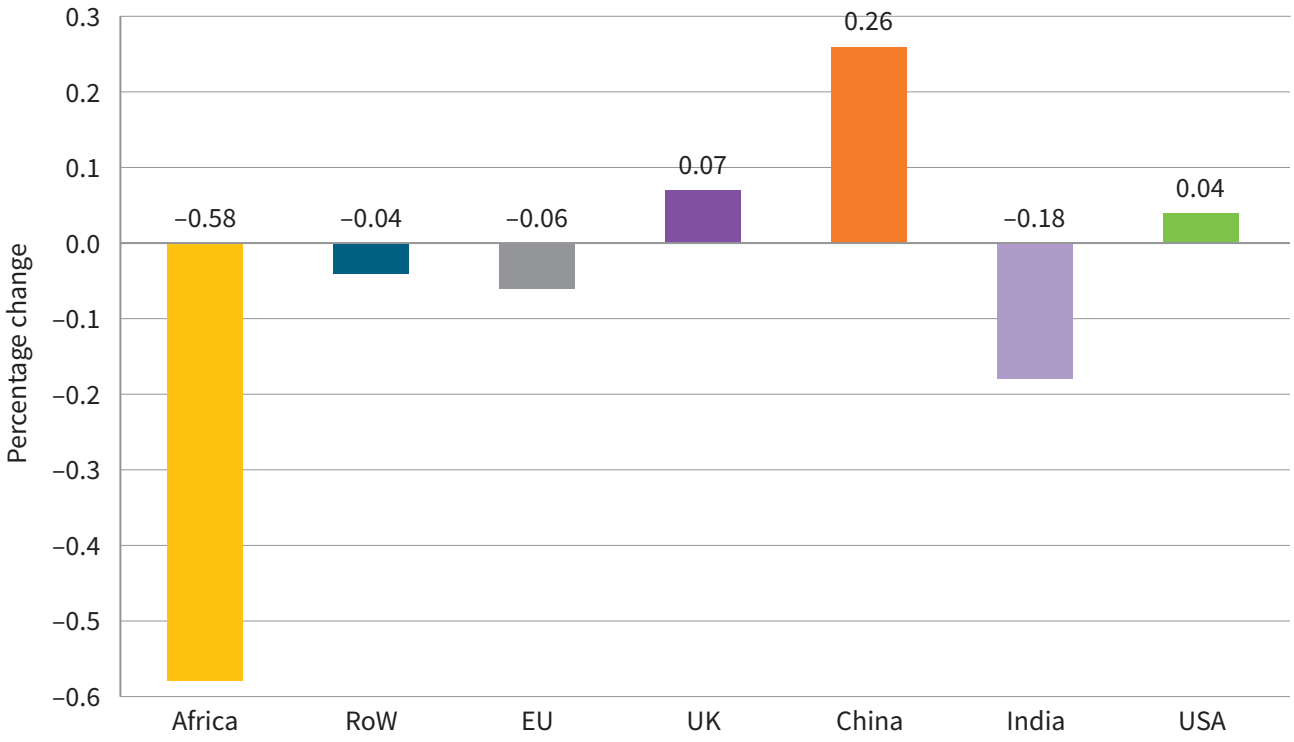
Note: Most of the countries in the aggregation (except very few countries in the RoW aggregation) do not export electricity to the EU.

Scenario 1: Limited CBAM coverage with a carbon price of €40 per tonne

This scenario simulates the impact of the CBAM with the initial shortlist of products (Table 1) at €40 per tonne. This is the 'lightest' scenario in which we would expect the most limited impact. We find that Africa's economy will be negatively affected by the CBAM with exports to the EU declining by 4% in total, that Africa will be worse affected than any of the other major economies analysed, but that at 0.58%, the decline in Africa's GDP will not be insurmountable (Figure 2). We find, however, that even at just €40 per tonne, the CBAM will raise EU import tariff revenue substantially as well as EU's emissions, but have little impact on global CO_2 emissions.

Beyond Africa, the EU economy is expected to decline by 0.06% and the Indian economy by 0.18%. In contrast, the CBAM will provide a small benefit to the economies of the UK, China and the US, with the GDP of these countries increasing by 0.07%, 0.26% and 0.04% respectively. These differentiated impacts correspond to the export composition and carbon intensity, and in turn variable tariffs implied by the CBAM (see Table 3). Substitution in production occurs away from countries and regions that are relatively more carbon intensive (like Africa, India and the RoW) in their production and toward ones that are less carbon intensive (like the UK, China and the US) as well as toward the EU. The fall in the EU's GDP owes to the price effect instigated by the CBAM: when the CBAM is imposed, the cost of goods imported by the EU increases. As a result, EU output in nominal terms will increase by 0.64%, but the price effect will result in a real GDP (after taking into account higher prices) decline of 0.06%. In total, this results in a moderate negative welfare impact on EU consumers.

Figure 2: Scenario 1: Impact of the CBAM on GDP, by economy (% change)



Source: CGE analysis results

The disproportionately large negative impact of the CBAM on the African economy, relative to other major economies, can be attributed to two main factors.

First, Africa's exports of several important commodities to the EU have a larger CO_2 emissions *intensity* than other countries. Hence, when the CBAM is imposed, Africa's exports are more exposed, such that the equivalent tariff changes are much higher than for the exports of other countries and this causes European consumers to

switch to other suppliers, such as China, the UK and the US (see Table 3). For example, Africa's exports of fertiliser, iron and steel, aluminium and cement have relatively higher CO_2 intensity embodied in them such that the CBAM increases the tariff applied to Africa's exports relatively more than it does to the tariff applied on exports from other economies. The higher emission intensity of Africa's exports to the EU creates a comparative disadvantage for African exporters to the EU market.

Second, the EU is a major export market for Africa, including for the CBAM products (Table 2). The EU accounts for 26% of Africa's exports of fertiliser, 16% of iron and steel, 12% of aluminium, 12% of cement and 33% of manufacturing, for example. As Africa's economy exports substantially more to the EU, it is expected that the CBAM will have a larger impact relative to other economies that are less dependent on the EU market.

We can see this by drilling down to the impact of the CBAM on Africa's sectoral exports to the EU. As shown in Table 4, Africa's exports to the EU will decrease in all sectors that the CBAM is imposed (i.e. the 'shortlist' sectors). Exports of fertiliser, electricity, iron and steel, aluminium and cement will decline by 2.13%, 6.49%, 5.71%, 9.60% and 2.01% respectively.

The negative impact on Africa's exports is somewhat (but only partially) mitigated by a trade diversion effect. While Africa's exports to the EU will decline for many commodities, Africa's exports of these products will increase to China and India. For instance, Africa's exports of fertiliser to China and India are expected to increase by 0.30% and 5.14%, and exports of iron and steel to these countries by 9.34% and 12.82% (Table 4). That in turn implies a benefit for those economies, as they are able to benefit from the more competitive supply of major inputs (like iron and steel) to their economies. In the case of China, this helps to explain why the CBAM has a positive net impact on its economy.

The exports of other commodities from Africa to the EU that are not covered by the CBAM are additionally forecast to decline. As seen in the results, Africa's exports of manufacturing, transportation and other services to the EU fall by 4.23%, 5.78% and 6.87%. These commodities, and especially transport and other services, can be seen as complements, and so decline on the back of reduced exports in other sectors.

The only commodities where Africa's exports to the EU still increase post-CBAM are agriculture and energy products (including fuels). These commodities are exempted from the CBAM under this scenario. Gains in these products are primarily due to the comparative advantage of African countries in these commodities and the fact that they are not covered by the CBAM. Africa's exports of agricultural and energy commodities to the EU are forecast to increase by 3.43% and 1.45%. The CBAM also affects Africa's exports to many other countries and regions. This relates to changes in demand within those countries in response to the EU, and changes stimulated within Africa's economy, such as the reallocation of factors of production.

Table 4: Scenario 1: Impact of the CBAM on Africa's exports, by destination (% change)

	EU	China	India	RoW	UK	USA
Agriculture	3.43	–0.18	4.08	2.29	–1.61	–6.75
Fertiliser	–2.13	0.3	5.14	–2.37	–1.34	–0.4
Electricity	–6.49	–7.89	–5.13	–6.26	–7.18	–7.14
Iron and steel	–5.71	9.34	12.82	–0.92	–3.77	3.06
Aluminium	–9.6	20.37	19.89	–7.01	–10.04	–2.04
Cement	–2.01	16.19	7.32	0.53	–3.41	–2.05
Energy	1.45	8.23	–0.33	–1.42	2.63	2.72
Manufacturing	–4.23	9.24	8.28	5.57	–0.4	6.88
Transportation	–5.78	–6.53	–3.89	–5.05	–6.08	–5.99
Other services	–6.87	–7.98	–5.18	–6.54	–7.35	–7.35
Public administration	–5.96	–7.29	–4.48	–5.77	–6.57	–6.56
Overall	**–3.99**	**3.07**	**3.5**	**–2.45**	**–4.1**	**–2.33**

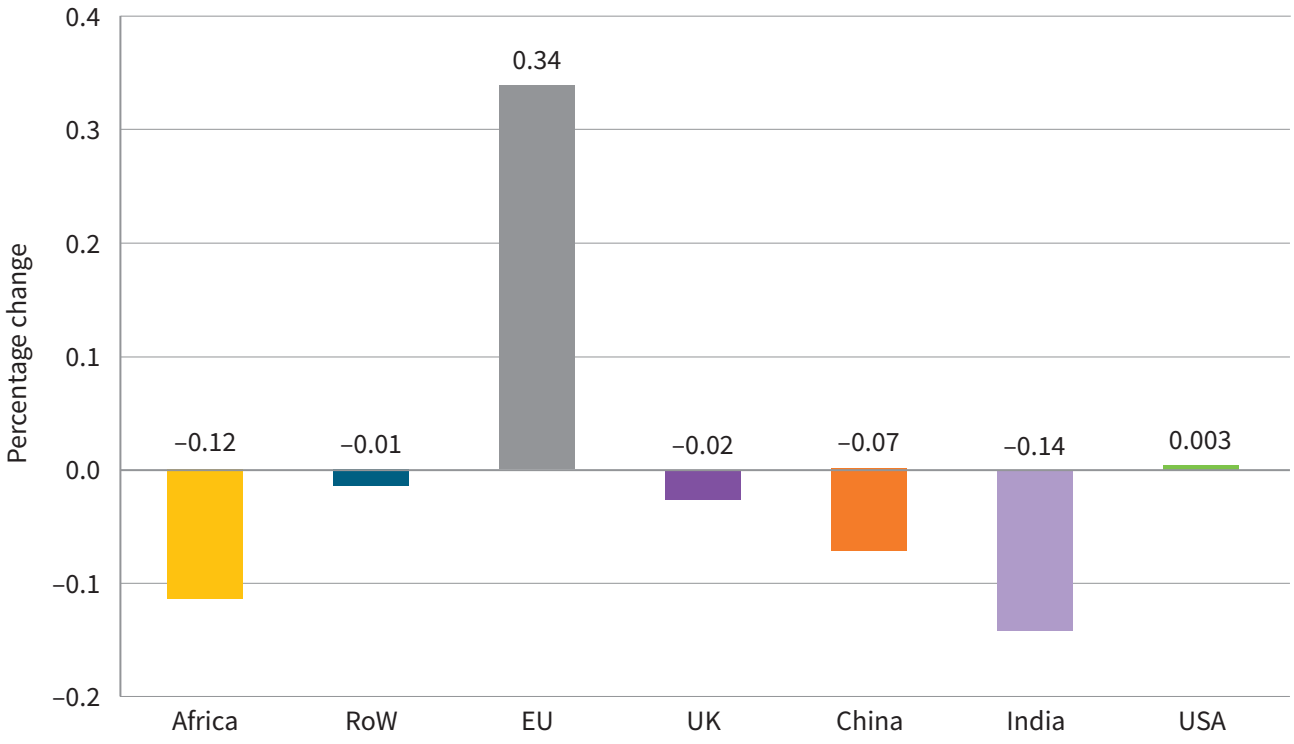
Source: CGE analysis results

As a revenue raising measure, the CBAM of course has additional consequences on EU import tariff revenue. The CBAM is forecast to increase EU import tariff revenue by 297.49% compared to a no-CBAM scenario. Benchmarking this on the import tariff revenue of 2021,[44] this would imply an increase in EU import revenues of approximately €73.7 billion. Although the CBAM policy will lead to a reduction in the importation of the CBAM commodities to the EU (or higher prices in the EU), the higher import tariff revenue will compensate for the fall in import and higher prices.

The environmental effects of the CBAM are limited and vary across countries, but address carbon leakage. Total CO_2 emissions are expected to fall in Africa (-0.12%), UK (-0.02%), China (-0.07%), India (-0.14%) and the RoW (-0.01%). In contrast, EU and the US would be expected to experience an increase in CO_2 emissions by 0.34% and 0.003% respectively (Figure 3). The reason for this is that by disincentivising *imports* of carbon-intensive goods, the CBAM incentivises the production of those goods inside the EU instead.

The CBAM itself is expected to reduce overall worldwide CO_2 emissions by just 0.002%. This suggests that, under the modelling parameters used in this model, a CBAM applied in the EU market alone mostly shifts carbon-intensive production from and between countries relatively more than it encourages a reduction in carbon emissions in aggregate. However, it is important to note that these forecasts do not account for other policy changes in the EU (or other countries) designed to reduce CO_2 emissions as part of its 'fit for 55 in 2030' package, which aims to reduce net GHG emissions by 55% by 2030, from 1990 levels.[45]

Figure 3: Scenario 1: Impact of the CBAM on CO_2 emissions, by economy (% change)



Source: CGE analysis results

44 See https://taxation-customs.ec.europa.eu/customs-4/eu-customs-union-facts-and-figures/customs-duties-mean-revenue_en.

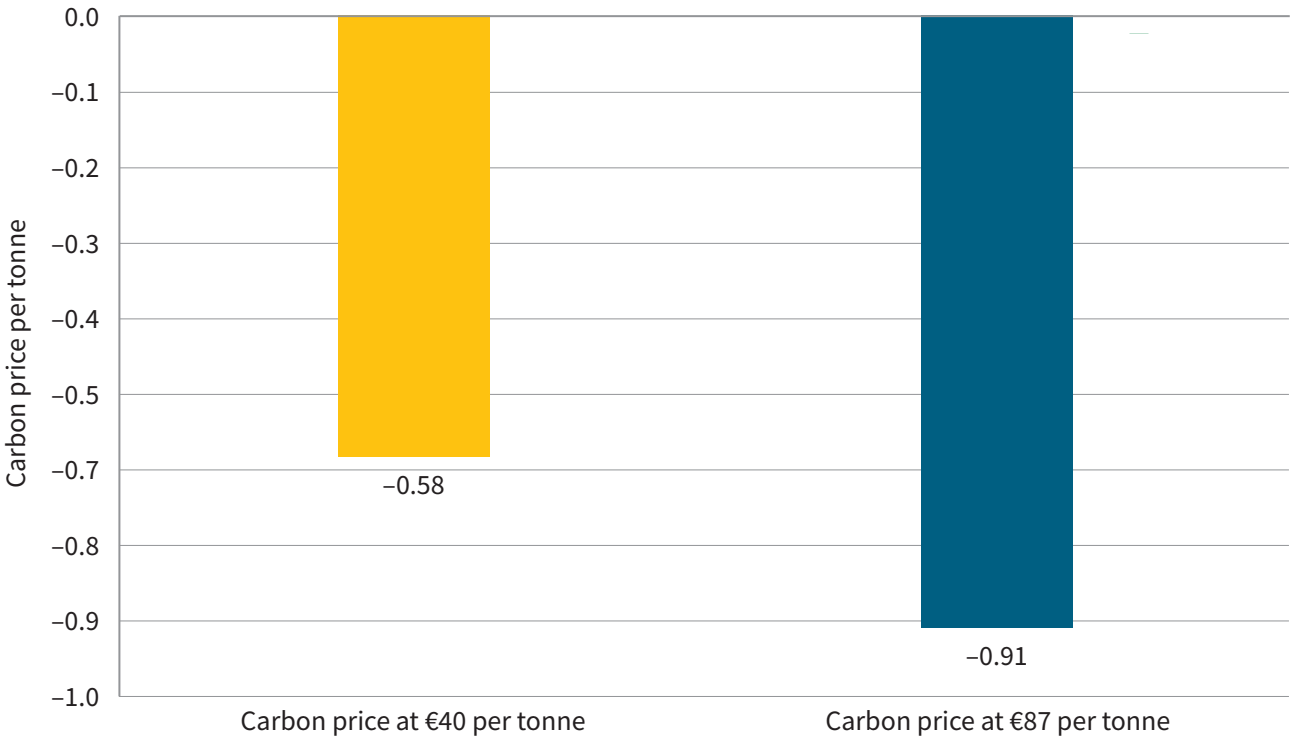
45 European Council. (2022, October 31). Fit for 55. Available at: https://www.consilium.europa.eu/en/policies/green-deal/fit-for-55-the-eu-plan-for-a-green-transition/.

Scenario 2: Limited CBAM coverage with a carbon price of €87 per tonne

This scenario simulates the impact of the CBAM on the initial shortlist of products (Table 1) but at a carbon price of €87 per tonne. In comparison with Scenario 1, this helps to gauge the sensitivity of the impacts of the CBAM to the price of carbon.

We find that Africa's economy will be more negatively affected by the CBAM as the price of carbon increases. However, despite the cost of carbon more than doubling, the impact on Africa's GDP increases by only 0.33 percentage points, suggesting diminishing returns to increases in the price of carbon. While Africa's GDP will decline by 0.58% under the €40 carbon price, it will fall by 0.91% under the €87 carbon price (Figure 4). At 2021 levels of GDP, that is equivalent to roughly a $16 billion reduction in Africa's GDP in the scenario in which the CBAM is priced at $40 per tonne and a $25 billion reduction at $87 per tonne.

Figure 4: Impact of the CBAM on Africa's GDP, carbon price at €40 per tonne and €87 per tonne



Source: CGE analysis results

Similarly, and unsurprisingly, the effects under the €87 per tonne scenario are larger for exports. Africa's exports to the EU will decline in total by 5.75%, as compared to 3.99% in the scenario with €40 per tonne. This is, however, also a less than proportional response to a more than doubling of the carbon price.

As seen in Table 5, the reduction in exports of all the commodities is much larger. Africa's exports of fertiliser, electricity, iron and steel, aluminium and cement will fall by 3.91%, 9.22%, 8.12%, 11.57% and 3.14% respectively. Overall, Africa's total exports to the EU will decline by 5.75%. The larger negative effects are expected as the higher carbon price of $87 will translate into a higher tariff equivalent, which will be imposed on imports to the EU.

Table 5: Impact of the CBAM on Africa's exports, by sector, carbon price at €40 per tonne and €87 per tonne (% change)

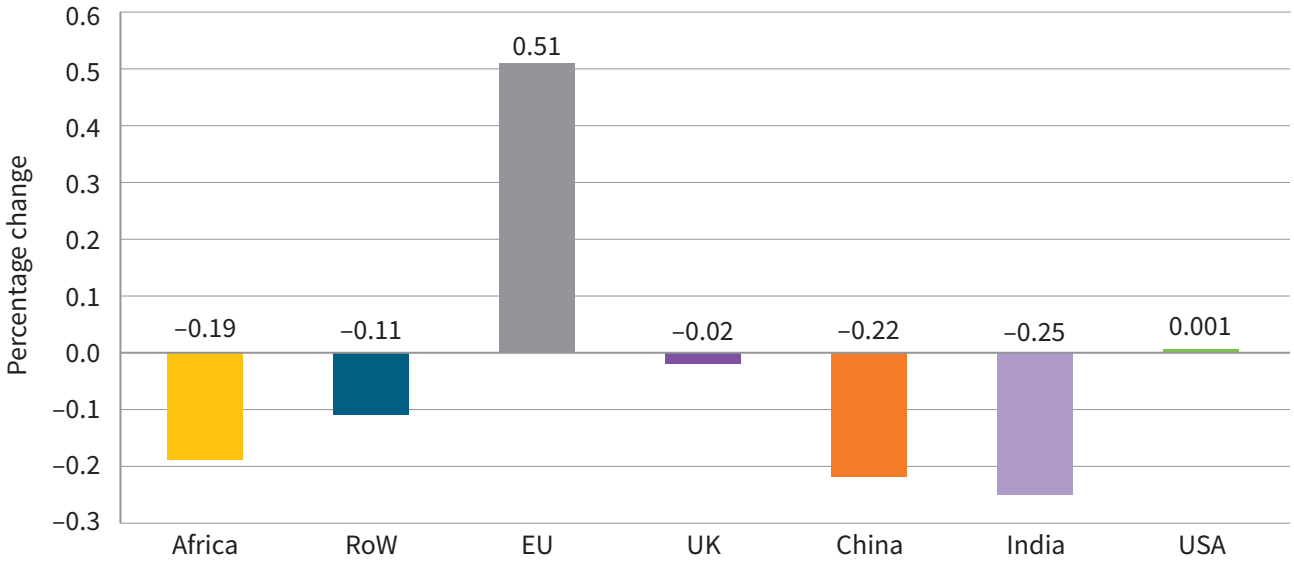
	CBAM with carbon price of €40	CBAM with carbon price of €87
Agriculture	3.43	1.09
Fertiliser	–2.13	–3.91
Electricity	–6.49	–9.22
Iron and steel	–5.71	–8.12
Aluminium	–9.6	–11.57
Cement	–2.01	–3.14
Energy	1.45	0.06
Manufacturing	–4.23	–5.97
Transportation	–5.78	–7.06
Other services	–6.87	–7.39
Public administration	–5.96	–8.01
Overall	**–3.99**	**–5.75**

Source: CGE analysis results

Under the €87 scenario, the total EU import tariff revenue will increase by 416.33%. Benchmarking this on the import tariff revenue of 2021,[46] this effectively means that EU import tariff revenue would increase by approximately €128.05 billion in our model.

The environmental effects of the scenario in which carbon is taxed at €87 are aligned with those in which carbon is taxed at €40, except that they are much larger. Doubling the price of carbon results in a more than proportional reduction in carbon emissions in China and the RoW. By substituting imports for domestic production, the EU would indirectly reduce the emissions of other countries, but increase production, and correspondingly emissions, in the EU. Hence, the relatively larger increase in EU emissions by 0.51% (Figure 5).

