ANNEX B to E/C.18/2024/CRP.33

Draft paper from the Subcommittee on Environmental Taxation proposed for final approval by the Tax Committee in October 2024

Border Carbon Adjustments: Impact and Relevance for Developing Countries

Part C: Potential responses to border carbon adjustments

The other two parts of this Workstream 4 were approved by the Committee at its Twenty-seventh Session in October 2023, and are available as advance unedited versions on the Committee's webpage.

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Introduction

This paper is presented under Workstream 4 "Border Carbon Adjustments: Impact and Relevance for Developing Countries". That workstream is divided into three parts. Part A deals with the "What" – what is carbon leakage and what are possible responses and their aims. Part B covers the "How" – how existing border carbon adjustment (BCA) proposals are intended to work and focuses on the EU Carbon Border Adjustment Mechanism (CBAM) as an example of how a BCA might work in practice and because it is, at the time of writing, the only initiative in force. These two parts were approved by the UN Tax Committee at its Twenty-seventh Session, and the advance unedited versions are available online[1].

Part C addresses possible "Responses" by first considering the potential impact of BCAs on developing countries. Then it looks at policy measures developing countries could take to address such impact. Finally, it briefly mentions some relevant administrative considerations which developing country governments could consider where exporters will be impacted by BCA regimes. Section 1 focuses on different economic studies and models that have been produced and may be of most interest to those considering the impact of BCAs from an economic perspective while Sections 2 and 3 on the potential measure to address BCAs and the administrative consideration may be of more interest to policy makers.

As with Part B, it is inevitable that many of the references in this paper are to the EU CBAM rather than more generically to BCAs. This is because most of the studies on impact to date have looked at potential versions of the EU CBAM or assumptions about it (given that they were carried out before CBAM was finalized). The section on administrative matters also focuses mainly on the EU rules given that these are the only ones in force at the date of writing.

It should be noted at the outset that the impact a BCA has on a developing country may depend upon the actions that country is already taking or plans to take to address climate change. On the one hand, to the extent explicit carbon pricing (such as a carbon tax) is being used, a credit should typically be given against any BCA imposed by the importing country – so reducing, or even potentially eliminating, the impact. This is examined in more detail in sections 2.2 and 2.3 below. On the other hand, however, while the number of explicit carbon pricing regimes is increasing globally, many countries use other measures – such as regulations, product standards or fuel duties (either with or without carbon pricing). To the extent such measures reduce emissions, there would be a correspondingly lower charge on imports imposed under any BCA. However, to the extent there were still residual emissions, imports would be subject to the BCA charge.

Also, even where a developing country applies an explicit carbon price, it is possible that it will be lower than the BCA charge in the importing region meaning there will be a residual BCA charge even after the credit for tax in the country of origin. There is, therefore, criticism of BCA measures in some quarters on the basis that they infringe the Paris Agreement principle of common but differentiated responsibilities because they potentially impact a country's sovereign right to decide what climate measures it takes by implicitly encouraging the use of explicit carbon pricing over other measures.

As with Parts A and B, this paper is not intended to either support or contradict the theory of carbon leakage, the need for BCAs to address concerns or their potential efficacy in doing so. It is intended to share information by highlighting the potential impact of BCAs on developing countries by reference

[1] https://financing.desa.un.org/what-we-do/ECOSOC/tax-committee/thematic-areas/environmental-taxation

to existing studies and to indicate some potential steps developing countries could take where they are impacted by BCAs.

1. Impact of a BCA on developing countries

1.1 Outline of potential factors to consider in analysing the impact of BCAs

In order for a country, or an individual enterprise, to understand how to respond to the introduction of a BCA by another country which impacts its exports, it is first necessary to analyze the potential effect such a mechanism may have. Setting out a methodology to achieve this is outside the scope of this paper. However, in general terms it would be necessary to look at a number of factors, potentially including some of the following:

- To what goods does the BCA apply?
- What is the level of exports of covered goods to the BCA area?
- What percentage do those BCA goods make up of total exports and what is the contribution which such exports make to total gross domestic product (GDP)?
- What is the carbon intensity of the goods?
- What is the carbon price in the BCA area?
- What is the potential BCA charge on the particular goods (found by considering the carbon price in the BCA area and the carbon intensity of the imports)?
- Does the exporting country have carbon pricing which will be offset against the BCA charge?
- What is the implied tariff[2] (the ad valorem charge on the goods) represented by the BCA (found by considering potential BCA charge less any credit for the local carbon price divided by the cost of the goods).
- What will the implied tariffs be on goods from competitor countries which also export to the EU and will any differences in the implied tariffs alter the relative competitive advantage between the relevant countries?
- What is the price elasticity of the goods?
- Given the above factors, what is likely impact on exports of the BCA goods and what will the impact be on the local GDP?
- Other factors which will be relevant in determining the impact could include:
  - The level of employment within the impacted sector.
  - The availability of affordable decarbonization technology to reduce the carbon intensity of covered goods.
  - The precise rules and complexity of the BCA and the number of BCA regimes to which a country is exporting.
  - Whether affected enterprises have the capacity to calculate embedded emissions in line with the BCA or whether they will be forced to use default calculations.
  - The possibility and ease of finding alternative viable export markets.