Figure 5: Scenario 2: Impact of the CBAM on CO_2 emissions, by economy (% change)



Source: CGE analysis results

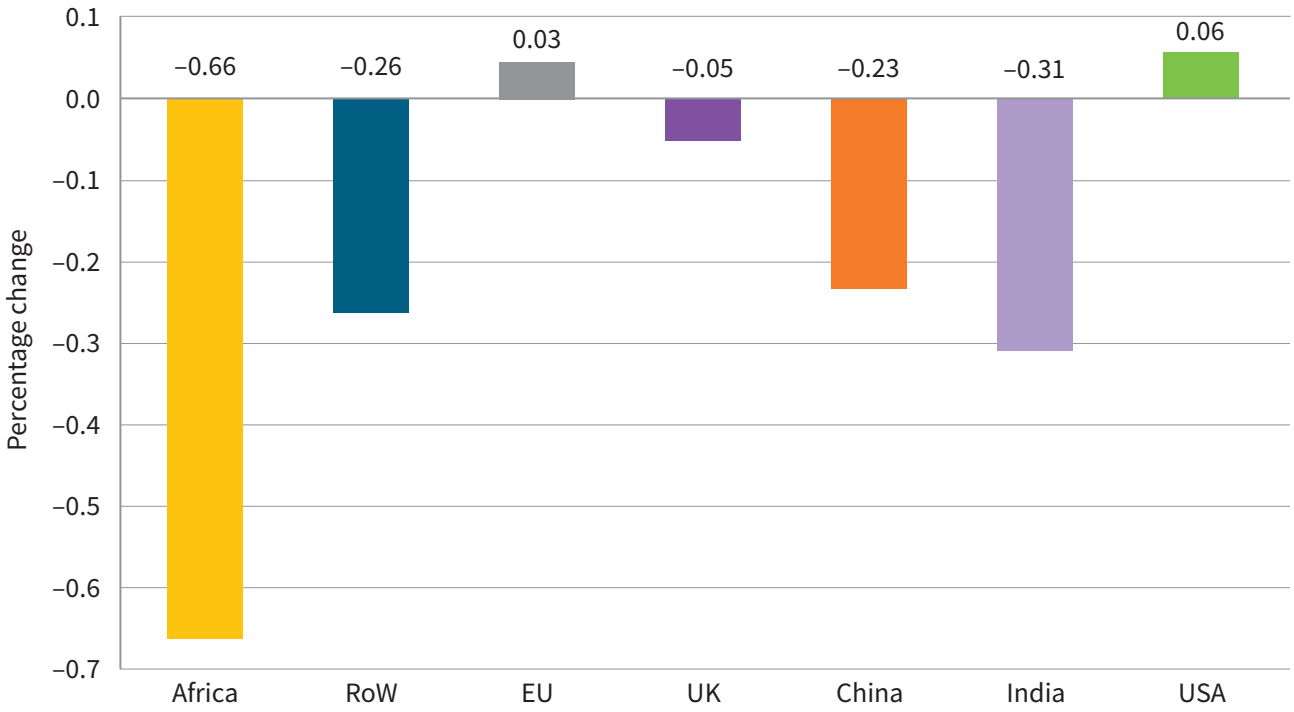
46 The import duties collected by the EU in 2021 amount to €24.8 billion. See https://taxation-customs.ec.europa.eu/customs-4/eu-customs-union-facts-and-figures/customs-duties-mean-revenue_en.

Scenario 3: Full CBAM product coverage with a carbon price of €40 per tonne

In this scenario we expand the coverage of the CBAM to all economic sectors of the economy, except public administration.[47] Note that as such, this scenario greatly exceeds in product coverage *current* ambitions for the CBAM. Individual economies are affected differently depending on the carbon intensity of their sectors and their dependency on the EU market across *all goods*. The economic impacts are only slightly more substantial for Africa, but much larger for most other economies, and particularly China, although Africa is still the most adversely affected region. The biggest change, however, is with China, which was conversely a net beneficiary of the reduced product scope CBAM modelled in Scenario 1.

The African economy is forecast to fall by 0.66% of GDP, India's by 0.31%, China's by 0.23%, the US by 0.06% and the UK by 0.05%, with the economies of the RoW declining by 0.26% (Figure 6). The EU economy will grow marginally by 0.03% (recalling that, by contrast in Scenario 1, with partial CBAM coverage, the EU economy shrank by 0.06%). As more commodities come under the CBAM, it will have a much larger and more balanced total impact on all economies of the world.

Figure 6: Scenario 3: Impact of the CBAM on GDP, by economy (% change)

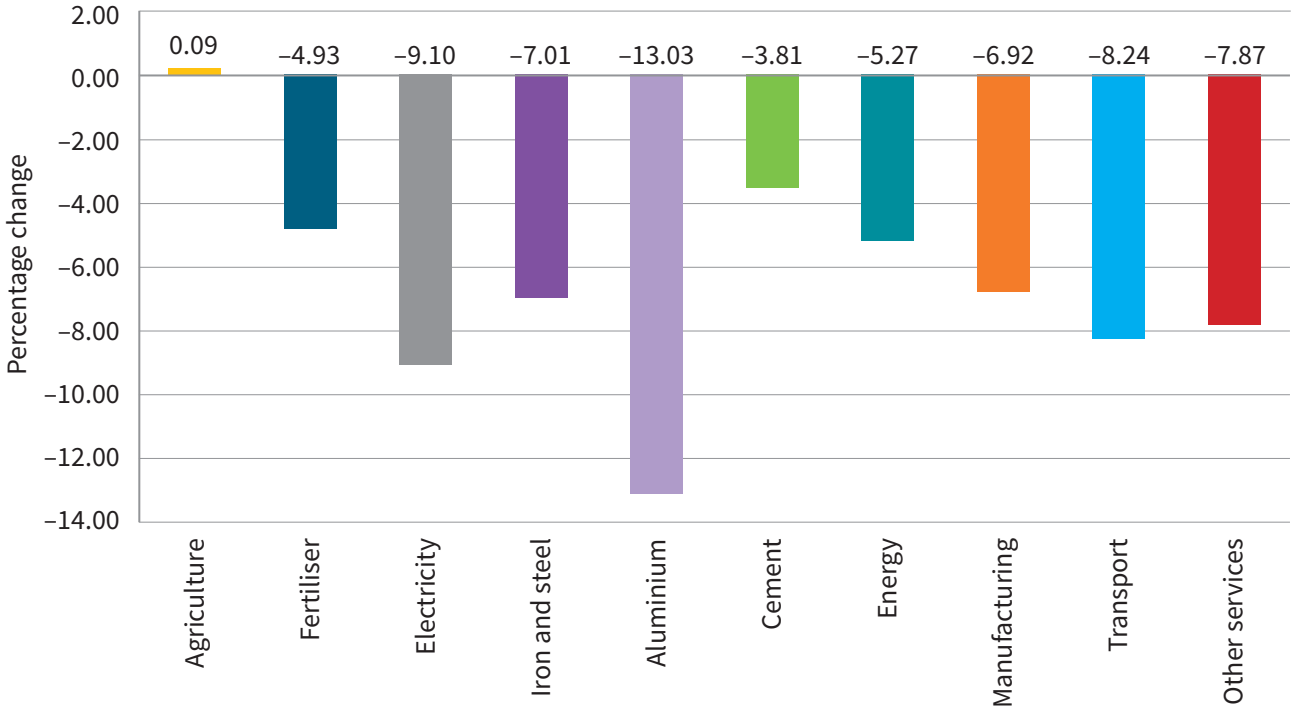


Source: CGE analysis results

Africa's total exports to the EU are forecast to fall by 6.65%. Figure 7 shows the breakdown in impact by sector. In terms of the size of the effects, Africa's export of fertiliser, electricity, iron and steel, aluminium, cement, energy, manufacturing, transportation and other services will fall by 4.93%, 9.10%, 7.01%, 13.03%, 3.81%, 5.27%, 6.92%, 8.24% and 7.87% respectively. However, owing to trade diversion effects, Africa's total exports to all destinations are expected to decline by a smaller 3.66%. The expansion of the scope of the CBAM to all commodities would also increase EU import tariff revenue by an incredible 458.01%.

47 In addition, the *ad valorem*/tariff equivalent of the carbon price on each sector and for each country for the CBAM sectors, a tariff equivalent of CBAM of 2%, is imposed on the other non-CBAM sectors in each country.

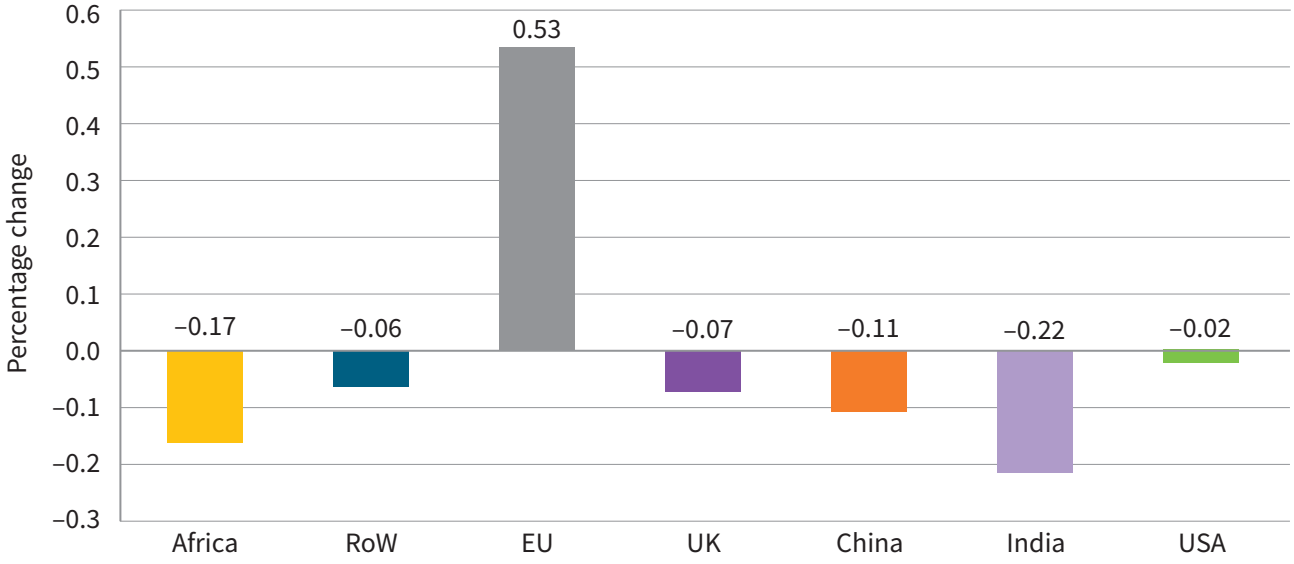
Figure 7: *Scenario 3: Impact of the CBAM on Africa's exports, by sector (% change)*



Source: CGE analysis results

Under this scenario with the CBAM applied to all economic sectors, the environmental effect is much larger. An expanded CBAM leads to a larger fall in CO_2 emissions. Overall, emissions will fall by 0.03% globally, suggesting that the environmental effect is much bigger than under the partial coverage (in which the total impact on world CO_2 emissions was just -0.002%) (Figure 8). Nevertheless, much of the impact of the CBAM on carbon emissions is still offset – in this scenario – by an increase in emissions in the EU. In reality, the EU will phase out ETS free allowances alongside the CBAM, resulting in a corresponding increase in the price of emitting CO_2 within the EU (this is addressed in Scenarios 4 and 5).

Figure 8: Scenario 3: Impact of the CBAM on CO_2 emissions, by economy (% change)



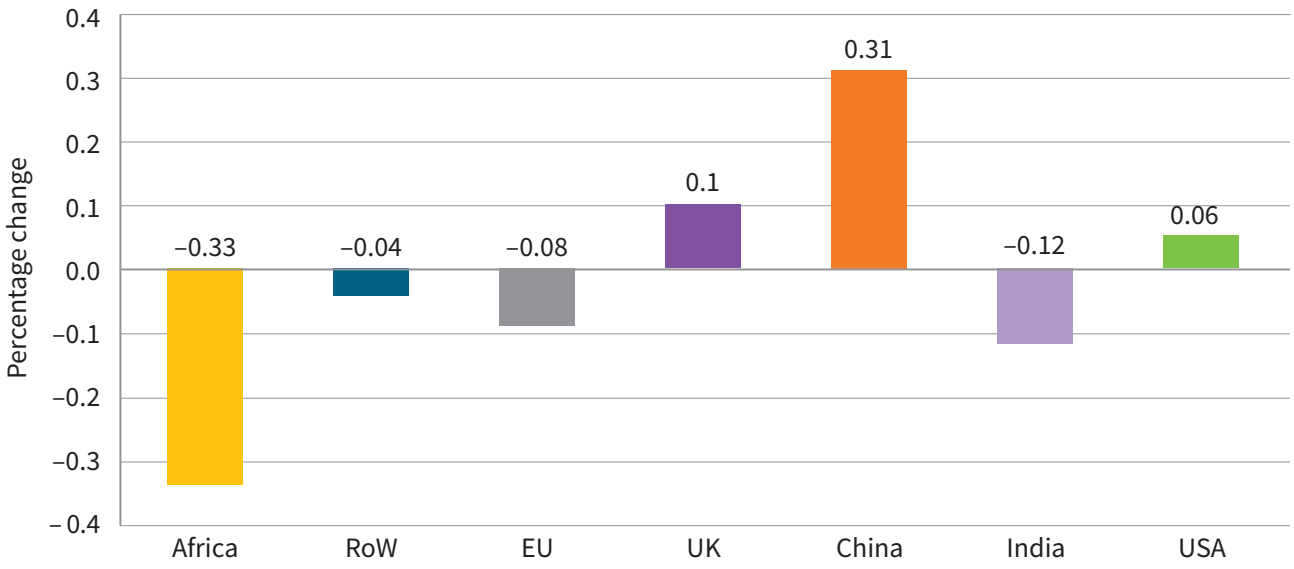
Source: CGE analysis results

Scenario 4: Partial CBAM product coverage with a carbon price of €40 per tonne and the EU ends free ETS allowances

The EU currently grants 'free allowances' of ETS credits to energy-intensive industries that are perceived to be at risk of carbon leakage. The CBAM is 'an alternative to free allocation, and as such the two measures should not overlap' and 'free allocation under the ETS will be gradually phased out as the Carbon Border Adjustment Mechanism is phased in for these sectors', according to EU press releases.[48] The free allowances are to be phased out between 2026 and 2034. The phasing out of the ETS allowances is a key part of attempting to ensure that the CBAM is WTO compatible (see Part II: CBAM and international legal frameworks: Options for Africa).

In this scenario we simulate an elimination of free ETS allowances alongside the implementation of the CBAM. The elimination of the ETS allowance is modelled in the CGE as a carbon tax imposed on EU production. This helps to reduce the distortionary effect of the CBAM, resulting in a correspondingly smaller shift of carbon-intensive production into the EU after the CBAM has been imposed. EU businesses in sectors covered by the ETS will simultaneously face higher costs for their carbon emissions at the same time as imports from outside the EU will face higher CBAM-related tariffs. We can see this in Figure 9, which, compared to the equivalent scenario without the elimination of the ETS (see Figure 2), results in a less negative impact on all other economies of the world outside the EU.

Figure 9: Scenario 4: Impact of the CBAM on GDP, by economy (% change)

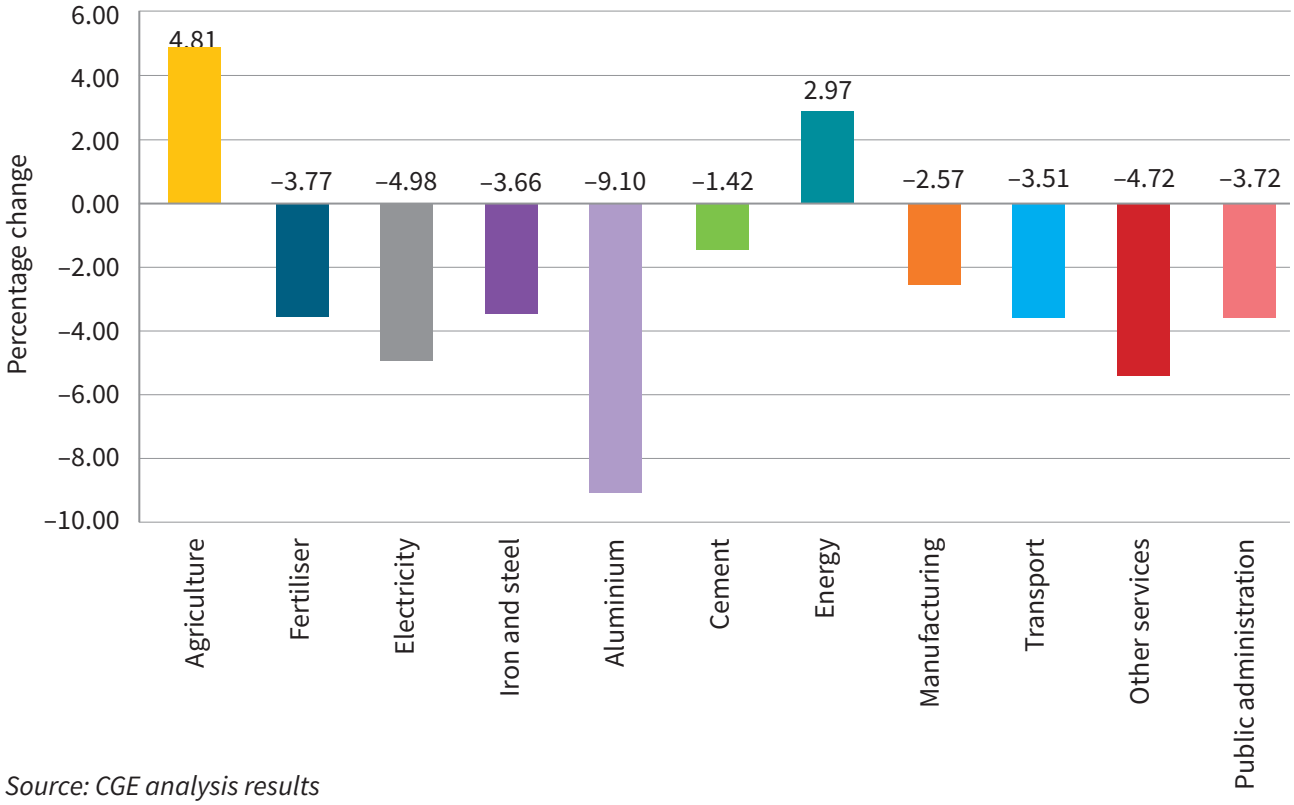


Source: CGE analysis results

The impact on Africa's exports to the EU is shown in Figure 10. Ending the EU's free ETS allowance reduces the competitive advantage enjoyed by some EU locally produced commodities over imported commodities. This means that ending the EU free ETS allowance mitigates the negative effects on the exports of some of these commodities under the CBAM. The removal of the EU ETS similarly encourages a reallocation of production factors from carbon tax-exposed sectors to non-exposed sectors. As a result, Africa's exports of some commodities to the EU increase substantially, even in the presence of the CBAM. Exports of fertiliser, electricity and energy are forecast to increase by 3.77%, 4.98% and 2.97% respectively. Africa's exports to the EU are expected to decline by an average of 1.11% while overall exports (to all countries/regions) will decline by only 0.08%.

48 European Commission. (2021). Carbon Border Adjustment Mechanism: Questions and answers. Available at: https://ec.europa.eu/commission/presscorner/detail/en/qanda_21_3661.

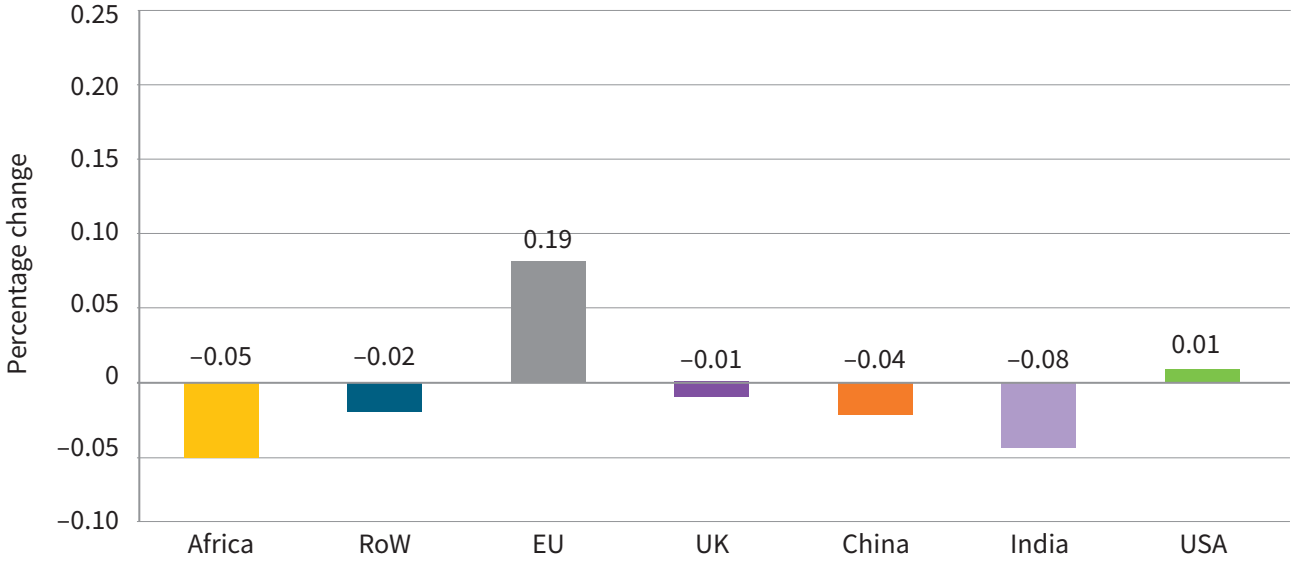
Figure 10: *Scenario 4: Impact of the CBAM on Africa's exports, by sector (% change*



Source: CGE analysis results

When the CBAM is complemented by the removal of the EU ETS, the substitution effect of the CBAM (in terms of substituting imports with local EU commodities) is diluted. This means that the CBAM has a reduced effect on increasing CO_2 emissions within the EU, but also a smaller effect on decreasing those emissions outside the EU. CO_2 emissions in Africa, UK, China and India fall by 0.05%, 0.01%, 0.04% and 0.08% respectively, while CO_2 emissions in the RoW, EU and USA rise by 0.02%, 0.19% and 0.01% (Figure 11).

Figure 11: Scenario 4: Impact of the CBAM on CO_2 emissions, by economy (% change)



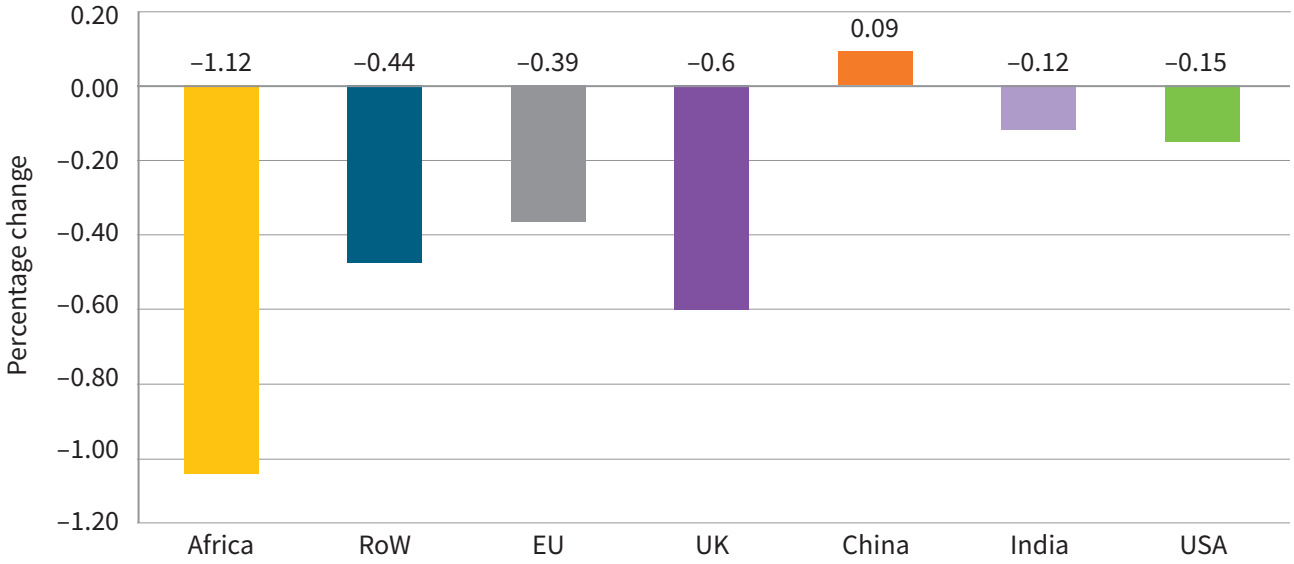
Source: CGE analysis results

Scenario 5: Full CBAM product coverage with a carbon price of €87 per tonne and the EU ends free ETS allowances

This scenario combines all previous possibilities to represent the most stringent combination of possible aspects of the CBAM, in line with the expected long-term implementation plan of the EU CBAM. Here it is assumed that carbon will be priced higher at €87 per tonne, that all products will be covered and that the EU will end free ETS allowances.

Based on these assumptions, the GDP of all countries, except the EU, will fall. The impact on Africa is much more substantial, with Africa's GDP falling by 1.12% (almost twice the initial scenario of a partial CBAM and a lower carbon cost). The negative impact on China and India is also much more pronounced (Figure 12).

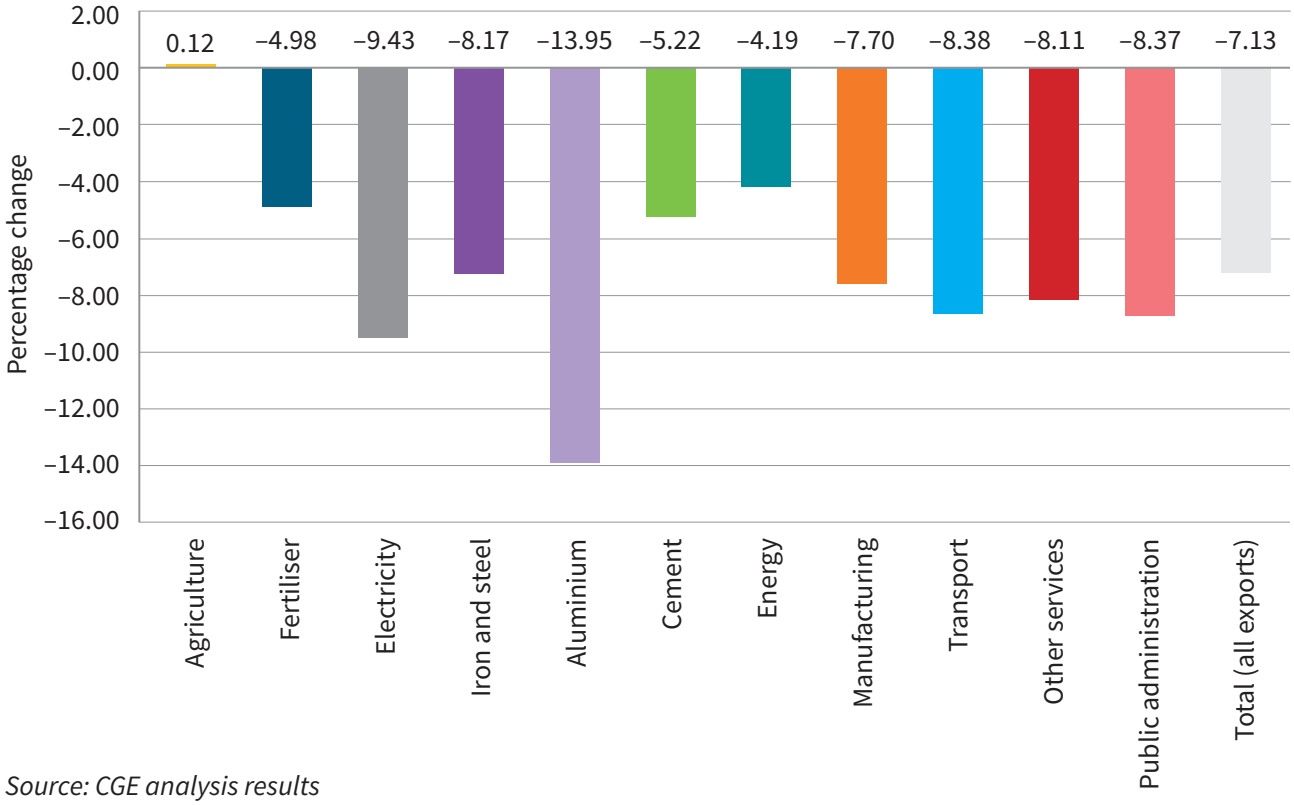
Figure 12: Scenario 5: Impact of the CBAM on GDP, by economy (% change)



Source: CGE analysis results

The trade effects of this scenario are much larger. As seen in Figure 13, there are large negative impacts on exports from Africa to the EU across all sectors, with the exception of agriculture. For example, exports of fertiliser, electricity, iron and steel, aluminium, cement, energy, manufacturing, transportation and other services will decline by 4.98%, 9.43%, 8.17%, 13.95%, 5.22%, 4.19%, 7.7%, 8.38% and 8.11% respectively. Overall exports to the EU will fall by 7.13%. However, it is important to note that while increasing the carbon price from $40 to $87 and expanding the sectoral coverage of the CBAM will have a negative effect on exports, the ending of the EU free ETS allowance somewhat mitigates this negative effect, as EU producers also lose some competitive advantage.

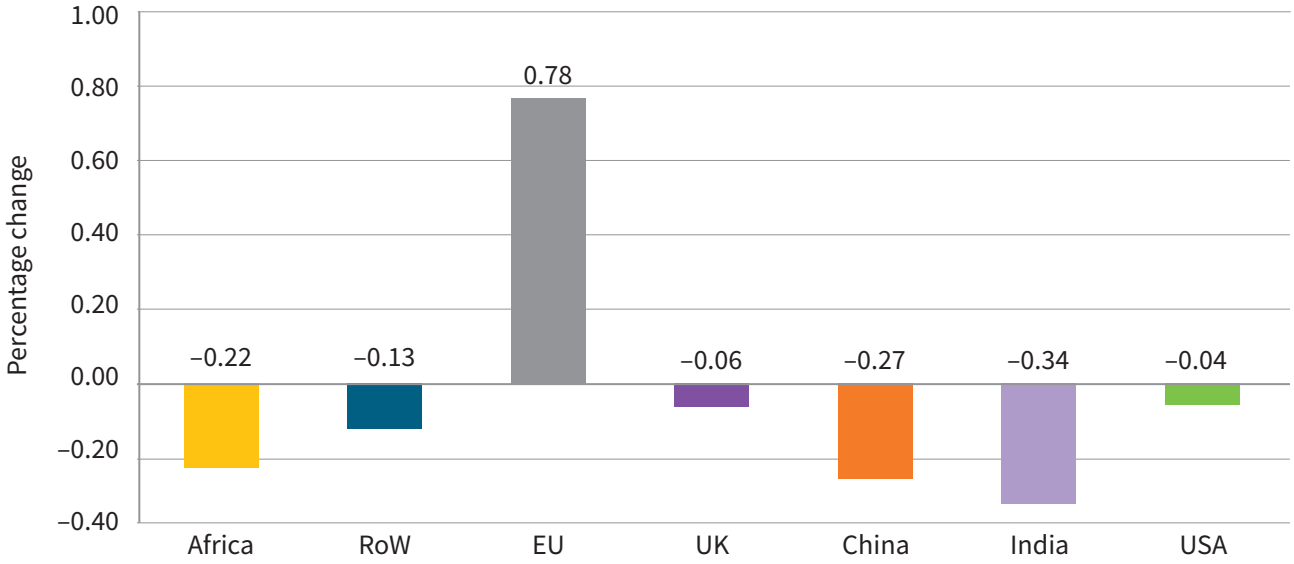
Figure 13: *Impact of the CBAM on Africa's exports, by sector (% change)*



Source: CGE analysis results

Lastly, the environmental effect of the CBAM under this scenario is shown in Figure 14. The CO_2 emissions of Africa, RoW, EU, UK, China, India and the USA will fall by 0.22%, 0.13%, 0.78%, 0.06%, 0.27%, 0.34% and 0.04% respectively. On the other hand, the EU's emissions will rise by 0.78%. The overall effect on CO_2 emissions is a decline by 0.04%, larger than any other scenario.

Figure 14: Scenario 5: Impact of the CBAM on CO_2 emissions, by economy (% change)



Source: CGE analysis results

Scenario 6: The EU, US, UK, Canada and Japan jointly implement the CBAM, with partial coverage and a carbon price of €40 per tonne

The EU is Africa's most important export market, being the destination for more than a quarter of Africa's exports in recent years. African countries therefore stand to be substantially directly impacted by the CBAM. However, the CBAM is important for precedent setting too among other partners with which African countries trade. An ancillary objective of the CBAM, in the words of the European Commission, is as 'a climate tool to push third countries to adopt more stringent climate measures'.[49] Should the EU succeed in this objective, the precedent set by the CBAM could have further indirect effects on Africa's trade with a wider range of partner countries.

The US is developing its equivalent regime, known as the Clean Competition Act, which would similarly establish a carbon border adjustment mechanism to 'incentivise deeper decarbonization among foreign producers while protecting U.S. firms'.[50] The UK, too, is considering its own carbon border adjustment mechanism and was, in June 2022, soliciting consultations on its design.[51] In August 2021, Canada also launched consultations on developing its own carbon border adjustment mechanism.[52]

In each instance, such partner countries explicitly refer to the EU's CBAM in policy documents, such as the UK House of Commons Environmental Audit Committee report on 'Greening imports: A UK carbon border approach', which includes an entire section analysing the EU CBAM.[53] Other countries reportedly considering equivalent schemes include Japan[54] and Canada.[55] The precedent set by the EU's CBAM is likely to amplify, with reverberating policy developments across African trading partners, implying a substantial change in the way a large share of world trade is conducted.

To gauge the possible consequences of 'copycat' policies, this bonus scenario replicates a version of the CBAM in the US, UK, Canada and Japan, alongside the EU. Under this scenario, we simulate the economic and environmental implications of these countries implementing a CBAM similar to the EU's.

Should these countries follow the EU to implement the CBAM (joint CBAM implementation), it will have a negative effect on all economies, including that of Africa. However, the impact is disproportionately larger (and more negative) on other economies in the world. Compared with Scenario 1 (in which only the EU implements a CBAM), the impact results in a proportionately larger fall in GDP for China, India and the RoW than for Africa (Figure 15). This stems from the relatively smaller concentration of exports from Africa to the markets of the other 'joint CBAM' countries, than to the EU.

49 European Commission. (2021). *Proposal for a Regulation of the European Parliament and of the Council establishing a Carbon Border Adjustment Mechanism*, 2021/0214 (COD).

50 CSIS (Center for Strategic and International Studies). (2022). Trade tools for climate: Transatlantic carbon border adjustments. Available at: https://www.csis.org/analysis/trade-tools-climate-transatlantic-carbon-border-adjustments.

51 Ernst and Young. 2022. UK Parliamentary committee calls for development of UK carbon border policy. Available at: https://www.ey.com/en_gl/tax-alerts/uk-parliamentary-committee-calls-for-development-of-uk-carbon-border-policy.

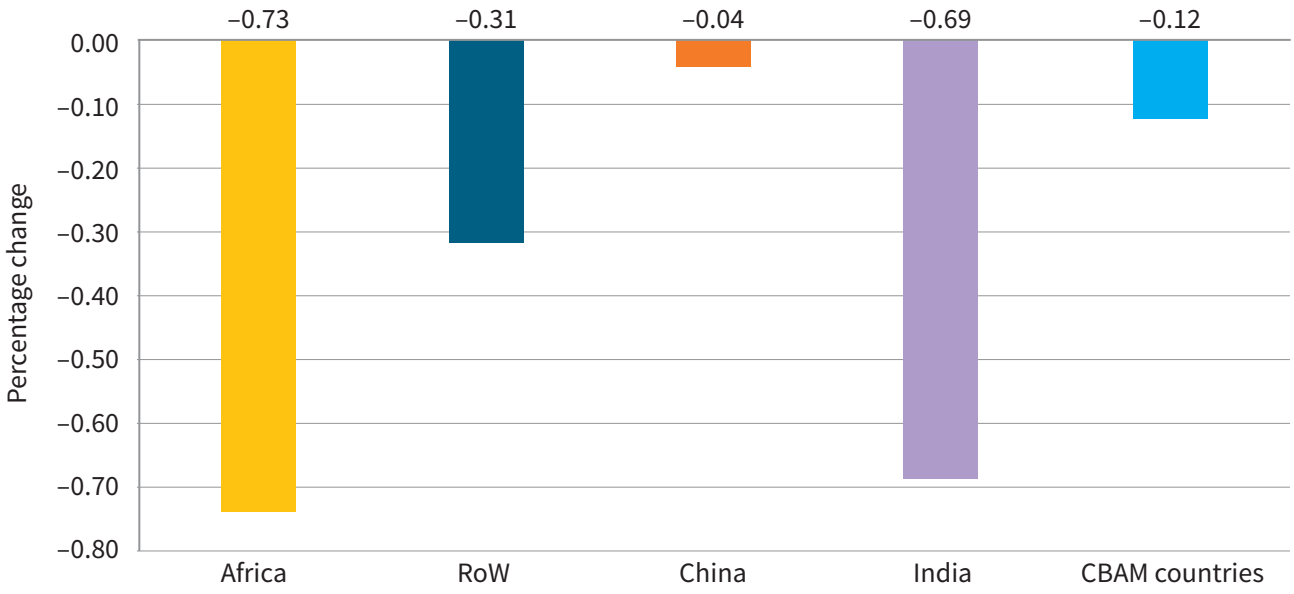
52 Government of Canada. (2021). Government launches consultations on border carbon adjustments. Available at: https://www.canada.ca/en/department-finance/news/2021/08/government-launches-consultations-on-border-carbon-adjustments.html.

53 See https://publications.parliament.uk/pa/cm5802/cmselect/cmenvaud/737/report.html.

54 Nikkei. (2021). Ministry of Economy, Trade and Industry considers introduction of border carbon tax following Europe and the United States, conclusion expected in summer. Available at: https://www.nikkei.com/article/DGKKZO69029070Q1A210C2EE8000/.

55 Government of Canada. (2021). Government launches consultations on border carbon adjustments. Available at: https://www.canada.ca/en/department-finance/news/2021/08/government-launches-consultations-on-border-carbon-adjustments.html.

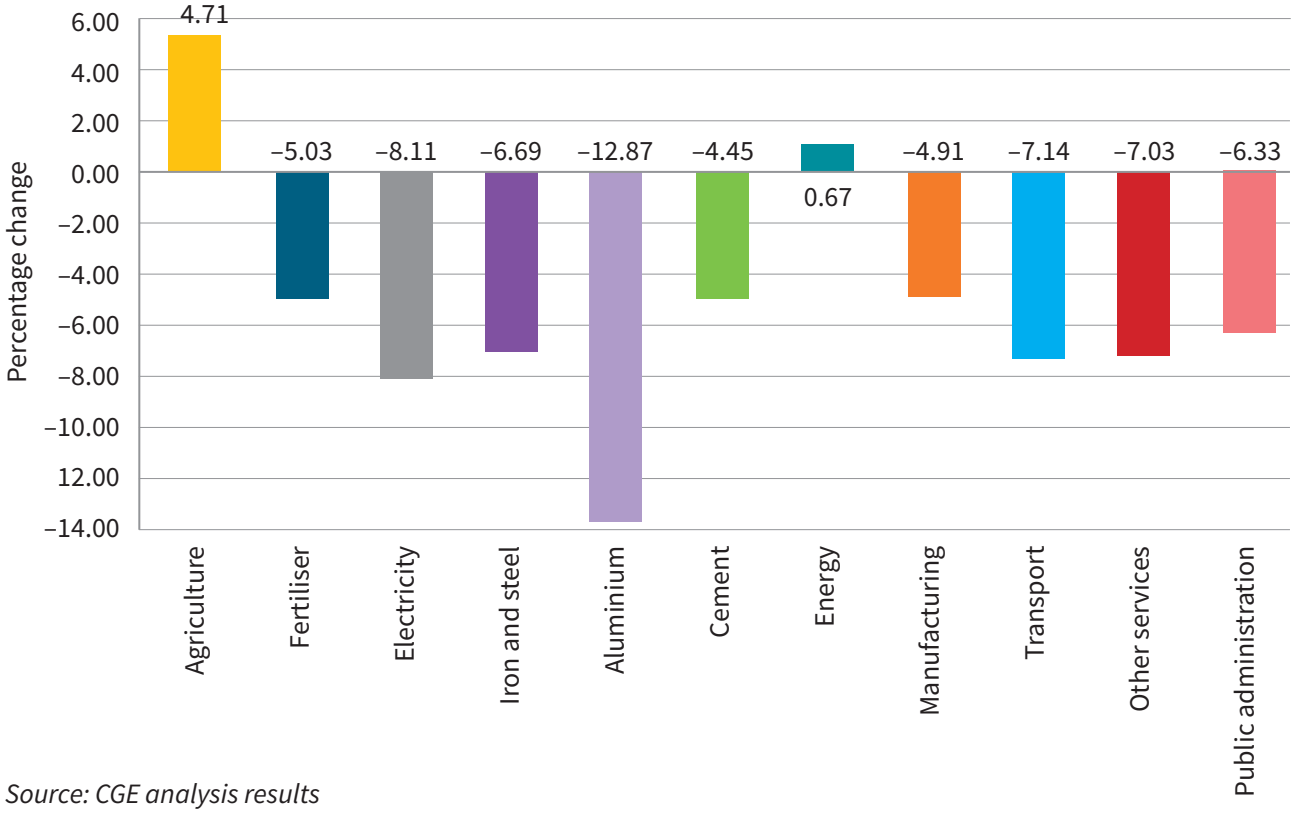
Figure 15: Scenario 6: Impact of the CBAM on GDP, by economy (% change)



Source: CGE analysis results

The sectoral decomposition of the impact on Africa's exports to the CBAM-implementing countries is shown in Figure 16. CBAM allows the locally produced commodities in the CBAM-implementing countries to be more competitive vis-à-vis African exports because of the additional tariff placed on imports. As such, the exports of fertiliser, electricity, iron and steel, aluminium, cement, energy, manufacturing, transport and other services from Africa decline by -5.03%, -8.11%, -6.96%, -12.87%, -4.45%, 0.67%, -4.91%, -7.14% and -7.03% respectively.

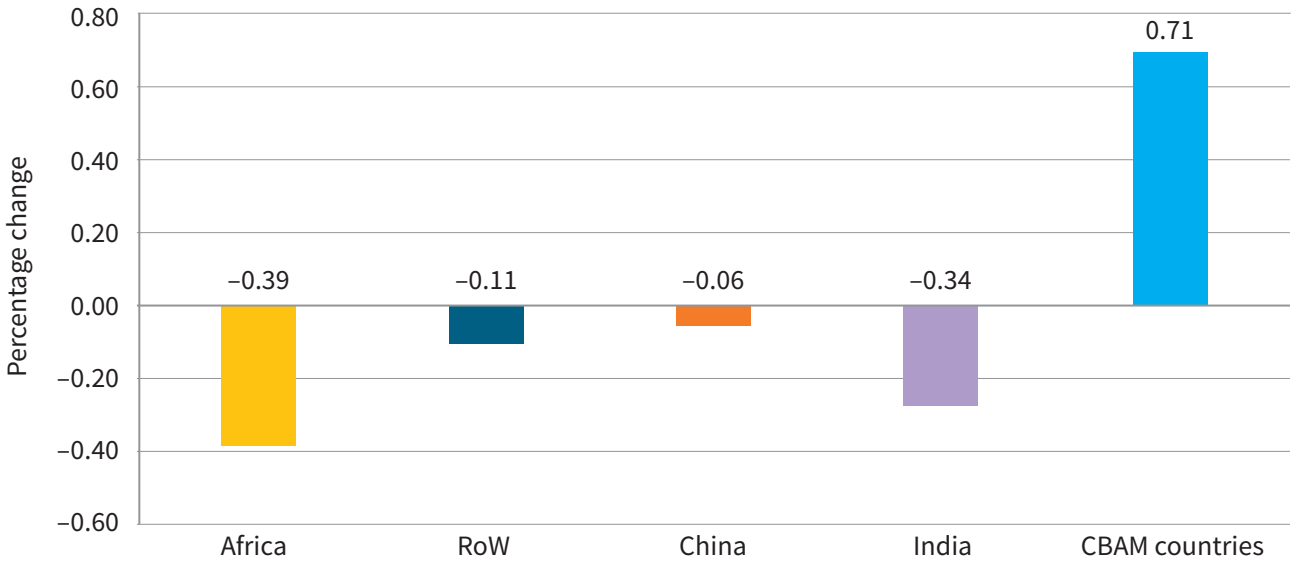
Figure 16: Scenario 6: Impact of the CBAM on Africa's exports, by sector (% change)



Source: CGE analysis results

This scenario has a much larger impact on reducing CO_2 emissions, with world CO_2 emissions declining by 0.04% (as compared to 0.002% in the equivalent scenario in which only the EU implements a CBAM). However, the CO_2 emissions of the CBAM-implementing countries will increase while those of the other countries will decrease (recall, however, that this scenario does not model the reduction of ETS free allowances or other policies that would reduce emissions in the EU, and potentially other 'joint CBAM' countries) (Figure 17). These results indicate that although the environmental impacts of the CBAM are still limited, implementation of the CBAM by more countries will have, not unsurprisingly, much larger impacts on global efforts to reduce emissions.