There are a number of studies by academics and institutions on the potential impact of BCAs, particularly on developing countries. Section 1.2. analyses some of these findings. It has been necessary to choose those available at the date of finalizing this paper in August 2024 which appear most pertinent.

This paper focus on three particular studies which examine and set out some of the factors referred to above such as the level of exports of impacted goods to the BCA area, the percentage of such goods in comparison with total exports, the implied tariffs and the potential impact on exports and welfare. These are: a 2022 Study by the French Development Agency entitled "Impact of CBAM on EU trade partners: consequences for developing countries"[3] (the "FDA paper"), a March 2022 paper released by the Task

[2] The implied tariff is the BCA charge on the goods (less any credit for the local carbon price) divided by their value. The higher the implied tariff, the more likely it is there will be an adverse impact on the imports.
[3] 2022 study by the French Development Agency

Force on Climate Development and the IMF: "The Global Impact of a Carbon Border Adjustment Mechanism, A Quantitative Assessment"[4] (the "TFCD/IMF paper"), and a study published by The African Climate Foundation and London School of Economics, Firoz Lalji Institute for Africa called "Implications for African Countries of a Carbon Border Adjustment Mechanism in the EU"[5] (the "AFC/LSE paper"). Reference is also made to a paper produced by the United Nations Conference on Trade and Development (UNCTAD) in July 2021 titled "A European Carbon Border Adjustment Mechanism: Implications for Developing Countries (the "UNCTAD paper")[6]. While these studies all refer to the EU CBAM, it is important to note that they were all carried out before the final details were agreed and they consider various scenarios some of which are very different from the actual EU CBAM as implemented. They are, therefore, potentially informative in considering the impact of hypothetical BCAs on developing countries (subject to the limitation set out in more detail in 1.2.1 below) but should not be taken as precise analysis of the actual EU CBAM.

This paper also refers briefly to a fifth study called "Effect of a European Carbon Border Adjustment Mechanism on the APAC Region: A structural gravity analysis", produced by The Research Institute of Economy, Trade and Industry (RIETI Discussion Paper Series 23-E-058) [7] (the RIETI Paper). This study was chosen as it is dated August 2023 and so is more closely based on the EU CBAM, which is the only currently existing example of a BCA.

As well as considering any insights from academic studies, it will also be important for individual countries to carry out their own assessments, taking into account their unique circumstances and identifying any safeguards or measures they may consider implementing.

A tool which could be useful to help countries analyze their own situation is the CBAM Exposure Index[8], developed by the World Bank. The tool specifically focuses on the potential impact of CBAM, which is currently the only operational BCA. It first calculates an Absolute Exposure Index, which estimates the total potential cost of CBAM certificates[9] likely to be imposed on the exports from a particular country, assuming an emissions price of $100/tCO2, expressed as a percentage of the value of total exports of the relevant goods. However, it does not take into consideration the carbon price already paid by producers which would be deducted from the cost. It then features the Relative CBAM Exposure Index, which considers the excess cost of CBAM certificates on goods imported to the EU over the carbon costs paid by an average EU producer of the same output. This latter index recognizes the ETS reforms in the EU should lead to higher cost pass-through in the EU market, given that EU producers will relinquish free allocations and have to pay fully for their emissions in future, meaning some exporter costs will be compensated by higher prices for their products sold in the EU. It therefore shows whether exports to the EU will become more or less competitive in comparison with EU produced products[10].

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[4] 20220329114245125696.pdf (pku.edu.cn)

[5] Implications for African Countries of a Carbon Border Adjustment Mechanism in the EU - The African Climate Foundation

[6] research paper by the United Nations Conference on Trade and Development

[7] Effect of a European Carbon Border Adjustment Mechanism on the APAC Region: A structural gravity analysis (rieti.go.jp)

[8] https://blogs.worldbank.org/en/trade/how-developing-countries-can-measure-exposure-eus-carbon-border-adjustment-mechanism; the tool is accessible here: https://www.worldbank.org/en/data/interactive/2023/06/15/relative-cbam-exposure-index?_gl=1*bp5zt0*_gcl_au*MTYwNTM5NjMzNC4xNzI1NDU4NzA5#2

[9] Importers of covered goods into the EU have to purchase CBAM certificates for every tonne of CO2 emissions embedded in the products and this is designed to mirror the cost of carbon borne by EU producers- see section 4.4 in Part B of this Paper for more detail.