Figure 17: Scenario 6: Impact of the CBAM on CO_2 emissions, by economy (% change)



Source: CGE analysis results

Summary of scenarios

Table 6 provides a comparison of the results of the different scenarios, assessing the economic implications of the CBAM on Africa's exports to the EU. A few notable features stand out.

First, as demonstrated by comparing Scenarios 1 and 2, the impact of the CBAM can be substantially amplified with a higher carbon price. This magnifies the impact of the CBAM, from having a modest to a relatively moderate effect on Africa's exports to the EU.[56] With the price of carbon more than doubling from €40 to €87, the fall in Africa's exports increases from -1.32% to –2.84%. This corresponds to a fall in Africa's GDP by -0.58% to -0.91%. In terms of impacted products, it is Africa's exports of aluminium, followed by electricity and iron and steel exports, that will be most adversely and directly affected. Electricity exports are, however, very minimal in value (worth less than 0.01% of Africa's exports to the EU). Africa's exports of manufactures and some services (transport, public administration and other services) are also negatively affected. This is because of the way they serve as intermediary inputs and complements to sectors affected by the CBAM.

Second, comparing Scenario 3 with Scenario 1 shows the impact of increasing the coverage of the CBAM from the initial list of products that it is scheduled to cover as it is phased in between 2026 and 2034 (iron and steel, cement, aluminium, fertiliser, hydrogen and electricity) to a hypothetical scenario in which its scope was expanded to cover all products. When all products are covered, the impact of Africa's exports to the EU is much more substantial, with total exports falling by -6%. This is driven mostly by a fall in energy exports (such as fuels), which account for more than half of all Africa's exports to the EU.

56 It is important to note that those scenarios do not include the phasing out of the EU's free allowances under the ETS.

Third, as shown in Scenario 4, removal of the EU ETS free allowances goes a substantial way towards rolling back the negative impacts of the CBAM on Africa's exports. The EU is planning to align the introduction of the CBAM with the phasing out of the ETS free allowances, so this is a realistic scenario. Even though Africa's exports actually increase by a small amount under this scenario (particularly of agriculture, fertiliser, electricity and energy), there is a small decline in Africa's GDP owing to changes in terms of trade.

Scenario 5 shows the impact of all prior scenarios together: full product coverage, a higher price of carbon and the removal of the EU ETS free allowances. The effects on Africa's exports would be fairly substantial, despite the removal of the ETS free allowances.

Finally, as demonstrated with Scenario 6, the CBAM will be much more impactful if the EU succeeds (as is possible) in influencing other countries to adopt similar carbon border adjustment measures. If the US, UK, Canada and Japan were to adopt an equivalent regime to the EU's CBAM alongside the EU, the cumulative impact is similar to doubling the price of carbon in just the EU's CBAM from €40 to €87. However, it is other economies (such as China and India) that would be relatively more substantially impacted by such a wider implication of CBAMs in joint countries. This is because a larger share of their exports goes to these countries, and especially the US.

Table 6: Comparison of scenarios: Impact of the CBAM on Africa's exports to the EU under different scenario conditions (% change)

		Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5	Scenario 6
	Share of sectoral exports in total African exports to the EU (%)	CBAM with carbon price of €40	CBAM with carbon price of €87	CBAM with carbon price of €40, all products	CBAM with carbon price of €40, EU ends free ETS allowance	CBAM with carbon price of €87, all products, and EU ends free ETS allowance	Joint CBAM (EU, US, UK, Canada, Japan) with carbon price of €40
Agriculture	5.26	3.43	1.09	0.09	4.81	0.12	4.71
Fertiliser	2.76	–2.13	–3.91	–4.93	–3.77	–4.98	–5.03
Electricity	0.09	–6.49	–9.22	–9.1	–4.98	–9.43	–8.11
Iron and steel	1.02	–5.71	–8.12	–7.01	–3.66	–8.17	–6.96
Aluminium	3.77	–9.6	–11.57	–13.03	–9.1	–13.95	–12.87
Cement	0.2	–2.01	–3.14	–3.81	–1.42	–5.22	–4.45
Energy	51.32	1.45	0.06	–5.27	2.97	–4.19	0.67
Manufacturing	23.63	–4.23	–5.97	–6.92	–2.57	–7.7	–4.91
Transportation	5.16	–5.78	–7.06	–8.24	–3.51	–8.38	–7.14
Other services	5.68	–6.87	–7.39	–7.87	–4.72	–8.11	–7.03
Public administration	1.11	–5.96	–8.01	–7.09	–3.72	–8.37	–6.33
Total (all exports)		**–1.32**	**–2.84**	**–6**	**0.4**	**–5.72**	**–2.12**
Impact on Africa's GDP		**–0.58**	**–0.91**	**–0.66**	**–0.33**	**–1.12**	**–0.73**

Source: CGE analysis results

COUNTRY-LEVEL IMPLICATIONS

To assess the country-level impact of the CBAM, we use a Ricardian model (see Annex B for more details on the model), with sectoral linkages between tradable and non-tradable sectors, to analyse different scenarios regarding the implementation of the CBAM for African exporters. We consider two kinds of product coverage: a carbon adjustment that only concerns a few goods (aluminium, steel and iron, fertilisers, electricity and cement), and another CBAM applied to all the goods exported to the EU by African producers (which is notably much broader than the CBAM currently envisaged). With the limited coverage, the impact of the carbon adjustment on African exports is negligible, even with a relatively high carbon price of €87/tonne. This is in part because these goods make up a small portion of total exports from African countries and then have no effect at the macro level. In contrast, when the CBAM is applied to all products imported by the EU, it has very detrimental effects on the growth of African countries. Small, agricultural countries are particularly affected by this policy.

The workings, parameters and calculations of this model are fundamentally different from that applied in the previous section. Consequently, so too are some of the results, while other results bring out consistencies. This helpfully highlights where the assessed impacts of the CBAM may owe more, or less, to modelling decisions.

The model presents results for welfare, terms of trade (ToT), volume of trade (VoT) and real wage effects. Welfare is the cumulative impact of changes in trade and terms of trade effects. Welfare would increase, for instance, if the CBAM would improve the terms of trade or the volume of trade, with everything else being equal. As changes in trade and terms of trade are mostly influenced by changes in real wages, welfare is conceptually equivalent to GDP. The terms of trade effect measures the gains of an increase in exporter prices relative to a change in importer prices from tariff reduction. The volume of trade is simply a measurement of the size of exports. Real wages are the consequences of changes to the cost of goods consumed by an economy relative to changes in the price of wages granted for what it produces. For example, if CBAM, by increasing trade costs, raises the price of intermediate tradable goods, that raises the price of the composite intermediate good and in turn producers suffer the losses, which lower real wages (see real wage equation in Annex B).

Disaggregated Scenario A: Limited CBAM coverage with a carbon price of €87 per tonne

Table 7 presents the disaggregated welfare and trade effects at the country level for the CBAM with limited coverage and a carbon price of €87 per tonne.

The trade effect of the CBAM with limited coverage is relatively modest. The volume of trade as well as the terms of trade effects are not substantively impacted. As a result, the impact of the CBAM on welfare is also small.

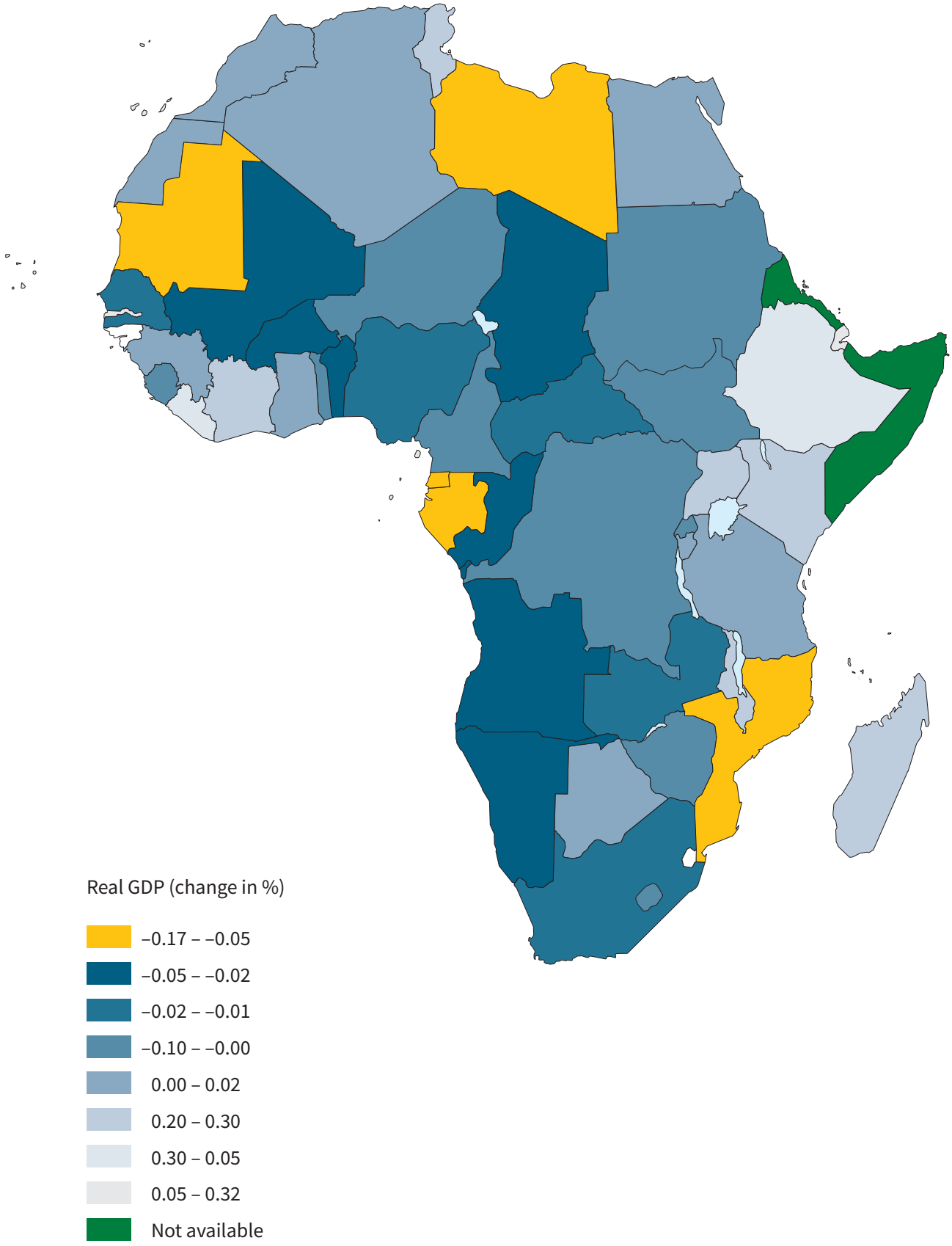
Table 7: Disaggregated Scenario A: Limited coverage, limited impact (% change)

Country	Welfare	ToT	VoT	Real Wage
Algeria	0.032	0.032	0.00063	0.21
Angola	–0.03	–0.023	–0.0067	–0.049
Benin	–0.031	–0.028	–0.0026	–0.08
Botswana	0.021	0.021	0.00068	0.089
Burkina Faso	–0.017	–0.014	–0.0032	0.061
Burundi	0.022	0.022	0.00079	0.19
Cabo Verde	0.057	0.027	0.03	2.2
Cameroon	0.028	0.026	0.0022	0.2
Central African Republic	–0.011	–0.0046	–0.0065	0.083
Côte d'Ivoire	0.064	0.063	0.0015	0.28
Democratic Republic of Congo	–0.044	–0.036	–0.008	0.079
Djibouti	0.32	0.24	0.078	0.81

Country	Welfare	ToT	VoT	Real Wage
Egypt	0.018	0.011	0.0065	0.12
Ethiopia	0.0068	0.0054	0.0014	0.0059
Gabon	–0.075	–0.062	–0.013	–0.18
Gambia	–0.12	–0.11	–0.013	–0.18
Ghana	0.013	0.011	0.0022	0.063
Guinea	0.0081	0.008	0.00016	0.07
Kenya	0.03	0.025	0.0048	0.08
Lesotho	–0.0039	–0.008	0.0041	0.00039
Liberia	0.33	0.3	0.027	0.4
Libya	–0.17	–0.17	0	–0.17
Madagascar	0.073	0.063	0.011	0.4
Malawi	0.02	0.016	0.0035	0.032
Mali	–0.036	–0.028	–0.0078	0.095
Mauritania	–0.054	–0.05	–0.0042	0.11
Mauritius	0.039	0.037	0.0019	0.26
Morocco	0.035	0.022	0.013	0.52
Mozambique	–0.056	–0.058	0.0024	–0.12
Namibia	–0.029	–0.03	0.00085	–0.041
Niger	0.021	0.02	0.00039	0.16
Nigeria	–0.0011	–0.00092	–0.00016	–0.00075
Rep. of Congo	–0.0071	–0.0062	–0.00092	0.006
Rwanda	–0.012	–0.012	–0.00003	0.035
Sao Tome & Principe	0.14	0.15	–0.0043	0.68
Senegal	–0.01	–0.0068	–0.0034	0.072
Seychelles	0.0052	–0.035	0.04	1.2
Sierra Leone	–0.0056	–0.032	0.026	0.5
South Africa	–0.011	–0.015	0.0041	0.042
Sudan	0.0012	0.00053	0.00065	0.014
Swaziland	–0.013	–0.016	0.0022	–0.012
Tanzania	0.0057	0.0038	0.0019	0.0075
Tchad	–0.017	–0.013	–0.0038	–0.027
Togo	0.052	0.044	0.008	0.13
Tunisia	0.094	0.056	0.038	1.2
Uganda	0.038	0.034	0.0041	0.18
Zambia	–0.009	–0.0096	0.00063	–0.063
Zimbabwe	0.0055	0.0045	0.00098	0.0039

Figure 18 presents the welfare effect of the CBAM in this scenario. Countries specialised in these products, as well as small countries, are the most affected, but the losses never go beyond 0.17% of GDP and the spectrum of range in impact on GDP is less than half a percentage point. For instance, Mozambique, which is sensitive because of aluminium exports to the EU, is hit by this policy but the cost only represents 0.07% of its GDP. The export of aluminium is largely diverted toward other markets. Some countries even obtain some gains due to the loss of competitiveness of the EU, but these gains are very small.

Figure 18: Change in real GDP, limited coverage



Not reported in detail here, results are similarly weak at a carbon price of €40/tonne. Analysis by sectors illustrates that only aluminium, steel and iron, fertilisers, electricity and cement are impacted, with few spillover effects to other sectors. Even these sectors are only weakly impacted because few African producers export these goods to the EU. In that case, one can consider that the insulation of African countries to world markets is an advantage; the detrimental effects of a more costly market access to the EU is limited to few producers.

Disaggregated Scenario B: Full CBAM coverage with a carbon price of €87 per tonne

Table 8 presents the disaggregated welfare and trade effects at the country level for the CBAM with full coverage (of all economic sectors) and a carbon price of €87 per tonne.

This scenario represents a severe trade shock and a significant decline in trade with the EU is reported, ranked between 40% and 60%. We can observe that the CBAM leads to an unambiguous decrease in all export volumes (column VoT).

However, the terms of trade and real wages respond to the CBAM differently according to country. Many countries lose on all fronts. For example, Liberia, Gambia, Angola, Cameroon, Cote d'Ivoire, Kenya and Nigeria endure a decrease in the volume of trade, in the terms of trade and in real wages. As a consequence, in this group the CBAM leads to a decrease in real income that is ranked between 0.4% for Nigeria and 5.8% for Liberia.

Some countries face an improvement in real wages and/or in their terms of trade, such as Djibouti, Togo, Benin, Tunisia, Morocco and South Africa. Djibouti is the most extreme case, with the sharp drop in exports to the EU not being offset by improvements in wages and terms of trade. The CBAM causes an 8% reduction in income growth. Generally speaking, small countries often lose the most when their external markets are restricted.[57] Hence, it is not surprising to observe in this group small countries for which the EU market is crucial.

The fact that the wage and/or the terms of trade are improved can be explained by different mechanisms. First, the CBAM mechanically increases the export price of African countries. However, exports of European products are also more expensive with this full coverage CBAM, since all intermediate goods imported into Europe to produce final goods are now subject to the CBAM. The terms of trade are improved when the former effect dominates the latter, and since African producers can reorient their imports from more competitive countries, such a positive effect is likely.

Second, the competitiveness losses of European producers in the downstream sectors enable competitors abroad to gain market share. African countries benefit from these opportunities, either by entering into these contested markets or by supplying goods to these new challengers. The terms of trade and wages go up from the increase in the demand for labour from producers of final and intermediate goods.

Not analysed here, it is also possible that the decrease in the volume of trade is accompanied by an increase in real wages when African producers increase their productivity. This can occur if producers import inputs that improve the efficiency of their production. This could lead to higher wages for workers, as firms are able to produce more with the same amount of inputs. Additionally, a shift in the composition of trade towards higher value-added goods could also lead to higher wages for workers.

However, these positive effects do not compensate for the losses resulting from the reduction of trade with the EU.

57 Anderson and Van Wincoop (2003). Gravity with Gravitas: A Solution to the Border Puzzle, American Economic Review, Vol. 93, No. 1, pp. 170-192, https://www.jstor.org/stable/3132167

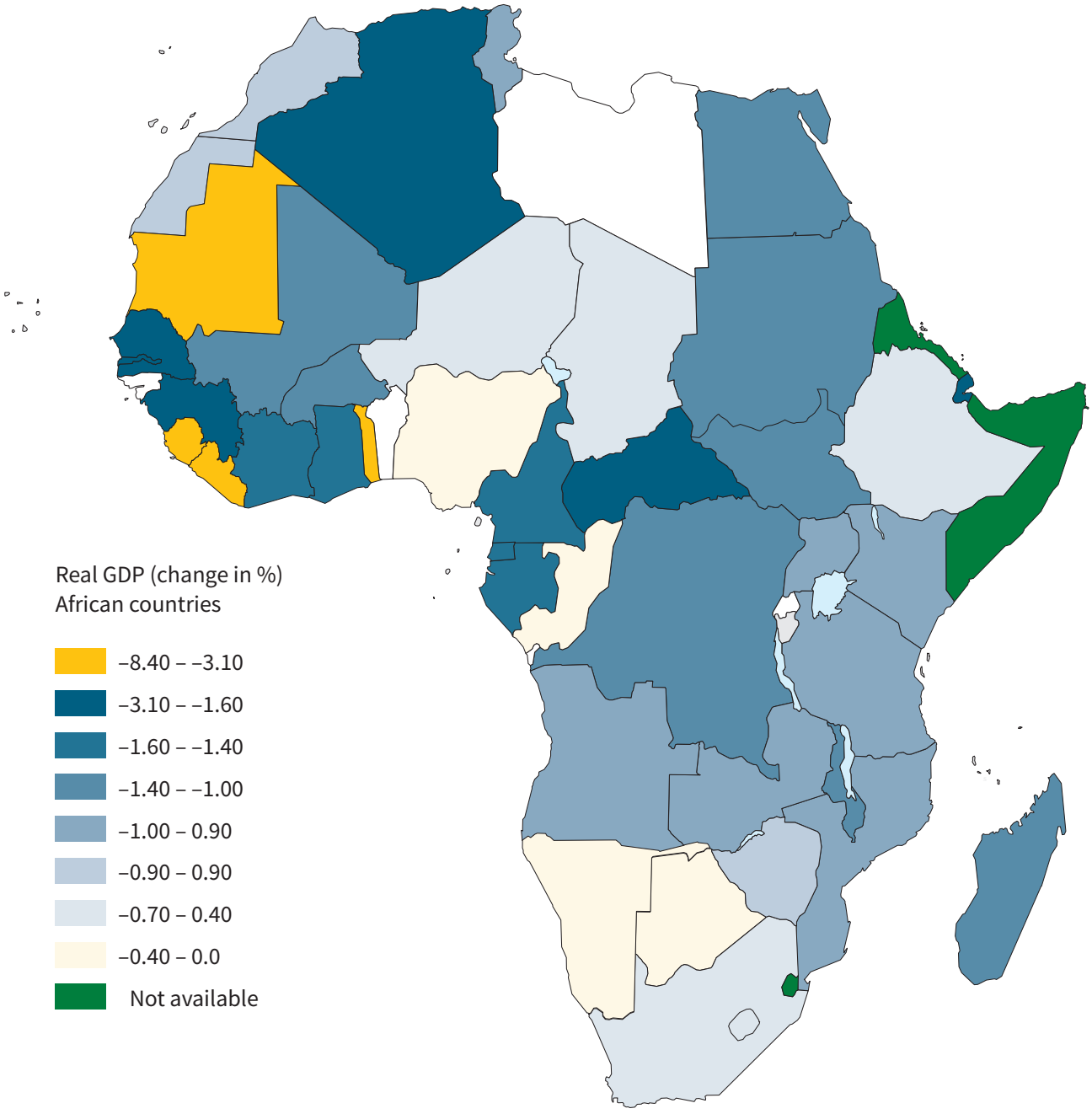
Table 8. Disaggregated Scenario B: Full coverage, limited impact (% change)

Country	Welfare	ToT	VoT	Real Wage
Algeria	−1.5	−0.34	−1.2	−0.85
Angola	−0.92	−0.12	−0.8	−0.63
Benin	−3	−0.035	−3	0.043
Botswana	−0.003	0.16	−0.16	1.3
Burkina Faso	−1.1	−0.22	−0.87	−1.1
Burundi	−0.59	−0.037	−0.56	−0.24
Cabo Verde	−2.4	0.51	−2.9	11
Cameroon	−1.4	−0.086	−1.3	−0.18
Central African Republic	−1.6	−0.017	−1.6	0.079
Côte d'Ivoire	−1.5	−0.21	−1.3	−0.7
Dem. Rep. of the Congo	−1	0.11	−1.1	0.86
Djibouti	−8.4	3.1	−11	14
Egypt	−0.88	−0.16	−0.72	−0.72
Ethiopia	−0.92	−0.64	−0.28	−0.8
Gabon	−1.4	0.29	−1.7	3.7
Gambia	−3.4	−0.38	−3	−0.62
Ghana	−1.5	−0.28	−1.3	−0.93
Guinea	−2.6	0.23	−2.9	1
Kenya	−0.9	−0.31	−0.6	−1.1
Lesotho	−0.37	0.64	−1	5.2
Liberia	−5.8	−1.1	−4.7	−1.4
Libya	5.1	5.1	0	23
Madagascar	−1.2	−0.018	−1.1	0.16
Malawi	−1.2	0.47	−1.6	1.5
Mali	−1.3	0.036	−1.3	0.5
Mauritania	−4.1	1.1	−5.2	6.9
Mauritius	−0.2	−0.064	−0.14	0.19
Morocco	−0.68	0.012	−0.69	0.45
Mozambique	−0.89	0.83	−1.7	2.5
Namibia	−0.28	0.15	−0.43	1.8
Niger	−0.7	−0.16	−0.54	−0.77
Nigeria	−0.36	−0.16	−0.2	−0.72
Rep. of the Congo	1.3	8	−6.7	34
Rwanda	−0.94	−0.13	−0.81	−0.53
Sao Tome & Principe	−2	−0.12	−1.9	0.023
Senegal	−1.6	0.002	−1.6	0.065
Seychelles	−1.7	3.6	−5.3	57
Sierra Leone	−3.2	0.091	−3.3	14
South Africa	−0.37	0.43	−0.79	1.8
Sudan	−0.8	−0.086	−0.71	−0.81
Swaziland	−0.4	0.082	−0.48	1
Tanzania	−0.92	−0.15	−0.77	−0.62
Tchad	−0.46	0.013	−0.47	0.28
Togo	−3.8	1.7	−5.5	4.8
Tunisia	−0.82	0.31	−1.1	2.6

Country	Welfare	ToT	VoT	Real Wage
Uganda	–0.72	–0.14	–0.58	–0.81
Zambia	–0.97	0.25	–1.2	9.1
Zimbabwe	–0.77	–0.6	–0.17	–0.006

In terms of welfare losses, a significant drop in real income occurs in West Africa. Moreover, the impact of the CBAM is asymmetrical, which could be problematic for common monetary areas, such as in the West African Economic and Monetary Union, where Senegal is more severely hit than other countries (e.g. Niger). However, even in that case, a devaluation of the currency might cushion the shock. A similar heterogeneous impact is observed in the Economic and Monetary Community of Central Africa (the Central African Republic in comparison to Chad), while the restrictive market access to the EU due to the CBAM is more homogeneous and less detrimental in the rest of Africa (for instance for countries of the East African Community or for the Southern African Customs Union). Figure 19 summarises these results in terms of welfare.

Figure 19: Change in real GDP, full coverage



Summary of country-level implications

For now, the list of products covered by the CBAM is short and includes only aluminium, steel and iron, fertilisers, electricity and cement.[58] We find that the impact of this carbon tax on African exports is relatively small even with a high carbon price, set at €87/tonne. This result is not surprising, as these exports represent a very small share of total exports from African countries. Countries specialising in this shortlist of goods in many instances find alternative outlets for their exports in other markets. The effect of the CBAM seems, in the stylised economy of our model, limited to few producers and then has limited macro effects.

Although there is currently no intention for the CBAM to cover all goods, the product coverage of the CBAM will be expanded over time. The European Commission has already warned that 'in the future [...] further products in these sectors as well as other sectors at risk of carbon leakage could be covered by the measure'.[59] Accordingly, we consider a much more ambitious policy with an implementation of the CBAM on all the products imported by the EU. Such full coverage may have very damaging effects for African economies. It is, however, a stylised scenario with, as currently scheduled, no intention for the CBAM to cover all goods. In this model, and unlike that of the previous section, much of this negative impact falls on the agricultural sector.

We find that, in the counterfactual world of our model, such a generalised CBAM has detrimental effects on the growth of African countries. Several small countries, specialised on agricultural products, are severely hit by this policy (see Annex B for some example). The hardest hit of all countries, Djibouti suffers an 8% recession.

ECONOMIC CONCLUSIONS

This part of the report assessed the economic impact of the CBAM on African countries using two different modelling approaches: a CGE model that analysed big-picture scenarios and an NTQM model that focused on country-level issues. Through scenario building, these models accounted for the different forms that the CBAM could evolve to take, including differences in the price of carbon, the products covered, internal EU carbon pricing policy, and whether other similar-minded countries join the EU in implementing equivalent CBAMs. Some of these scenarios relate better to the CBAM as it will initially emerge while others forecast how it might realistically evolve, and yet others still help us to understand what drives the economic impact of the CBAM on African countries.

We demonstrated that the initial CBAM, when its product coverage is limited, is unlikely to be overly burdensome. With the product coverage of the CBAM limited to the initial shortlist of products proposed by the EU at the time of writing (cement, iron and steel, aluminium, fertilisers and electricity) and with a relatively low carbon price per tonne of €40 (which is in fact lower than the price at the time of writing), the CBAM would be expected to reduce Africa's exports to the EU by just 1.32%. Many of those products would, however, find alternative buyers, particularly in China and India. The resulting impact on African GDP would be a decline of 0.58% (about $16 billion at 2021 levels of GDP). Nevertheless, African countries would be worse affected than many other economies owing to their relatively higher carbon intensity in production and disproportionate dependency on the EU marketplace for exports, with the EU being African countries' single most important export destination.

Nevertheless, there was found to be ample scope for the impact of the CBAM to scale if the price of carbon remains high, or even rises further, and if the scheme is expanded to cover more products. Internal reforms within the EU market, particularly to remove the ETS free allowances that are currently granted to protect certain carbon-emitting sectors, would help to mitigate some of the negative impact of the CBAM. Nevertheless, under a scenario of a CBAM applied to all products, and with the carbon price per tonne set at €87, even removing ETS free allowances would not stop the impact of the CBAM rising to reduce Africa's total exports to the EU by as much as 5.72%. Africa's GDP under such a scenario was estimated to fall by 1.12% (around $31 billion at 2021

58 As noted, hydrogen was subsequently added after the modelling in this report was conducted.

59 European Commission. (2022). Draft regulation of the European Parliament and of the Council establishing a carbon border adjustment mechanism – General approach.

levels of African GDP).

It seems likely that the EU will not be the only region to impose a CBAM or similarly equivalent regime. The US, Japan, Canada and UK are each considering their own alternatives to the CBAM. A scenario in which the EU CBAM is replicated in all of these countries alongside the EU amounts to a far larger global pressure against carbon-intensive production. We found, however, that the weight of those equivalent CBAM regimes would fall less proportionately heavily on African countries than on other economies in the world, such as China and India, owing to the smaller share of each of those 'joint CBAM' countries in Africa's exports.

Unsurprisingly, many African countries were assessed to be more exposed to the CBAM than others, as a result of the extent to which their exports are destined to the EU and the carbon intensity of those exports relative to other competing suppliers, both within the EU and in other countries. Countries that were found to be particularly vulnerable included many smaller economies and LDCs, including Djibouti, Liberia, Mauritania, Togo, Gambia, Sierra Leone, Benin, Guinea, Sao Tome and Principe, Senegal and the Central African Republic. In each of these economies, the impact of a CBAM covering all goods was estimated to have a negative impact on their GDP by more than 1.5% and up to 8.4%. A more limited CBAM, which more closely resembles the CBAM that will initially be imposed and covering only the initial shortlist of products, was found to be far less impactful, reducing the GDP of no individual African country by more than 1%.

PART II

CBAM AND INTERNATIONAL LEGAL FRAMEWORKS: OPTIONS FOR AFRICA

This section of the report sets out the implications of the CBAM regarding relevant obligations under international legal frameworks, viewed from three angles. The first angle provides an assessment of the legal implications of the CBAM under WTO rules, and specifically the General Agreement on Tariffs and Trade (GATT). The analysis includes an opinion on possible legal avenues African countries can pursue to address the effects of the CBAM on trade with the EU. There is no suggestion that African countries *should* bring a case against the CBAM. Rather, the objective is to set out the facts and legal issues that would be relevant if the CBAM were to be challenged under the WTO in relation to the GATT. Since it cannot be conclusively established how a CBAM challenge would be ruled upon by a WTO panel, the focus is on CBAM's potential strengths and weaknesses under relevant WTO rules.[60] The second angle reviews the technology transfer provisions set out in the WTO's TRIPS Agreement in relation to the role they could play in supporting clean-energy technology transfer and identifies both the opportunities and limitations. The third angle explores the enforceability of climate finance obligations under relevant international legal frameworks, with a focus on the WTO and the Paris Agreement.

60 While most trade between Africa and the EU is covered by the Everything But-Arms (EBA) preference scheme, the Economic Partnership Agreements (EPAs) or the Euro-Med Agreements, the WTO dispute settlement system would be the most practical venue for a claim against the CBAM to be filed, given its well-established and tested nature. Therefore, this section focuses exclusively on the WTO.

I – LEGAL IMPLICATIONS OF THE CBAM UNDER THE WTO

This section analyses the legality of the CBAM under relevant WTO provisions. Notwithstanding the EU's repeated claims that it intends to introduce and implement a CBAM that is WTO compliant, the EU CBAM and surrounding legal issues have generated intense discussion as to whether it will, in fact, be WTO compliant.[61] The text reflecting the agreement of the European Commission, the European Council and the European Parliament was released on 8 February 2023[62] and is awaiting formal approval from the European Parliament and the Council of the EU.

To assess the WTO consistency of the CBAM, arguments can be made under the Technical Barriers to Trade (TBT) Agreement, the Subsidies and Countervailing Measures (SCM) Agreement and the GATT. The GATT is the key agreement under which the CBAM's WTO consistency is analysed in this section, which looks at the strengths and weakness of the CBAM under the GATT.

Under the GATT, there are four sets of relevant rules that could be invoked against the CBAM. The applicability of these provisions for the CBAM would depend, in part, on whether the CBAM would be considered an internal tax or regulation, or rather a border measure.[63] If the CBAM were construed as an internal tax or regulation, it would be subject to **national treatment provisions under GATT Article III**, which requires that WTO members do not discriminate between imported products and 'like' domestic products. If the CBAM were construed as a border measure, it would be subject to **tariff bindings under GATT Article II**. It could be found to exceed, for example, the EU's relevant tariff bindings on covered products such as steel. However, the GATT does allow for an excess over the scheduled amount – if the CBAM (a 'charge') is equivalent to an 'internal tax' (the ETS) that complies with Article III.2. Thus, Article II on tariff bindings would be relevant only if the CBAM is considered not to be an internal tax or regulation. Moreover, if the CBAM were construed as a border measure that limits imports, it would risk violating **GATT Article XI, which sets out a prohibition on quantitative import restrictions**.

Irrespective of whether the CBAM would be construed as an internal tax or regulation or a border measure, it will be subject to the **Most Favoured Nation (MFN) provision under GATT Article I,** prohibiting discrimination between 'like' products from different trading partners.

Importantly, even if the CBAM is found to violate one or more of the four rules set out above, such violation can *still* be justified under the exceptions clause set out in GATT Article XX. The analysis below first establishes whether the CBAM could potentially violate MNF, national treatment, tariff binding commitments, and the prohibition of quantitative import restrictions, followed by an analysis of any potential justification of such violations under GATT Article XX.

61 See, e.g., Hillman, J. (2013). Changing climate for carbon taxes: Who's afraid of the WTO? Climate & Energy Policy Paper Series; Howse, R. (2015). Non-tariff barriers and climate policy: Border-adjusted taxes and regulatory measures as WTO-compliant climate mitigation strategies. In *European Yearbook of International Economic Law*, 3–18; Pauwelyn, J. (2007). *U.S. federal climate policy and competitiveness concerns: The limits and options of international trade law* (Nicholas Institute for Environmental Policy Solutions, Duke University Working Paper); Trachtman, J. (2016). *WTO law constraints on border tax adjustment and tax credit mechanisms to reduce the competitive effects of carbon taxes* (RFF Discussion Paper); Horn, H. & Mavroidis, P. (2011). To B(TA) or not to B(TA)? On the legality and desirability of border tax adjustments from a trade perspective. *The World Economy* 34(11), 1911–1937; Bacchus, J. (2021). *Legal issues with the European Carbon Border Adjustment Mechanism* (Cato Institute Briefing Paper No. 25); Espa, I., Francois, J., & van Asselt, H. (2022). *The EU proposal for a Carbon Border Adjustment Mechanism (CBAM): An analysis under WTO and climate change law* (WTI Working Paper no. 06/2022).

62 Council of the European Union, *Proposal for a regulation of the European Parliament and of the Council establishing a Carbon Border Adjustment Mechanism*, 8 February 2023 (COM(2021)0564 – C9-0328/2021 – 2021/0214(COD)). Available at: https://www.europarl.europa.eu/RegData/commissions/envi/inag/2023/02-08/ENVI_AG(2023)742452_EN.pdf.

63 Other GATT provisions that could have implications for the CBAM are the GATT Articles VIII on 'Fees and Formalities connected with Importation and Exportation' and X on 'Publication and Administration of Trade Regulations'. Due to space constraints, however, these provisions are not further analysed in this paper.

Legal assessment

1. Most Favoured Nation treatment

African countries can make arguments that the CBAM violates the MFN principle, which requires that WTO members accord equal treatment to 'like' imports from all countries, immediately and unconditionally.[64] This provision will be applicable to the CBAM irrespective of whether it is construed as an internal tax, regulation or border measure.

Products with different carbon intensities would be considered 'like' products, based on the four criteria highlighted in the jurisprudence when conducting a likeness analysis: (i) end-uses of a product in a given market; (ii) physical properties, nature and quality of the product; (iii) consumer tastes and preferences; and (iv) tariff classification.[65] Since the properties, nature and quality of the product and tariff classification remain similar for products with different carbon intensities, only consumer preferences could potentially be a relevant factor in considering products with different carbon intensities as 'non-like'. However, it would be difficult to establish that there is a difference in consumer preference between high carbon-intensive and low carbon-intensive products, such that it impacts the substitutability of products. Thus, the products with high carbon intensity will most probably be considered 'like' products manufactured with less carbon-intensive methods.

The CBAM could be found inconsistent with the MFN principle, both *de jure* and *de facto*. By exempting EFTA countries that are already a part of the ETS or have agreements to the same effect as the CBAM, the CBAM discriminates on the basis of origin.[66] Thus, the CBAM can be considered a *de jure* violation of the MFN principle. A *de facto* MFN violation may also arise if the CBAM 'imposes conditions that have a detrimental impact on the competitive opportunities for like imports from Members'.[67] In this regard, the absence of appropriate technologies to calculate emissions in developing countries would trigger the use of default values, which may impose higher tax burdens on, for instance, African products in comparison to others and render them uncompetitive. Moreover, the absence of carbon pricing mechanisms in Africa generally compared to other countries could signal the CBAM's detrimental impact on its competitive opportunities. Further, the CBAM discriminates against those countries with climate policies that do not adopt carbon prices, by allowing only those members with 'equivalent' carbon taxes to claim adjustments. These distortions in competition between goods of different WTO members would violate the MFN obligation.

2. National treatment

To find a violation of the national treatment provisions set out in GATT Articles III:2 and/or III:4, three criteria must be met: (i) the EU carbon measure must be construed as a border adjustable tax (Article III:2) or regulation (Article III:4); (ii) high and low energy-intensive products must be considered 'like'; and (iii) the CBAM must impose a heavier burden on imported products compared to domestic products. African countries can argue that the CBAM meets these three criteria, and thus constitutes a violation of the national treatment provisions set out in GATT Articles III:2 and/or III:4.

It can be argued that the EU carbon measure (the EU ETS) can be adjusted on imports (through the CBAM). If a domestic tax or regulation is sufficiently product or sales related, GATT Articles III:2 and III:4 allow countries to also impose it on imports to ensure equal conditions of competition.[68] The SCM Agreement provides further guidance on what types of taxes are adjustable at the border – albeit in the context of export rebates – noting that only indirect taxes are border adjustable. Since direct taxes include only property and income taxes, it could be concluded that the EU carbon tax, which is neither an income nor a property tax, is an indirect tax

64 Art. I.1, GATT 1994.
65 Report of the Working Party on Border Tax Adjustments, BISD 18S/97, para. 18; Appellate Body Report, *Japan – Alcoholic Beverages II*, p.20.
66 Trachtman, J. (2016). *WTO law constraints on border tax adjustment and tax credit mechanisms to reduce the competitive effects of carbon taxes* (RFF Discussion Paper), p.16.
67 Appellate Body, *EC – Seal Products*, para. 5.88.
68 Pauwelyn, J. & Kleinmann, D. (2020). *Trade related aspects of a Carbon Border Adjustment Mechanism: A legal analysis*. Briefing for the INTA Committee, European Parliament, p.8.

that can be potentially adjusted on imports.[69] At the same time, the requirement to surrender CBAM certificates at a weekly average EU price could also be considered as a regulation.[70]

Assuming that the EU ETS is an internal tax or regulation and thus can be adjusted on imports (through the CBAM), it cannot impose a heavier tax burden on imports compared to 'like' domestic products. As set out in the MFN section above, high and lower carbon-intensive products will mostly probably be found to be 'like' products. This leads to an assessment whether the CBAM imposes a heavier burden on imported products compared to 'like' domestic products. Three factors related to the design and implementation of the CBAM will play an important role in the national treatment discrimination analysis. The first factor concerns the price: the design of the CBAM suggests that there may be situations where the amount payable by importers exceeds prices payable by domestic 'like' products under the ETS, as the CBAM would depend on the method of carbon determination and certificate prices, which change on a weekly basis.[71]

The second factor concerns the determination of carbon content. The CBAM determines carbon content based on actual embedded emissions and, only where that is not possible, default values. Some scholars have argued that this increases the likelihood that the CBAM would be considered consistent with the national treatment principle.[72] However, arguments can also be made that the CBAM's various regulatory requirements distort the conditions of competition against imports as a group.**73** For example, in the absence of adequate information on embedded emissions in the CBAM declaration, the EU may use default values based on 10% of the worst-performing installations in that country (i.e. adverse inference). Previous WTO disputes have discussed the use of statutory baselines in the absence of verifiable data,[74] but they did not automatically authorise the use of the adverse inference principle. Instead, the domestic country's *predominant method of production*, or simply the best available technology, could have been used as a standard of measure.[75] Given the novelty of the CBAM and complexities surrounding carbon accounting methods, it is unlikely that producers in developing countries and LDCs will be able to provide verifiable emissions data *en masse*. Requiring importers to procure higher-priced allowances based on default values limits the competitiveness of imports, which could be a factor that suggests discriminatory treatment under Article III:4.

The third factor with relevance for the national treatment analysis is the phasing out of EU ETS allowances. Indeed, while the CBAM was originally presented as an alternative to the free allocation of EU ETS allowances, the Commission has proposed for the ETS and the CBAM to be operating side by side over a 10-year period, with the CBAM being gradually phased in and free allowances under the ETS gradually phased out.[76] This would arguably amount to EU industries receiving protection – on the one hand, they will benefit, at least partially, from being exempt from the costs they would have otherwise incurred as part of the EU ETS, while on the other hand, they will benefit from the fact that foreign producers would be paying a cost equal to the embedded emissions in their imported products.[77] Anticipating this issue, the EU has proposed that the requirement to surrender CBAM certificates will be commensurately phased in as the ETS free allowances are phased out. However, it is unclear how this would be done in practice, and a violation of the national treatment principle cannot be ruled out.[78]

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69 See, ibid.; Wooders, P. & Cosbey, A. (2010). Climate-linked tariffs and subsidies: Economic aspects (competitiveness and leakage). Presented at TAIT 2nd Conference on 'Climate Change, Trade and Competitiveness: Issues for the WTO' in Geneva, 16–18 June 2010.

70 Both an internal tax and regulation can be adjusted on imports. As set out in Pauwelyn and Kleimann (ibid.), the difference between the two in the context of the CBAM is that an internal tax can be adjusted either at the point of sale or consumption in the EU, or at the border through a charge that is 'equivalent' to the internal tax, whereas an internal regulation can only be adjusted for imports by applying the same or equivalent regulation on imports.

71 Ibid.

72 Espa, I., Francois, J., & van Asselt, H. (2022). *The EU proposal for a Carbon Border Adjustment Mechanism (CBAM): An analysis under WTO and climate change law* (WTI Working Paper no. 06/2022), p.21.

73 The Appellate Body in *EC – Asbestos* adopted the 'disparate impacts' test, which means that less favourable treatment must be assessed across groups of 'like' imported and domestic products. It allows a measure to discriminate between 'like' products, without being found to accord less favourable treatment to the entire group. Appellate Body Report, *EC – Asbestos*, para. 100.

74 Appellate Body Report, *US – Gasoline*, pp.27, 28.

75 Hillman, J. (2013). Changing climate for carbon taxes: Who's afraid of the WTO? Climate & Energy Policy Paper Series, 8. Howse writes that determining baselines on the basis of assumptions about domestic production processes may also violate Article III.2. Howse, R. (2015). Non-tariff barriers and climate policy: Border-adjusted taxes and regulatory measures as WTO-compliant climate mitigation strategies. In *European Yearbook of International Economic Law*, 10.