[10] A high score on the Relative CBAM Exposure Index identifies countries with covered sectors that are both relatively emissions intensive in comparison with an average EU producer and dependent on exports to the EU. For example, a score of 0.05 would mean the value of the CBAM costs of the exporter's covered goods—in excess of the higher prices they might command based on average EU producer costs—would amount to 5% of

The CBAM Exposure Index focuses on the impact of CBAM on particular sectors. It does not therefore indicate the overall impact on a country's economy but could be useful in assisting governments to determine if action needs to be taken to support a particular industry which is likely to be adversely impacted by CBAM.

1.2 Analysis of relevant literature

1.2.1 The studies and inherent limitations

Standard criticisms made of modelling are that it is a simplification of complex realities, it relies on assumptions that can be questionable and its results depend on the accuracy of data used. Such limitations should be borne in mind when considering any of the conclusions in the studies referred to in this paper.

As stated above, it should also be noted that the all but one of the studies quoted below, which examine the potential impacts of an EU CBAM, were written before the CBAM Regulation was finalized. Therefore, they look at the impact on exports of the goods covered by earlier proposals – iron and steel, aluminium, fertilizer, cement and electricity – and do not specifically look at the goods which were added in the later stages such as hydrogen or certain downstream products like nuts and bolts. The final one only considers the impact on iron, steel, aluminium and chemicals[11]. More relevant still, some scenarios assume a coverage of a much wider range of products or assume other jurisdictions introduce a BCA. Despite their wording, the studies may not serve as accurate estimates of the impact of the EU CBAM as implemented but serve as indications of the impact of potential versions of a BCA. The studies also use different estimates about, for example, the cost of carbon, the impact of abolishing free allowances under the EU Emission Trading System (EU ETS) and how the EU CBAM may be extended. The conclusions each study draws are not, therefore, always directly comparable.

As will be apparent from the various tables set out below, some of the figures presented are based on historical data – which should be reasonably accurate. However, even here, there are some discrepancies in the different studies – for example in the data on exports to the EU. Other figures presented rely on modelling and the outcomes can therefore only be indicative as they depend upon the assumptions made. The various papers use different models to predict outcomes, and each has advantages and drawbacks.

Comments on various models used in the studies

The FDA paper uses the EORA-26 MRIO database (Lenzen et al., 2012; Lenzen et al., 2013) to estimate the direct and indirect impacts of CBAM on production, wages and employment. The paper notes the advantage of using MRIO is that the indirect impact is not only due to the supply of inputs for domestic producers, but also internationally.

The UNCTAD paper state that the research used a Computable General Equilibrium (CGE) model which is the latest version of the Global Trade Analysis Project (GTAP) Model, a multi-country and multi-sectoral model fully documented in Hertel and Tsigas (1997) and Corong et al. (2017). GTAP covers the entire world economy with detailed data for 147 regions and 65 sectors.

The TFCD/IMF paper notes that the model which is used builds on the dynamic CGE models by Van der Mensbrugghe (2019) and Zhai (2018), and is calibrated to Global Trade Analysis Project (GTAP) database 10.0.

the total value of exports in that sector. If the score is below zero it means the exports would become more competitive and enjoy a net gain from the reform, with higher prices exceeding the certificates cost.

[11] However, note that among chemicals, only hydrogen is in the current scope of CBAM

The following two models rely on a similar modeling approach based on a structural gravity model focusing on Africa and Asia, respectively.

The ACF/LSE paper states the study uses two modelling approaches. The first uses a CGE model – more specifically, the PEP-w-1 model developed by Lemelin and colleagues. The CGE model can assess the economy-wide effects of the CBAM. However, the study uses a static CGE model and a major limitation is its inability to assess the impacts of the CBAM over a long-term period. 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 in the ACF/LSE paper relies on the New Trade Quantitative Model (NTQM) as developed by Caliendo and Parro. The paper notes this model is better able to assess disaggregated individual African countries to identify those that may have vulnerabilities and sensitivities to the EU CBAM but this is at the cost of dynamic effects, such as changes to long-run aggregate factor productivities.

The RIETI uses a structural gravity model. It notes the structural gravity model includes the intuition that trades is inversely proportional to distance, but is based on microeconomic foundations. The model used in the study is taken from Baier et al. (2019) and uses Anderson-Armington Constant Elasticity of Substitution (CES) production function to model trade.

It should be noted that CGE models are complex and time consuming to design and their results are highly dependent on key economic parameters, data quality and assumptions made.