76 Espa, I., Francois, J., & van Asselt, H. (2022). *The EU proposal for a Carbon Border Adjustment Mechanism (CBAM): An analysis under WTO and climate change law* (WTI Working Paper no. 06/2022), p.16.

77 Ibid.

78 Ibid.

In sum, assuming that the EU's carbon tax would be construed as an internal tax or regulation that can be adjusted on imports, arguments can be made that the CBAM violates the national treatment provisions set out in GATT Article III:2 and/or Article III:4.

3. Tariff bindings

WTO members are prohibited from imposing any import duty (including 'other duty or charge') that is in excess of those provided in their respective schedules.[79] CBAM could be construed as an 'other duty or charge'[80] in violation of the GATT, as the EU's consolidated Schedule of Concessions does not contain any scheduled 'other duties or charges' for the products covered by the CBAM.

However, the GATT does allow for an excess over the scheduled amount – if the CBAM (a 'charge') is equivalent to an 'internal tax' (the ETS) that complies with Article III.2 and is imposed on a 'like' product or in respect of an article from which an imported product has been manufactured or produced. Thus, whether the CBAM violates tariff bindings would depend on whether it is construed as a border measure or an internal tax adjustable on imports.

As already set out, arguments can be made that the ETS is border adjustable, and thus falls within the scope of GATT Article III. However, arguments can also be made that the CBAM is a border measure, given that the act of importing the product – and not an internal event such as sale, distribution, use or transportation of the imported product – would trigger the obligation to purchase emission certificates.[81] This would be supported by the jurisprudence, as the Appellate Body held in *China – Measures Affecting Imports of Automobile Parts* that if the obligation to pay is accrued at the moment of, and by virtue of, importation, then it is a border measure, whereas if it is triggered after the good has been imported, it is considered an internal tax.[82] Thus, if construed as a border measure, arguments can be made that the CBAM violates tariff bindings under Article II.

4. Quantitative restrictions

The CBAM can also be potentially considered a quantitative restriction under GATT Article XI. While a *de jure* violation would be difficult to establish given that the CBAM does not seek to limit trade and imports, it does not preclude the possibility of a *de facto* violation. To establish a *de facto* violation, African countries must demonstrate that the CBAM, by its design, imposes conditions that create a disincentive to import[83] and has a limiting effect on the quantities imported.[84] At the same time, it cannot fall within one of the exceptions set out in Article XI:2.[85]

There are various aspects of the CBAM that could be considered to violate GATT Article XI, including: the fact that the covered goods can only be imported into the EU by authorised declarants who must buy CBAM certificates and declare the emissions in the imports; the fact that buying CBAM certificates is a precondition for importation; and the fact that increased administrative burdens and compliance costs, default emissions prices and discriminatory treatment, may not only hamper the quantities of imports from African countries, but also disincentivise African imports by reducing their competitiveness. Thus, depending on how the CBAM is construed, arguments can be made that the CBAM violates GATT Article XI.

79 Art. II.1(b), GATT 1994.

80 Appellate Body, *India – Additional Import Duties*, para. 151: 'The duties and charges covered by the second sentence of Article II:1(b) are "defined in relation to" duties covered by the first sentence of Article II:1(b), such that ODCs encompass only duties and charges that are not [ordinary customs duties].' Similarly in Panel Report, *Dominican Republic – Import and Sale of Cigarettes*, paras. 7.113-114: 'any fee or charge that is in connection with importation and that is not an ordinary customs duty, nor a tax or duty as listed under Article II:2 … would qualify for a measure as an "other duties or charges" under Article II:1(b).'

81 Bacchus, J. (2021). *Legal issues with the European Carbon Border Adjustment Mechanism* (Cato Institute Briefing Paper No. 25), p.3.

82 Appellate Body Report, *China – Measures Affecting Imports of Automobile Parts*, paras. 158–161.

83 Panel Reports in *India – Quantitative Restrictions* (para. 5.129) and *India – Autos* (paras. 7.269–7.270) read together.

84 Appellate Body, *China – Raw Materials*, paras. 319–320.

85 These exceptions note that Article XI shall not apply to export prohibitions or restrictions temporarily applied to prevent or relieve critical food shortages; import and export prohibitions or restrictions necessary to the application of standards or regulations for classification, grading or marketing; and import restrictions on agricultural or fisheries products, subject to certain conditions.

5. Potential justifications of the CBAM under GATT Article XX

So far, the potential legal weaknesses of the CBAM under the GATT have been assessed. It should be clear that there is strong likelihood that, should the CBAM be challenged in a dispute at the WTO, a panel will find a violation of one or more of the GATT provisions that were assessed. Even if the panel finds a violation, however, such a violation can be justified under the General Exceptions Clause set out in GATT Article XX. This means that, in all likelihood, the WTO consistency with respect to the CBAM will depend on whether it complies with the two-prong test set out in GATT Article XX. We assess the key factors of the CBAM that would be important for a panel's analysis under GATT Article XX, looking first at whether the CBAM would be covered by the environmental justifications set out in GATT Article XX (b) and/or (g), and second, whether the CBAM meets the requirements set out in the chapeau of GATT Article XX.

A. Environmental justification

For an otherwise WTO-inconsistent measure to be covered by GATT Article XX, there is a requirement as a first step that the measure falls within one of the subparagraphs that identify legitimate public policy objectives. Two subparagraphs are particularly relevant in the context of the CBAM: subparagraph (b) which requires that a measure is 'necessary to protect human, animal or plant life or health' and subparagraph (g), which requires that measures 'relat[e] to the conservation of exhaustible natural resources if such measures are made effective in conjunction with restrictions on domestic production or consumption'. The focus now shifts to these issues.

1. Whether the CBAM is necessary to protect human, animal or plant life or health under Article XX(b)

It is well established that a reduction of carbon emissions aims to protect human health from climate change.[86] There is also a 'sufficient nexus' between the environmental objective and the EU, given that GHG emissions mix in the atmosphere as they contribute to climate change globally. Thus, irrespective as to where they occur, they can be found to pose a risk to EU citizens. In addition, the CBAM's *necessity* to the achievement of this purpose must be demonstrated by 'weighing and balancing' three factors: (i) the extent of the CBAM's contribution to achieving the final objective, that is, reducing carbon emissions; (ii) the CBAM's trade restrictiveness in the light of the importance of the interests or values at stake; and (iii) the availability of less trade-restrictive alternatives with equivalent contributions to reduction of carbon emissions.[87]

A factor that could facilitate arguments that the CBAM is not more trade restrictive than necessary concerns the product scope of the measure: if the CBAM targets all products, including those that are low in carbon intensity, it could be argued that the measure is more trade restrictive than necessary in light of its objective of addressing climate change. Accordingly, the CBAM's scope is envisioned to (at least initially) cover only a handful of high carbon-intensive products which are also at a high risk of leakage: iron and steel, cement, fertiliser, aluminium and electricity. Indeed, the Commission has explained that the link between the sectoral coverage and the sectoral ambit of highest carbon leakage evidence is aimed at ensuring 'the highest environmental impact at relatively low administrative effort'.[88] The Commission is now seeking to further expand this logic by broadening product coverage to also include hydrogen, organic chemicals, and polymers, given their carbon intensity, further ensuring that the CBAM targets products with high carbon and trade intensity.[89] The proposal to include indirect emissions, certain precursors and some downstream products such as screws and bolts and similar articles of iron and steel would arguably further strengthen arguments that the CBAM is 'necessary' to protect human, animal or plant life or health. Indeed, failure to include these and other carbon-intensive products could undermine arguments regarding the environmental objective of the measure.

However, to challenge the CBAM's necessity on the basis of its trade restrictiveness, African countries could propose other reasonably available, less trade-restrictive alternatives to the CBAM that would meet the same objective, such as a uniform consumption-based carbon tax imposed on imports and domestic products; comprehensive and uniform labelling requirements for imported and domestic products; or

86 Panel Report, *Brazil – Taxation*, para. 7.880.
87 Appellate Body Report, *Brazil – Retreaded Tyres*, para. 156.
88 European Commission, CBAM Proposal.
89 Espa, I., Francois, J., & van Asselt, H. (2022). *The EU proposal for a Carbon Border Adjustment Mechanism (CBAM): An analysis under WTO and climate change law* (WTI Working Paper no. 06/2022), p.12.

export rebates for EU producers to offset differences between costs faced by them and their foreign counterparts.[90] Given the urgency of climate action as per the Paris Agreement as well as the fact that border adjustment remains a relatively open policy, and such alternatives may have their own weaknesses, the CBAM's contribution to reduction in emissions may be held to outweigh its trade restrictiveness. A WTO panel may therefore consider the CBAM as necessary to protect human health and hence provisionally justified under Article XX(b).

2. Whether the CBAM relates to the conservation of exhaustible natural resources under Article XX(g)

The second potential justification is Article XX(g). To fall under this exception, the CBAM must 'relate to the conservation of exhaustible natural resources if such measures are made effective in conjunction with restrictions on domestic production or consumption'. The CBAM aims to protect the planet from the effects of climate change, worsened by increasing carbon emissions. WTO jurisprudence has clarified that an exhaustible natural resource can encompass clean air,[91] and that it reflects 'contemporary concerns of the community of nations about the protection and the conservation of the environment'.[92] Therefore, the CBAM can be said to be a measure to conserve all planetary lifeforms in light of urgent and necessary climate action.

The CBAM must be 'related to' the conservation of natural resources, which means there must be 'a close and genuine relationship of ends and means'.[93] The CBAM contributes to lowering carbon emissions, which, as recognised by multilateral environment agreements (MEAs), has a direct and consequential impact on managing climate change. The effect is not merely incidental or inadvertent. Moreover, to fall within subparagraph (g), the CBAM must be made effective 'in conjunction with restrictions on domestic production or consumption'. Here, African countries could argue that while the CBAM runs parallel to the ETS, there is more favourable treatment generally available to domestic producers, thereby negating the CBAM's even-handedness. However, a panel may overlook this in the overall justification of the measure and enable the CBAM to be provisionally justified under Article XX(g).

In sum, credible arguments could be made to justify the CBAM under the first prong of the GATT Article XX exceptions clause – either under XX(b) or XX(g) or both.

B. Chapeau test of GATT Article XX

To fall within the Article XX exceptions clause, the CBAM must also comply with the chapeau of GATT Article XX, which requires that a measure does not arbitrarily or unjustifiably discriminate between countries where the same conditions prevail, or function as a disguised restriction on international trade.

As set out in the previous sections, arguments can be made that the CBAM constitutes discrimination under the MFN and/or National Treatment (NT) provisions. To establish that the CBAM's discrimination is not arbitrary or unjustifiable under the chapeau, there must be a rational connection between the discriminatory treatment and the objective of the measure.[94] In other words, for the CBAM to be justified, its discriminatory elements must be 'reconciled with, or rationally related to, the policy objective with respect to which the measure has been provisionally justified under one of the subparagraphs of Article XX'.[95]

There are various design features of the CBAM that could be considered to constitute arbitrary or nonjustifiable discrimination. For example, the CBAM discriminates against countries that have climate policies with no carbon pricing, even if such policies exhibit similar environmental outcomes, by not considering them eligible for reductions in certificates to be surrendered. As a result, regulations or bans on the use of coal-generated electricity in the exporting country would not be considered adequate to claim exemptions under the CBAM, even though such a measure would likely achieve the same level of emissions reduction. This discrimination could be considered unjustifiable or arbitrary.

90 All of these options may be subject to WTO challenge, but the potential of trade distortion and the number of undue burdens on exporting countries that disincentivise them will be reduced.
91 Panel Report, *US – Gasoline*, para. 6.37.
92 Appellate Body Report, *US – Shrimp*, para. 129.
93 See Appellate Body Report, *China – Rare Earths*, para. 5.90.
94 Appellate Body Report, *Brazil – Retreaded Tyres*, paras. 226–228.
95 Appellate Body Report, *US – Tuna II (Mexico) (Second Recourse to Article 21.5 – Mexico)*, para. 6.271.

Moreover, by making space for claiming reductions if a carbon price has been paid in a third country, the EU appears to be coercing all third countries to adopt essentially the same climate action policy, that is, a carbon tax. This type of discrimination cannot be said to be either even-handed or rationally related to the policy objective of addressing climate change.[96] WTO jurisprudence confirms that 'an intended and actual coercive effect on other governments' to 'adopt essentially the same policy' is considered impermissible in trade relations.[97]

The WTO Appellate Body has also held that 'discrimination exists […] when the application of the measure does not allow for any inquiry into the appropriateness of the regulatory programme for the conditions prevailing in those exporting countries'.[98] Indeed, the CBAM does not provide the flexibility to check the appropriateness of the CBAM under different national conditions, especially in low-income and least developed countries affected most by the measure,[99] by failing to consider developmental concerns and the principle of common but differentiated responsibility. In this regard, Professor Joost Pauwelyn has noted that 'the introductory phrase of Article XX may force the carbon-restricting country [i.e. the EU] to have lower or even no carbon restrictions on imports from developing countries, especially the poor ones'.[100] In other words, differential treatment based on countries' level of development would arguably strengthen a defence under Article XX of GATT, including arguments of 'necessity' under Article XX(b), and arguments that the CBAM does not amount to unjustifiable or arbitrary discrimination and is not a disguised restriction on trade.

In sum, while the EU could make credible arguments that the CBAM falls within subparagraph b and/or g of GATT Article XX, complying with the chapeau of GATT Article XX would, based on the existing jurisprudence, will likely be an uphill battle.

Strategic considerations

Based on the foregoing assessment, the CBAM raises a number of questions relevant to WTO consistency that could potentially be challenged in a WTO dispute. Most probably, the battle about the legality of the CBAM will take place in the context of GATT Article XX, in particular the chapeau. Such a potential WTO dispute would divide the WTO membership: most WTO members, including African countries, would be subject to increased CBAM fees and certificate requirements and would likely be in favour of challenging the measure based on its WTO consistency. Members with similar carbon regimes in place might focus their challenge on equivalence issues under the TBT Agreement, or rather, might not want to challenge the CBAM at all, for fear of the implications this will have on their own carbon tax adjustment regimes.

Should African countries want to ensure that the CBAM is designed and implemented in a way that is neither more trade restrictive than necessary nor discriminatory, they could opt to challenge the CBAM under the WTO dispute settlement system. This could be done with the support of the Advisory Centre on WTO Law. Alternatively, African countries could consider signing up as third parties to a WTO dispute against the CBAM initiated by another WTO member. The latter option would enable participation in legal challenges brought against the CBAM, while not shouldering the burden of the significant resources that are typically required to bring a dispute at the WTO. In considering engaging with the WTO dispute settlement system, it would be important to keep in mind that the WTO's appeal mechanism is not currently functioning, which risks panel reports being appealed 'into the void', and thus that a dispute remains unresolved.[101]

96 Trachtman writes: 'A BTA regime should not be designed to coerce other states into establishing their own carbon regimes or joining an international regime.' Trachtman, J. (2016). *WTO law constraints on border tax adjustment and tax credit mechanisms to reduce the competitive effects of carbon taxes* (RFF Discussion Paper), p.26.

97 Appellate Body Report, *US – Shrimp*, para. 161.

98 Ibid., paras. 164–165.

99 Brandi, C. (2013). Trade and climate change: Environmental, economic and ethical perspectives on border carbon adjustments. *Ethics, Policy & Environment* 16(1), 79–93. Available at: https://doi.org/10.1080/21550085.2013.768395.

100 Espa, I., Francois, J., & van Asselt, H. (2022). *The EU proposal for a Carbon Border Adjustment Mechanism (CBAM): An analysis under WTO and climate change law* (WTI Working Paper no. 06/2022), p.20, citing Joost Pauwelyn, Carbon leakage measures and border tax adjustments under WTO law, in Geert Van Calster and Denise Prévost (eds), *Research handbook on environment, health and the WTO* (Edward Elgar, 2013), 503–504.

101 Lester, S. (2022). *Ending the WTO dispute settlement crisis: Where to from here?* International Institute of Sustainable Development (IISD Policy Analysis). Available at: https://www.iisd.org/articles/united-states-must-propose-solutions-end-wto-dispute-settlement-crisis.

II – LEVERAGING THE TRIPS AGREEMENT TO FACILITATE ACCESS OF AFRICAN COUNTRIES TO EST

In parallel to considering a legal challenge to the CBAM, African countries can also consider leveraging the provisions in the TRIPS Agreement to access environmentally sound technologies (EST). These include technologies that consist of processes and innovative methods, such as energy storage, recycling and waste management, industrial processes and GHG reduction methods.[102] Based on World Intellectual Property Organization (WIPO) patent filings, most of the EST patents are concentrated in countries that are part of the OECD. It will be critical for African countries to ensure access to EST technologies to facilitate a green transition. This, in turn, could potentially mitigate the implications of the CBAM on EU market access. Although the CBAM stipulates a transitional period until the end of 2025, this is by no means a sufficient time frame for African countries to make the transition.[103]

The TRIPS Agreement sets out international rules relevant to the regulation of intellectual property rights (IPRs). Investments by African countries in a well-functioning IP system could have potential positive effects in the creation and diffusion of EST. At the same time, leveraging compulsory licensing and technology transfer provisions in TRIPS will be critical. This section addresses the role of the TRIPS Agreement in facilitating African countries' access to EST, focusing on compulsory licensing and technology transfer in the context of EST. It proposes possible actions African countries could consider to address limitations relevant to the applicability of existing flexibilities in the TRIPS Agreement.

Compulsory licensing for EST: Opportunities and challenges

The TRIPS Agreement enshrines exclusive rights of patent holders to use, offer for sale, sell or import the patented good, as well as to assign, transfer and license the patent. However, to ensure that a balance between IPRs and obligations is reached, the TRIPS Agreement incorporates flexibilities for developing countries and LDCs. For instance, Article 31 of the TRIPS Agreement allows members (or a third party authorised by it) to use a patent without the authorisation of the patent owner under certain circumstances – also known as compulsory licensing – subject to compliance with various conditions and requirements.

Specifically, for the issue of a compulsory licence, (i) the applicant must have tried to negotiate a voluntary licence; (ii) the scope and duration must be limited; (iii) the use should not be exclusive; (iv) the use should be for the supply of the domestic market; (v) the patent owner must be paid an adequate remuneration; and (vi) it should be subject to legal review. The requirement that efforts to obtain consent from the right owner have been made can be waived in a situation involving a 'national emergency or other circumstances of extreme urgence, or in the cases of public non-commercial use'.[104]

The TRIPS Agreement does not impose limitations on the types of technologies that can be subject to compulsory licensing. Nevertheless, discussions on compulsory licensing have centred around public health. In this regard, recognising the 'difficulties that WTO members with insufficient or no manufacturing capacities in the pharmaceutical sector could face in making effective use of compulsory licensing', and following the mandate of the ministerial conference, in 2003, the General Council issued a decision granting exporting members more flexibilities on compulsory licences to produce pharmaceutical products.[105] This amendment for pharmaceuticals allows WTO members to not only produce those goods for domestic use, but also for export, allowing countries with limited capacity to produce public health-related goods to access affordable pharmaceuticals through producers oversees that have such capacity. While imports under this mechanism are limited to LDCs, non-LDC countries may also apply it to imports by notifying their intention to do so.

102 Lewis, L. (2015). The applicability of TRIPS flexibilities to the developing world for climate change mitigation as a public good in green energy projects. *Asper Review* Volume XV.

103 Michaels, A. (2009). International technology transfer and TRIPS Article 66.2: Can global administrative law help least-developed countries get what they bargained for? *Georgetown Journal of International Law* 41(1), 231.

104 Article 31, TRIPS Agreement.

105 General Council Decision on the implementation of paragraph 6 of the Doha Declaration on the TRIPS Agreement and public health, of 30 August 2003, document WT/L/540 and Corr.1. Later, on 6 December 2005, the General Council issued the Protocol amending the TRIPS Agreement and sent it to the members for acceptance. As a result, the TRIPS Agreement was modified to incorporate the amendment, thus making this waiver permanent.

African countries could use compulsory licensing to ensure access to EST.[106] However, they might want to follow the process that took place in the pharmaceutical context, by seeking clarification and/or a review as to how compulsory licensing could be applied in the context of EST. This clarification or review should assess how the provisions on compulsory licensing in Article 31 of TRIPS would be relevant in the context of EST. This could focus on establishing that climate change is a national emergency, such that compulsory licences can be granted without the requirement of seeking prior consent from the patent right holder or without the requirement to produce only for the domestic market.

In 2013, Ecuador submitted a proposal to the TRIPS Committee, suggesting, *inter alia*, a reaffirmation of existing flexibilities in connection with EST and a review of the applicability – and restrictiveness – of provisions set out in Article 31 of TRIPS for compulsory licensing in the context of EST, and an evaluation of the regulation of voluntary licensing and conditions thereof, from the standpoint of the most vulnerable developing countries in the context of adaptation to and mitigation of climate change.[107] Ecuador's proposal furthermore sought to evaluate exemption from patentability inventions that were 'vital' for the diffusion of EST related to mitigation of climate change, as well as to promote open technology licensing when the development was financed with public funds.

African countries should consider joining forces with Ecuador and other interested developing countries and LDCs, and submit a new communication re-emphasising the importance of developing additional clarifications and/or a review of the applicability of compulsory licensing to EST. Such a submission could be made to the TRIPS Council, or under the Trade and Environmental Sustainability Structured Discussions (TESSD), which has highlighted the importance of 'promoting and facilitating access to environmental goods and services, including *encouraging the global uptake of new and emerging low-emissions and other climate-friendly technologies*'.[108]

Technology transfer in the TRIPS Agreement

In addition to compulsory licensing, African LDCs can also leverage the technology transfer provisions in the TRIPS Agreement. Technology transfer was traditionally understood as the exchange of hardware and machinery. Thus, assistance programmes focused on sharing tangible assets with LDCs.[109] The concept of international transfer of technology has changed. It is currently understood as 'any process by which a party in one country gains access to the technology of another party in a second country and successfully learns how to absorb it into its production function'.[110] It includes sharing knowledge and know-how with LDCs, which, unlike the traditional notion, are intangible.[111]

Specifically, Article 66.2 of TRIPS requires developed countries to provide incentives to enterprises and institutions in their territory to transfer technology for countries to establish a viable and sound technological base. At the same time, Article 7 of TRIPS states that protecting IPRs should promote the transfer and dissemination of technology in such a way that it encourages 'social and economic welfare', while TRIPS Article 8 acknowledges the right of members to adopt measures to (i) promote public interest in vital sectors for their technological development and (ii) prevent the use of IPRs to affect the international transfer of technology, and requires members to pursue public policy objectives.[112] These provisions suggest that EST would be covered by technology transfer provisions.

106 Compulsory licensing also has limitations: while compulsory licensing addresses patent barriers and thus facilitates access to patented technologies, it does not automatically mean African countries will be able to produce the technology.

107 Communication from Ecuador on Contribution of Intellectual Property to Facilitating the Transfer of Environmentally Rational Technology of 27 February 2013 to the TRIPS Council, WTO document IP/C/W/585.

108 Trade and Environmental Sustainability Structured Discussions (TESSD): Ministerial Statement on Trade and Environmental Sustainability (Revision), WT/MIN(21)/6/Rev.2, 14 December 2021.

109 Fox, D. (2019). Technology transfer and the TRIPS agreement: Are developed countries meeting their end of the bargain? *Hastings Science and Technology Law Journal* 10(1), 4.

110 Michaels, A. (2009). International technology transfer and TRIPS Article 66.2: Can global administrative law help least-developed countries get what they bargained for? *Georgetown Journal of International Law* 41(1), 231; K.E. Maskus quoted by Pandey, B.N. & Saha, P.K. (2011). Technology transfer in TRIPS Agreement: Implications for developing countries. *Dehradun Law Review* 3(1), 39.

111 Fox, D. (2019). Technology transfer and the TRIPS agreement: Are developed countries meeting their end of the bargain? *Hastings Science and Technology Law Journal* 10(1), 4.

112 Pandey, B.N. & Saha, P.K. (2011). Technology transfer in TRIPS Agreement: Implications for developing countries. *Dehradun Law Review* 3(1), 43.

However, various shortcomings could stand in the way of this provision resulting in the transfer of EST to LDCs. This includes the fact that Article 66.2 does not require developed countries to transfer technology to LDCs; it merely focuses on providing incentives to enterprises to do so. Related to this, the provision is silent on what constitutes 'incentives' or 'technology transfer'. Moreover, since members do not have direct control over IP, compelling governments to transfer relevant technologies will necessarily have limitations. As a result, the enforcement of technology transfer provisions under TRIPS has generally been highly ineffective.

There are several actions that African countries could consider undertaking to make the TRIPS technology transfer provisions more effective in the context of EST. First, while TRIPS Article 66.2 creates an obligation for developed countries, the initiative must come from the LDCs. Specifically, African LDCs could identify needs and priorities relevant to technology transfer for EST, to ensure the incentives provided by developed countries are focused on the transfer of these technologies. In the context of the CBAM, priority technologies could focus on those relevant to the production of products covered by the CBAM.

Second, African LDCs could seek to increase implementation of the technology transfer provisions by focusing on improving monitoring. In 2001, under pressure from LDCs, ministers agreed to 'put in place a mechanism for ensuring the monitoring and full implementation of the obligations'.[113] The mechanism was set up by the TRIPS Council in 2003.[114] This monitoring mechanism requires that developed countries provide information every year on the technology transfer incentives they have implemented. Yet, there is no agreed standard to evaluate whether the objective of incentivising technology transfer is being achieved. Developed countries seem to have interpreted the TRIPS provision to mean that they comply with Article 66.2 based on programmes aimed at providing technical assistance that substantially involves the transfer of readily accessible, generally mature technologies already available in the public domain.[115] In this regard, LDCs could seek to adopt clarification on how to identify that technology transfer obligations have been met in the context of EST.[116]

Like compulsory licensing, these discussions could either take place in the TRIPS Council, or within the TESSD framework. One of the additional benefits of having these discussions under TESSD is that it could facilitate focusing beyond the technology needs of LDCs, with an emphasis on a broader spectrum of developing countries which will help overcome the bureaucratic division between LDCs and developing countries in the African context.

Key take-aways

This section has analysed the relevance of TRIPS provisions to ensure access to EST for Africa. Accessing these technologies would minimise the potential negative effects of the CBAM on African exports to the EU, as it would enable a transition to production processes with a lower carbon usage. Such benefits will be particularly pronounced if African countries are able to access technologies relevant to producing products covered under the CBAM – both currently and potentially – with an eye towards an expanded scope.

Both the TRIPS provisions on compulsory licensing and technology transfer could enable African countries to access EST. However, it would be imperative for African countries to build a coalition with developing countries and LDCs to seek clarifications on the applicability of compulsory licensing to EST, and/or a review of the appropriateness of existing restrictions in compulsory licensing provisions as applied to EST. With regards to technology transfer of EST, African LDCs must adopt a proactive stance and identify the types of technologies that would be critical to enable a green transition, with a focus on technologies relevant to greening products covered by the CBAM. Focus on strengthening monitoring commitments would be another way to enhance implementation of TRIPS flexibilities.

113 Ministerial Decision on Implementation-Related Issues and Concerns, of 14 November 2001, at the Fourth WTO Ministerial Conference in Doha, Qatar, document WT/MIN(01)/17, para. 11.2.

114 TRIPS Council Decision on the Implementation of Article 66.2 of the TRIPS Agreement, of 19 February 2003, document IP/C/28.

115 Pandey, B.N. & Saha, P.K. (2011). Technology transfer in TRIPS Agreement: Implications for developing countries. *Dehradun Law Review* 3(1), 50.

116 Michaels, A. (2009). International technology transfer and TRIPS Article 66.2: Can global administrative law help least-developed countries get what they bargained for? *Georgetown Journal of International Law* 41(1), 243.

III – ENFORCEABILITY OF CLIMATE FINANCE OBLIGATIONS UNDER THE PARIS AGREEMENT AND THE WTO

Having assessed potential claims that can be made with regard to the CBAM's consistency under the WTO, and the relevance of the TRIPS Agreement to facilitate access to EST for African countries, this section focuses on climate finance obligations and analyses potential legal avenues of enforceability.

As set out above, the amended CBAM Proposal of June 2022, as adopted by the EU Parliament, includes a commitment by the EU to finance LDC efforts towards the decarbonisation of their manufacturing industries, which at the minimum would annually be at the level of revenues generated by the sale of CBAM certificates. While the Commission committed to report annually on the contribution of the CBAM revenues to the decarbonisation of the manufacturing industry in the LDCs,[117] this is contradicted by the provision in the February 2023 text agreed between the Commission, the European Parliament and the Council to direct CBAM revenues to the EU Innovation Fund.

However, based on a May 2022 press release,[118] the EU might seek to fulfil its commitments under the Paris Agreement by providing such financial support to LDCs, presumably under Article 9, which provides that developed country parties to the Paris Agreement *shall* provide financial resources to less developed countries, in continuation of their obligations under the UNFCCC.[119] From the outset, however, this approach would appear to negate the obligation to provide financial resources to developing countries as part of the principle of common but differentiated responsibilities, as the CBAM would still require African countries to pay for carbon emissions embedded in their EU exports.

This section assesses the legal implications of using CBAM revenues to fulfil the EU's Article 9 obligations under the WTO. In particular, it analyses the impact of doing so under GATT Article XX and looks at additional ways in which both trade and environmental legal frameworks can be leveraged to ensure that the EU fulfils its financial obligations under Article 9 of the Paris Agreement.

Legal implications of using CBAM funds to fulfil Article 9 commitments under the Paris Agreement

As set out above, ambiguity remains regarding the use of CBAM revenues. Using CBAM revenues to support decarbonisation in African countries would be preferable to the alternative of spending the revenues on the EU Innovation Fund.

From a legal perspective, using CBAM revenues to support decarbonisation in African countries by channelling the funds through a Green Climate Fund would strengthen the EU's arguments to justify the CBAM under GATT Article XX.[120] In particular, using the CBAM revenues, either in part or in full, to fund mitigation and adaptation activities in developing countries would strengthen arguments that the CBAM is *necessary* to protect human, animal or plant life or health under XX (b) or is *related to* the conservation of exhaustible natural resources under XX (g).[121] In addition, it would strengthen the EU arguments under the chapeau that the measure is not a disguised restriction on trade, and that the EU is acting in good faith.[122] Thus, legally, the EU would have an incentive to ensure that parts of its CBAM revenue will be used to support decarbonisation efforts in developing countries, including African countries.

117 European Parliament. (2022, May 17). CBAM: MEPs push for higher ambition in new carbon leakage instrument [Press release]. Available at: https://www.europarl.europa.eu/news/en/press-room/20220516IPR29647/cbam-meps-push-for-higher-ambition-in-new-carbon-leakage-instrument.

118 Ibid

119 For a commentary on Article 9 of the Paris Agreement, see Mehling, M. (2021). Article 9: Finance. In *The Paris Agreement on climate change*. Edward Elgar Publishing. Retrieved Nov. 4, 2022, https://www.elgaronline.com/view/book/9781788979191/book-part-9781788979191-18.xml.

120 See, Hillman, J. (2013). Changing climate for carbon taxes: Who's afraid of the WTO? Climate & Energy Policy Paper Series; Cosbey, A., Mehling, M., & Marcu, A. (2021). *CBAM for the EU: A policy proposal*. European Roundtable on Climate Change and Sustainable Transition. Available at: https://dx.doi.org/10.2139/ssrn.3838167.

121 Espa, I., Francois, J., & van Asselt, H. (2022). *The EU proposal for a Carbon Border Adjustment Mechanism (CBAM): An analysis under WTO and climate change law* (WTI Working Paper no. 06/2022), p.27.

122 Ibid.

Enforceability of the Paris Agreement/MEAs under WTO law

More broadly, the question arises whether trade agreements can play a role in ensuring that countries comply with their funding obligations under Paris Agreement Article 9. This provision provides, *inter alia*, that developed countries shall provide financial resources to assist developing countries with respect to both mitigation and adaptation in continuation of their existing obligations under the Convention. The issue of enforceability of provisions in MEAs under WTO law arises when actions allowed under the former implicate the obligations under the latter. However, there is no clarity on how such an issue may be resolved by a future panel as per past jurisprudence.

The Appellate Body in *US – Shrimp* referred to the Convention on International Trade in Endangered Species (CITES) while analysing whether endangered shrimp is an exhaustible natural resource as per GATT Article XX(g), regardless of the treaties' membership composition. However, the *EC – Biotech* panel interpreted Article 31(3)(c) of the Vienna Convention on the Law of Treaties (VCLT) to find that only treaties ratified by all WTO members can be invoked in a WTO dispute.[123] As a result, since the EU had based its measure on the Convention on Biological Diversity and the Cartagena Protocol on Biosafety, the panel rejected the EU's reliance upon the two MEAs to justify its measures. However, the panel left open the option of considering MEA rules in the process of interpretation, regardless of membership. It should be noted that these cases concerned the invocation of a MEA to justify a trade measure, but not to enforce an obligation *per se* in a MEA. With the number of MEAs and climate and environment-related trade measures on the rise, it can be reasonably presumed that the WTO will soon have to provide guidance on this specific issue.

In the absence of such guidance, several proposals have been made to clarify the relationship between MEAs and WTO law, including at the WTO Committee on Trade and Environment.[124] Since 1995, scholars have made proposals to amend GATT Article XX to include a subparagraph on measures taken in compliance with MEAs[125] or, going a step further, to presume compliance of any such measures with Article XX.[126] The calls for climate waivers have also gained prominence. They encapsulate the idea that WTO obligations will be waived for trade-restrictive measures taken in pursuit of climate action.[127] Similarly, a 'climate peace clause' has been proposed, requiring members to wait a specified time period before initiating a dispute.[128] These proposals all seek to increase the prominence of MEAs in assessing whether a WTO member can justify an otherwise WTO-inconsistent measure; they do not, however, ensure that WTO members actually implement commitments made under MEAs, including the Paris Agreement Article 9 obligations.

Moreover, since any waiver or peace clause must be adopted by consensus at the WTO, and given the current political climate at the WTO, it will be very difficult to envisage that such a waiver would be adopted soon. Moreover, introducing a waiver for climate-related commitments, or establishing a presumption of compliance with GATT Article XX, would require resolving various technical challenges. For example, in the context of the Paris Agreement, a key question is how to assess compliance with Nationally Determined Contributions. Questions like these can be expected to be further discussed over the years to come. It would be imperative for African countries to anticipate and play an active role in these discussions.

123 Panel Report, *EC – Biotech*, para. 7.68.

124 Nissen, J.L. (1997). Achieving a balance between trade and the environment: The need to amend the WTO/GATT to include multilateral environmental agreements. *Law and Policy in International Business* 28(3), 901, 918.

125 Ibid.

126 Bacchus, J. (2016). *Global rules for mutually supportive and reinforcing trade and climate regimes* (E15 Initiative Policy Options Paper), p.16. Available at: https://www3.weforum.org/docs/E15/WEF_Climate_Change_POP.pdf.

127 Bacchus, J. (2017). *The case for a WTO climate waiver*. Centre for International Governance Innovation. Available at: https://www.cigionline.org/sites/default/files/documents/NEWEST%20Climate%20Waiver%20-%20Bacchus.pdf.

128 Ibid.

Enforceability of the Paris Agreement under RTAs

In contrast to the WTO, momentum to strengthen the link between the Paris Agreement and trade agreements is developing in the context of EU Regional Trade Agreements (RTAs). In its 2021 Trade Policy Review and 2022 Review of Trade and Sustainable Development provisions, the Commission announced its intention to make the Paris Agreement an 'essential element' of future trade agreements.[129] Making the Paris Agreement an essential element of RTAs would allow either party to the RTA to unilaterally suspend the agreement in whole or in part, following a breach of the Paris Agreement. This marks an important innovation in the EU's approach to sustainable trade, with potential significance for the wider sustainability agenda.[130]

This could be relevant to ensure the EU fulfils its climate financing obligations under Article 9 of the Paris Agreement. In this context, it would be useful for an RTA that has elevated the Paris Agreement to an essential element of its own agreement, to further include a specific reference to Article 9 of the Paris Agreement as an 'essential' part of that Agreement, thus elevating the consequences attached to failure to provide climate finance. As the EU seeks to implement its new approach to the Paris Agreement in future RTAs, it would be important for African countries to take note of any direct references to the climate finance obligations.

Development assistance obligations under WTO law

Special and differential treatment (S&DT) towards developing countries and LDCs has been a fundamental principle under WTO law. Unlike climate law, there is no equivalent obligation to provide financial assistance to WTO members. It includes instead assistance related to technical assistance and capacity building. The following subsections analyse the implications of certain S&DT provisions and the Aid for Trade (AfT) programme on climate finance.

1. GATT Article XXXVI and Article XXXVII

Part IV of the GATT titled 'Trade and Development' enshrines principles, objectives and commitments in Articles XXXVI and XXXVII. Specifically, Article XXXVI.6 underscores the need for collaboration between all members and international lending agencies to ensure economic development in the poorer countries. Article XXXVI.7 calls for collaboration between WTO members and UN agencies like the UNFCCC Secretariat. Article XXXVII contains mandatory obligations to reduce barriers on a high priority basis to products of particular export interest to developing countries and to refrain from imposing new or increasing existing barriers on such products. Developed countries are required to make best efforts to maintain trade margins with less developed countries at equitable levels, and actively consider other measures that can increase their exports.

These provisions do not contain any explicit mandate for developed countries to transfer funds to African nations. But they highlight the need for cooperation with other organisations to provide financial assistance, which will be a useful provision if African nations negotiate the inclusion of climate finance as a precondition to accepting any waivers benefiting developed countries. Increased technical cooperation between the WTO and the IMF or the Green Climate Fund will enhance transparency and increase accountability of members.

Under Article XXXVII, members' commitment to eliminate trade barriers and refrain from imposing customs duties or introducing fiscal measures in relation to imports from less developed members may be used in the challenge against the CBAM, as the CBAM does not introduce any exemptions for them.

Further, the best-efforts obligation to explore other supportive measures can also be leveraged by African countries to ensure that the EU attempts to adequately fund both adaptation and mitigation efforts. Any failure to consider such financing or negotiate financing commitments in relation to trade or consult with affected stakeholders may be argued to be inconsistent with the specific obligations under Article XXXVII.[131] However, there is no tangible or effective remedy.

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129 European Commission, 18 February 2021, Trade Policy Review; European Commission, 22 June 2022, TSD Review.

130 Bryan, K. (2021, February 2). Climate change and human rights in EU international agreements: Essential elements. Available at: https://www.linkedin.com/pulse/climate-change-human-rights-eu-international-agreements-bryan/.

131 See, Panel Report, *EEC – Restrictions on Imports of Dessert Apples*.

2. Aid for Trade

Aid for Trade, a development assistance programme, could be leveraged to meet climate finance goals. As reported by the OECD, AfT has been successful in mobilising US$400 since 2006.[132] It is instrumentalised in various ways, one of which is the Enhanced Integrated Framework (EIF), a multi-donor managed trust fund situated within the WTO Secretariat. EIF evaluates the funding priorities through Diagnostic Trade Integration Studies (DTIS). In the past, environmental concerns have not featured much in the funding considerations and have been geared toward building economic infrastructure and productive capacity.[133] But the AfT remains an opportunity for developing countries to identify and link climate-related ambitions in trade and prioritise such action areas for funnelling climate finance. For example, the EIF DTIS could highlight climate-related infrastructure and capacity as clear areas requiring funding or consider national trade policies that are designed to respond to commitments under the Paris Agreement.

However, AfT is a mechanism that lacks enforceability. Even if development assistance can be seen as S&DT under various agreements, whether climate finance amounts to development assistance that *per se* can qualify as S&DT is unclear. Indeed, whether S&DT itself is enforceable is subject to legal debate. In 2006, Stiglitz and Charlton recommended that for WTO development programmes like AfT to be successful, they need to be made enforceable under WTO law.[134] However, consensus on such a proposal would be very difficult to achieve, especially from developed, donor countries. As an alternative, transparency can be used to monitor the commitments made, their fulfilment, and improve accountability of donor countries. Some recommendations include adding a review of AfT performance (including commitments and disbursements) in the WTO Trade Policy Review process and in the WTO's biannual AfT Global Review process.[135]

The Enhanced Transparency Framework of the Paris Agreement includes mandatory reporting requirements on aggregate financial support mobilised under the Paris Agreement. Developed countries in particular are required to report the financial assistance they have provided under Article 9 and related information on how the finance is disbursed with granular-level information.[136] While the mechanism is not useful as a tool of enforcement, it is a useful tool to monitor the level of fulfilment of the commitments made by developed countries and evaluate the nature and quality of climate finance being provided. The availability of this information will help to respond to climate finance gaps, evidence-based policy resolutions as well as help build trust between nations.[137]

ICJ under Paris Agreement

The Paris Agreement provides for recourse to dispute settlement under the International Court of Justice (ICJ), in accordance with the provision in the UNFCCC. However, recourse to the ICJ requires that both parties to the dispute have accepted the ICJ's jurisdiction. To date, only the Netherlands has done so, rendering an ICJ dispute not a practically available option to enforce finance obligations under Article 9 of the Paris Agreement. Another option for African countries is to consider obtaining non-binding 'advisory opinions' from the ICJ on developed countries' climate finance obligations under the current MEAs. While such opinions are only consultatory, they hold great moral value. But the possibility also remains that the ICJ advises against the existence of any climate finance obligation.

132 OECD/WTO. (2019). Aid for Trade at a glance 2019: Economic diversification and empowerment. Available at: https://read.oecd-ilibrary.org/development/aid-for-trade-at-a-glance-2019_18ea27d8-en#page1.

133 Keane, J., Bird, N., Tanjangco, B. & Colenbrander, S. (2021). *Aligning climate finance and aid for trade: A new agenda for LDC negotiators* (ODI Policy Brief). Available at: https://cdn.odi.org/media/documents/Aligning_climate_finance_and_Aid_for_Trade_X1bReFA.pdf.

134 Stiglitz, J. & Charlton, A. (2006). Aid for Trade. *International Journal of Development Issues* 5(2), 8.

135 Birkbeck, C.D. (2022). Greening Aid for Trade and sustainable development: Financing a just and fair transition to sustainable trade. International Institute for Sustainable Development, p.56. Available at: https://www.iisd.org/system/files/2022-07/greening-aid-trade-financing-just-transition.pdf.

136 UNFCCC Decision 18/CMA.1, Modalities, procedures and guidelines for the transparency framework for action and support referred to in Article 13 of the Paris Agreement (15 December 2018) FCCC/PA/CMA/2018/3/Add.2.

137 Weikmans, R. & Roberts, J.T. (2017). The international climate finance accounting muddle: Is there hope on the horizon? *Climate and Development* 11(2), 97–111. Available at: https://doi.org/10.1080/17565529.2017.1410087.

Key take-aways

This section provided an assessment of the implications of using funds generated by CBAM to meet the EU's funding obligations under Article 9 of the Paris Agreement. In undertaking this assessment, it provided an overview of the possible role of the WTO, RTAs and the ICJ with regard to the implementation of obligations under the Paris Agreement, including obligations to provide climate finance. It found that under the WTO, using CBAM revenues to contribute to climate funds for developing countries would in fact strengthen, not weaken, arguments the EU could make under GATT Article XX to justify the CBAM.

At the same time, it was highlighted that while the WTO's existing jurisprudence does not place much emphasis on obligations countries have undertaken as part of their MEAs, momentum is building in EU RTAs to increase the consequences of a breach of the Paris Agreement by elevating it to an essential element clause. Development assistance provisions under the WTO and their potential relevance for climate finance obligations were reviewed. The role that the ICJ could play in adjudicating climate finance obligations was outlined.

Discussions and developments at the intersection between climate change finance obligations and trade law will become more frequent in the years to come. African countries should closely follow developments in all relevant fora to ensure they influence these discussions and that their interests are taken into account.

LEGAL CONCLUSIONS

This part of the report reviewed the legal implications of the CBAM under the WTO, the relevance of technology transfer provisions set out in the TRIPS Agreement, and the issue of WTO enforceability of climate finance obligations under the Paris Agreement Article 9, with particular emphasis on potential legal consequences should the EU decide to use CBAM proceeds to comply with its climate finance obligations.

As regards to WTO legality of the CBAM and options for Africa, various potential areas of WTO inconsistency that could be challenged were noted. Ultimately, whether the CBAM will be found to be consistent with the WTO will likely depend upon whether it can be justified under the provisions set out in GATT Article XX. If African countries wish to challenge the legality of the CBAM, organisations such as the Advisory Centre on WTO Law (ACWL) (as noted earlier) can provide the necessary legal guidance and support to do so. Further, various ways in which technology transfer and compulsory licensing provisions can be leveraged in the context of EST were assessed. Important weaknesses can be found in these provisions which suggest that African countries should seek a review while proactively identifying the types of critical EST that are required for a green transition. The WTO TESSD forum should also be an important platform for African countries to participate in, to identify their interests and explore ways in which African countries and other developing countries and LDCs could access critical EST technologies.

Finally, in relation to implementing climate financing obligations, several ways in which the WTO, RTAs and the ICJ could be relevant were noted. The overarching conclusion, however, is that there is a lack of clarity in the provisions that could be invoked to ensure compliance with climate financing commitments under the Paris Agreement. However, discussions about how to better align the Paris Agreement with trade obligations can be expected to gain momentum in the next few years. African countries should stand ready to shape these discussions.

ANNEX A
COMPUTABLE GENERAL EQUILIBRIUM MODEL

This study uses a static multi-region world CGE model to analyse the economic and environmental impacts of the CBAM on the African economy. CGE models are used to investigate the impacts of public policy, and have been widely used to explore the impacts of trade and environmental policies.[138] For this study, the PEP-w-1 model, developed by Lemelin and colleagues,[139] is used. The PEP-w-1 model is a multi-region, single period world model version of the PEP-1-1 model, developed by Decaluwe et al.[140] The equations in the model follow the neoclassical economic theory and assume that consumers and producers are rational, and seek to maximise utility given budget constraints and minimise production costs, respectively. The PEP CGE model is a standard model. However, an environmental module is created in the model by adding new equations that link sectoral outputs with CO_2 emissions. The emission coefficients are obtained from the GTAP database.

The PEP model separates capital and labour into several categories, and takes into account a broader set of tax instruments. In the model, output is composed of intermediate consumption and value added in fixed proportion. Value added is a composite of the production factors (which include land, labour and capital) via a constant elasticity of substitution (CES) function. Commodities produced in each sector of the economy are either sold in the domestic market or exported to the rest of the world, and this relationship is depicted by a constant elasticity of transformation (CET) function. The relative prices of domestic sales and exports provide a

138 De Melo, J. (1988). Computable general equilibrium models for trade policy analysis in developing countries: A survey. *Journal of Policy Modeling* 10(4), 469–503; Piermartini, R. & Teh, R. (2005). Demystifying modelling methods for trade policy. WTO Discussion Paper No. 10, World Trade Organisation, Geneva, Switzerland.

139 Lemelin, A., Robichaud, V., Decaluwe, B., & Maisonnave, H. (2013). PWP-w-1: The PEP Standard multi-region, single period world CGE model. Partnership for Economic Policy (PEP), Nairobi, Kenya.

140 Decaluwé, B., Lemelin, A., Robichaud, V., & Maisonnave, H. (2013). PEP-1-1: The PEP standard computable general equilibrium single-country – Static CGE model, Version 2.1. Partnership for Economic Policy (PEP), Nairobi, Kenya.

signal for producers in this respect. Similarly, commodities consumed in the domestic market comprise both imported and domestically produced commodities, which are assumed to be imperfect substitutes. This is indicated using the Armington assumption with a CES function between imported and domestic commodities.

The CGE model is calibrated to the GTAP 10.a database. The GTAP 10.a database provides an overview of the global economy in four reference years: 2004, 2007, 2011 and 2014, including bilateral trade flows, transportation and protection linkages and flows between domestic industries. The main database includes 141 countries/regions (including 121 countries and 20 regions), 65 sectors and 5 factors. The countries and regions included in the database account for 98% of the global GDP and 92% of the global population.[141]

To run the model in line with the objectives of this study, the 141 countries/regions and 65 sectors are aggregated. Given that the CBAM is initiated and implemented by the EU, all EU countries are aggregated as a bloc (EU). The focus of this study is to examine the impacts of the CBAM on Africa. Hence, all African economies are aggregated. Other key economies are also included in the model. These are countries that have strong trade and economic relations with Africa. The idea is to ascertain if the implementation of the CBAM will lead to trade diversion from Africa–EU to Africa and other countries. The key economies included are the USA, UK, China and India. All other countries are aggregated as the RoW. In total, the data aggregation and model include seven countries/regions: EU, Africa, USA, UK, China, India and the RoW. In some scenarios, the country aggregations are changed in line with the specification of the CBAM scenarios. It is also noteworthy that the model assumes that the UK is no longer part of the EU, but the CBAM is not imposed on the UK.

Similar to the aggregation of the regions, 65 sectors in the GTAP database are aggregated into 14 sectors. The aggregation of the sectors is partly informed by the design of the CBAM and the emission-intensiveness of the sectors. The CBAM is imposed on energy-intensive sectors such as electricity, cement, glass, steel, aluminium, paper, petroleum and coal, chemicals and fertiliser. While the sector aggregation is done taking this into consideration, other key sectors for African economies like agriculture and minerals are considered. The key sectors that are targeted by the CBAM in this study (fertiliser, electricity, iron and steel, aluminium, cement) are disaggregated. Other key sectors such as agriculture, energy sectors (coal, oil and gas), transportation and services are also disaggregated. In all, the 14 sectors are agriculture, fertiliser, electricity, iron and steel, aluminium, cement, coal, crude oil, natural gas, petrochemical, manufacturing, transport, other services and public administration. The International Standard Industrial Classification of All Economic Activities (ISIC) of the UN is used for matching the sectors of interest (in the CBAM framework) with the sectoral classification in the GTAP database.

The five production factors (skilled labour, unskilled labour, capital, land and natural resources) in the GTAP 10.a database are retained. The aggregation was done using the GTAPAgg2 and methodology provided by Robichaud in the general algebraic modelling system (GAMS).[142]

141 Aguiar, A., Chepeliev, M., Corong, E., McDougall, R., & Van der Mensbrugghe, D. (2019). The GTAP database: Version 10. *Journal of Global Economic Analysis* 4(1), 1–27.
142 Robichaud, V. (2015). How to create input files for DATA_AGG.gms. Partnership for Economic Policy (PEP), Nairobi, Kenya

COMPUTATION OF EMISSIONS EMBODIED IN TRADE

To calculate the tariff equivalent of the CBAM, the CO_2 emissions data in the GTAP database is used. The GTAP CO_2 emission data is from CO_2 emissions from fossil fuel combustion as reported by the International Energy Agency (IEA). It assumes that embodied CO_2 emissions are associated with bilateral trade and intermediate input employed by different countries/regions.[143] The GTAP database captures the bilateral trade flows and industries' CO_2 emissions per unit of production at the country and commodity level. This approach of CO_2 estimation aligns with the Tier 1 methods of the 1996 Intergovernmental Panel on Climate Change (IPCC) guidelines and is updated to reflect the current emission accounting framework.

To calculate the tariff equivalent of the CBAM at €40 per tonne and €87 per tonne, the emissions embodied in exported communities to the EU are multiplied by the carbon prices to determine the *ad valorem* equivalent of the CBAM.[144] It is this *ad valorem* equivalent that is now applied as a tariff surcharge to simulate the impacts of the CBAM. In other words, the carbon price is multiplied by the emission per output in each sector to get the carbon cost. Then, the data on total import and import tariff in the GTAP database is used to calculate the existing tariff. The carbon cost is then added to the existing import tariff to calculate by how much the tariff rate increases specifically because of the carbon cost. It is this increase in the tariff rate that is now used as a shock in the model.

143 Chepeliev, M. (2021). Possible implications of the European Carbon Border Adjustment Mechanism for Ukraine and other EU trading partners. *Energy Research Letters* 2(1); European Commission. (2019). The European green deal. Available at: https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=COM%3A2019%3A640%3AFIN.

144 Ibid.

ANNEX B
NEW TRADE QUANTITATIVE MODEL

The model used for this section is based on Caliendo and Parro,[145] who propose a multi-country and multisector Ricardian model (i.e. an extension of Eaton and Kortum).[146] There are N countries and J sectors. Subscripts k and j are used for sectors, o and d for countries. This economy is composed of L representative households that maximise a Cobb-Douglas utility function of final goods denoted C_d^j, with α_d^j the preference parameter for these goods:

$$u(C_d) = \prod_{(j=1)}^{J} (C_d^j)^{\alpha_d^j}$$

which is maximised under the income constraint $I_d = C_d P_d$ where income depends on wages and on lump-sum transfers of tariff revenues (defined later) with the consumption price index, P_d, given by:

$$P_d = \prod_{(j=1)}^{J} (P_d^j / \alpha_d^j)^{\alpha_d^j} \qquad (1)$$

145 Caliendo, L. & Parro, F. (2014). Estimates of the trade and welfare effects of NAFTA. *The Review of Economic Studies* 82(1), 1–44.
146 Eaton, J. & Kortum, S. (2002). Technology, geography, and trade. *Econometrica* 70(5), 1741–1779.

These final goods are produced in the intermediate sectors with the same technology than intermediate goods. A continuum of intermediate varieties, denoted $\omega^j \in [0, 1]$ is produced in each sector *j.* These producers differ in their efficiency to produce by a factor $z_d^j(\omega^j)$ drawn from a Fréchet distribution. In this sector, the production is a Cobb-Douglas function γ_d^{kj} with the share of materials from sector k used in the production of intermediate good j, denoted $m_d^{kj}(\omega^j)$, and y_d^j the share of labour $l_d^j(\omega^j)$. This production function is given by:

$$q_d^j = z_d^j(\omega^j)\,[l_d^j(\omega^j)]^{\gamma_d^j} \prod_{(k=1)}^{J} [m_d^{kj}(\omega^j)]^{\gamma_d^{kj}} \qquad (2)$$

The wage of workers is denoted wd and labour is mobile between sectors but not between countries. Intermediate goods, which are tradable and non-tradable goods, are produced under constant return to scale. Firms evolve under perfect competition and set the price at the unit cost $c_d^j/z_d^j(\omega^j)$ with c_d^j the cost of an input given by:

$$c_d^j = A_d^j w_d^{\gamma_d^j} \prod_{(k=1)}^{J} (P_d^k)^{\gamma_d^{kj}} \qquad (3)$$

where A_d^j is a constant (depending only of γ_d^j) and P_d^k the price index of intermediate goods.

This equation describes sectoral linkages, where change in a price of one intermediate good affects the cost of other products.

The supply of all intermediate goods in the sector k and country d, following the Ethier formulation, is given by:

$$Q_d^j = [\int r_d^j(w^j)^{1-\sigma^j} dw^j]^{1/(1-\sigma^j)}$$

where σ^j is the elasticity of substitution between intermediate goods within sector j and where

$$r_d^j(w^j) = \left[\frac{p_d^j(w^j)}{P_d^j}\right]^{\sigma^j} Q_d^j$$

where $p_d^j(w^j)$ is the lowest price of intermediate good w^j across all location d (defined below). Trade costs, k, depend on tariffs and distance:

$$k_{do}^j = \tilde{\tau}_{do}^j d_{do}^j \qquad (4)$$

with $\tilde{\tau}_{do}^j = (1 + \tau_{do}^j + cbam_{do}^j)$ where τ_{do}^j the *ad valorem* tariff, $cbam_{do}^j$ the *ad valorem* carbon adjustment and d_{do} the distance between o and d.

Producers in sector j in country d supply a composite intermediate good w^j by purchasing intermediate goods from the lowest cost suppliers across countries. Since trade costs take the form of iceberg costs, a tradable good produced in o is available at location d at the following price:

$$p_d^j(w^j) = \min\left\{\frac{c_o^j k_{do}^j}{z_o^j(w^j)}\right\}$$

Infinite international trade costs are assumed for non-tradable goods as well as zero local trade costs such as $p_d^j(w^j) = c_d^j/z_d^j(w^j)$.

Using all these assumptions, the price index of composite goods is given by:

$$P_d^j = A^j \left[\sum_{0=1}^{N} \lambda_o^j (c_o^j k_{od}^j)^{-\theta^j} \right]^{-1/\theta^j} \quad (5)$$

with A^j a constant, λ_d^j the location parameter of the Fréchet distribution that varies by country and sector, and θ^j the shape parameter of this distribution that is sector specific.

Finally, the market clearing condition on the good market equals the supply to the demand of final goods and intermediate goods:

$$Q_d^j = C_d^j + \sum_{k=1}^{J} \int m_d^{j,k}(w^j) dw^j$$

Using the properties of the Fréchet distribution, the expenditure shares, denoted π_{do}^j, take the following form:

$$\pi_{do}^j = \frac{\lambda_o^j [c_o^j k_{do}^j]^{-\theta^j}}{\sum_{h=1}^{N} \lambda_h^j [c_h^j k_{dh}^j]^{-\theta^j}} \quad (6)$$

This share is thus just a function of prices, technologies and trade costs. Total expenditures on goods j, χ_j^d, are the sum of the expenditures such as:

$$X_d^j = \sum_{k=1}^{N} \tau_d^{j,k} \sum_{o=1}^{N} + x_o^k \frac{\pi_{od}^k}{1+\tau_{od}^k} + l_d \alpha_d^j \quad (7)$$

where the final absorption in country d, l_d, depends on wages w_d, tariff revenues $R_d = \sum_{j=1}^{j} \sum_{i=1}^{N} \tau_{od}^j M_{od}^j$ (with M_{od}^j the amount imported $M_{od}^j = x_d^j \frac{\tau_{do}^j}{1+\tau_{do}^j}$) and trade deficit D_d:

$$I^d = w_d L_d + R_d + D_d$$

with D_d the trade deficit which is the sum of the sectoral deficits, $D_d \sum_{k=1}^{J} D_{do}^k$ such as $D_d^k = \sum_{0=1}^{J} M_{od}^j - \sum_{0=1}^{N} E_{od}^j$ where the export E_{od}^j is given by $E_{od}^j = X_o^j \frac{\tau_{do}^j}{1+\tau_{do}^j}$. Aggregate trade deficits in each country are exogenous but sectoral trade

deficits are endogenously determined.

The model is solved for changes in prices and wages after a discrete change in trade costs due to the CBAM policy, from to τ to τ'. All the variables that are affected by this new tariff are analysed in relative change and denoted with a 'hat' (i.e. $\hat{x} = x'/x$). Then the equilibrium is obtained from the following equations with the cost of the input:

$$\hat{c}_d^j = \hat{w}_d^{\gamma_d^j} \prod_{(k=1)}^{J} (P_d^k)^{\gamma_d^{kj}} \quad (8)$$

The price index:

$$\hat{p}_d^j = \left[\sum_{k=1}^{N} \pi_{do}^j \left[\hat{k}_{do}^j \hat{c}_d^j \right]^{-\theta^j} \right]^{-\frac{1}{\theta^j}} \quad (9)$$

The trade share:

$$\pi^{j}_{do} = \left[\frac{\hat{k}^{j}_{do} \hat{c}^{j}_{o}}{\hat{P}^{j}_{d}} \right]^{-\theta^{j}} \tag{10}$$

With $\hat{k} = (1 - \tau^{j'}_{do})/(1 + \tau^{j}_{do})$.

Total expenditures in each country and sector are defined by:

$$\sum_{j=1}^{J} \sum_{o=1}^{N} \frac{\pi^{j'}_{od}}{1 + \tau^{j'}_{od}} x^{j}_{d} - D^{d} = \sum_{j=1}^{J} \sum_{o=1}^{N} \frac{\pi^{j'}_{od}}{1 + \tau^{j'}_{od}} x^{j'}_{o} \tag{11}$$

These five equations (8), (9), (10), (11) and (12) give the equilibrium in relative changes. The great advantage of this system is that it can be resolved with few data and estimations. Only tariffs, trade shares, value added, production and their respective shares and the sectoral dispersion of productivity are necessary. The trade elasticities are here directly determined by the dispersion of productivity θ^{j}.

COMPUTATION OF EMISSIONS EMBODIED IN TRADE

The carbon price of the EU ETS market is translated into a tariff rate equivalent. We follow here Mattoo et al. and their computation of the border tax adjustment based on domestic carbon content,[147] and Korpar et al.,[148] who analyse the effects of the CBAM for Austria.

This tariff rate equivalent on imports of industry k is defined as follows:

$$\tau_{k} = \frac{p^{ETS} E_{k}}{Y_{k}}$$

where τ_{k} is computed for each EU country using 2016 as reference year, Y_{k} is the gross industry output, E_{k} is the CO_2 emission associated with sector k output in each EU country, and p^{ETS} is the price of carbon on the EU ETS market. Industry output and CO_2 emissions are respectively provided by Eora 26 transaction and environment extension[149] (satellite account) matrix. More precisely, for this study we consider CO_2 emissions coming from energy (fuel combustion activities, fugitive emissions from fuels, solid fuels, oil and natural gas, etc.); industrial processes and product use (mineral industry, chemical industry, metal industry, other product manufacture and use, etc.); agriculture (including livestock); waste and other sources of CO_2 emissions. The tariff rate to be imposed by the EU on merchandise coming from non-European countries is the simple average of τ_{k}.

The levels of the tariff rate by the above calculation are relatively similar and low across sectors. However, agricultural and fishery products are at least six times higher than others, suggesting that countries whose economies are most dependent on exports of agricultural and fishery products to the EU would be most impacted by CBAM, once it is applied to a wide range of products.

147 Aaditya Mattoo & Arvind Subramanian & Dominique Mensbrugghe & Jianwu He, 2013. "Trade effects of alternative carbon border-tax schemes," Review of World Economics (Weltwirtschaftliches Archiv), Springer;Institut für Weltwirtschaft (Kiel Institute for the World Economy), vol. 149(3), pages 587-609, September. https://ideas.repec.org/a/spr/weltar/v149y2013i3p587-609.html

148 Korpar, N., Larch, M., & Stolling, R. (2022). Comparing scenarios for a European carbon border adjustment mechanism: Trade, fdi and welfare effects with a focus on the Austrian economy. The Vienna Institute for International Economic Studies. Research Report 460.

149 Eora 26 satellite account compiles GHG emissions from several sources in the Eora-26 harmonised classification. We consider the most reliable of these, named PRIMAP-hist, which provides national historical data of emission time series (1750-2019) available for CO_2, CH_4 and N_2O.

SECTORAL CONTRIBUTION TO WELFARE EFFECTS

The contributions of each sector to the decrease of the volume of trade and the terms of trade are far from homogeneous and often very concentrated in a few sectors. The sectoral contribution to the aggregate terms of trade and volume of trade effects for eight of the most impacted and poor countries are shown in Table B.1. The agricultural sector is often hardest hit by the CBAM, such as in Djibouti, Benin, Togo, The Gambia and Liberia. In Djibouti, for example, about 91% of the decrease observed in term of volume of trade (–11%) is explained by the impact of CBAM on the agricultural sector. In Mauritania, three sectors – mining and quarrying, metal products, and food and beverages – explain most of the change in welfare (volume of trade and terms of trade). Metal products explain half of the aggregate change of the volume of trade, and petroleum, chemical and non-ferrous metal 16% of change of the terms of trade in Guinea. In this model, the main explanations why certain sectors have a large aggregate effect compared to others are the magnitude of the increase tariffs, how large the share of materials used in production is and how important sectoral linkages are.

Table B.1: Sectoral contribution to welfare effects (% change)

Fishing	Benin		Djibouti	
Sectors	VoT	ToT	ToT	VoT
Agriculture	–214	0.117	0.884	90.9
Fishing	7.63	0.195	0.000769	0.025
Mining and quarrying	2.37	0.0445	0.0123	4.96
Food and beverages	121	53.2	16.5	–0.232
Textiles and wearing	74	15.4	10.8	–0.897
Wood and paper	0.947	0.644	1.02	–0.0675
Petroleum, chemicals and machinery	13.4	3.4	17.6	6.09
Metal products	0.522	5.83	18	–0.0345
Electrical and machinery	55.2	7.36	16.8	–0.235
Transport equipment	–7.62	5.55	13.4	–0.216
Other manufacturing	46.7	8.27	5.02	–0.271

	Guinea		The Gambia	
Sectors	VoT	ToT	ToT	VoT
Agriculture	13.2	1.93	82.4	1.31
Fishing	0.839	0.000888	0.148	0.0123
Mining and quarrying	59	0.0913	0.156	0.0323
Food and beverages	–3.26	27.8	2.12	38
Textiles and wearing	–3.84	13.6	7.56	23.6
Wood and paper	0.436	2.18	0.12	1.32
Petroleum, chemicals and machine	–2.89	16.6	2.17	15.1
Metal products	50.1	7.27	0.779	5.72
Electrical and machinery	–8.79	15	2.52	6.62
Transport equipment	–3.95	12.9	1.35	5.57
Other manufacturing	–0.916	2.56	0.7	2.75

	Liberia		Mauritania	
Sectors	VoT	ToT	ToT	VoT
Agriculture	77	0.203	−2.63	3.44
Fishing	0.000481	0.000297	7.66	0.0026
Mining and quarrying	3.79	0.0246	46.3	0.0889
Food and beverages	0.761	3.48	35.5	22.2
Textiles and wearing	0.197	1.55	−2.6	24.9
Wood and paper	0.0126	0.376	0.00287	1.96
Petroleum, chemicals and machinery	−0.161	2.25	−0.603	14.1
Metal products	1.57	1.3	18.7	7.61
Electrical and machinery	0.0137	4.92	−2.19	14.3
Transport equipment	16.8	85.4	−0.032	10.1
Other manufacturing	0.0391	0.506	−0.154	1.41

	Togo		Sierra Leone	
Sectors	VoT	ToT	ToT	VoT
Agriculture	51.7	0.311	75.1	−2.12
Fishing	0.0371	0.000444	0.324	−0.000573
Mining and quarrying	28.4	0.147	219	0.273
Food and beverages	0.654	21.3	−279	38.9
Textiles and wearing	−1.17	33.1	−1.53	7.67
Wood and paper	0.0914	1.68	9.39	2.77
Petroleum, chemicals and machinery	3.47	13.7	11.1	23.8
Metal products	15.9	4.63	18.4	5.43
Electrical and machinery	1.15	10.7	31.4	13.4
Transport equipment	−0.591	12.6	10.2	6.96
Other manufacturing	0.314	1.76	5.44	2.86

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