CGE models frequently seek to capture the structure of the economy and behavioural response of agents (firms, households, government) to simulated policy changes and trace the impact on key economic variables, including income and expenditure flows. Thus, CGE models are created to analyze the main interdependencies between the sectors contained in the underlying data sets and the behaviour of different economic actors in order to evaluate alternative policy scenarios or economic shocks. CGE models often underestimate the value of goods and services that are not traded on markets and often also inadequately capture externalities such as pollution. They are often based on growth assumptions and are therefore not designed as forecasting tools. The RIETI Paper also notes the model it uses "has a fair share of assumptions, and suffers from several limitations. Similar to CGE models, we assume a CES production function. In addition to assuming that said elasticity of substitution is a constant (Armington-type), we also ignore capital or technological change in the model, and simply focus on one production input, labor."

The World Bank's CBAM Exposure Index (see section 1.2.1) is a statistical indicator looking specifically at the impact of the EU CBAM. It relies on detailed trade data (Harmonized System (HS) 6-digit level for 2019 from the World Bank's World Integrated Trade Solution) and emissions intensity data from GTAP for Scope 1 and Scope 2 emissions[12]. Although the latter source has benefitted from recent disaggregation by Chepeliev and Corong (2022) and Chepeliev et al. (2022), it is not necessarily as refined as the trade data, so some deviations from firm-level data can be expected. It also excludes hydrogen trade. The Index does take into account the different coverage of Scope 2 emissions across CBAM products. This policy choice can have important implications for certain developing countries. For example, Mozambique has a large amount of primary aluminum production, which is emissions intensive, and nearly all of its exports go to the EU. This would make it potentially highly exposed. However, Mozambique relies on hydropower for electricity generation, which makes such exports relatively competitive if such non-fossil electricity use can be verified. This would mean that Mozambique would be deemed less exposed to the CBAM if emissions from electricity generation were included in the CBAM. Including such scope 2 emissions in all sectors will be part of the

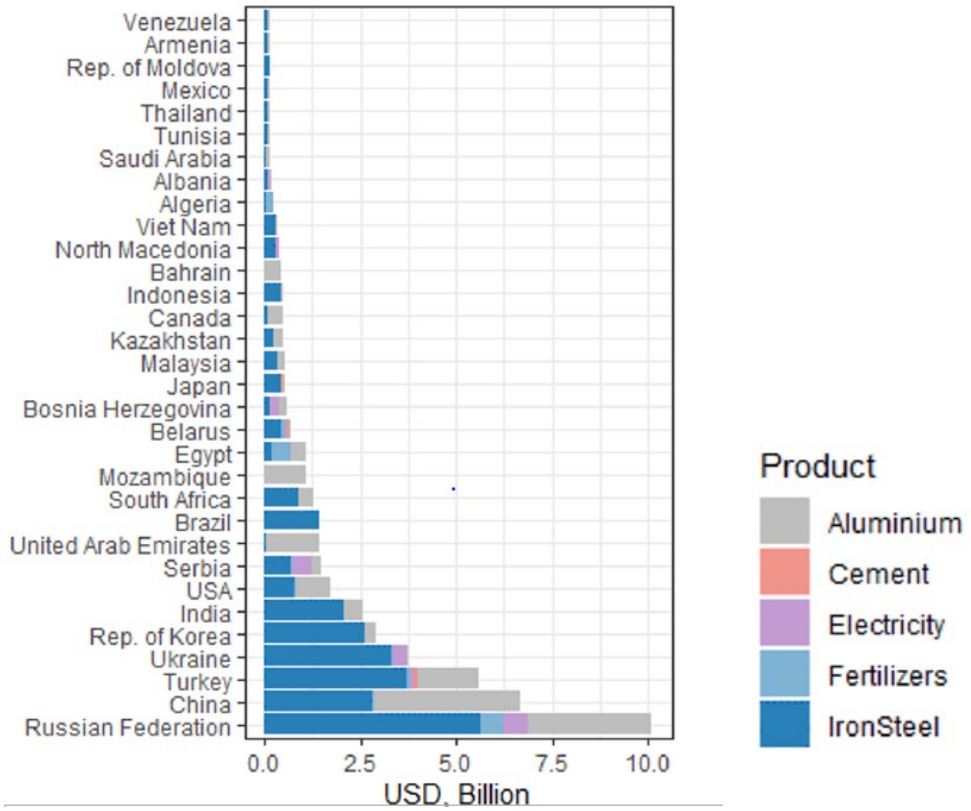
[12] Scope 1 are emissions released during the production process while scope 2 are indirect emissions arising from production of electricity or heat used in the production

implementation review in 2025. Further information about the methodology used can be found in the World Bank's technical note[13].

1.2.2 Volume of exports of CBAM goods to the EU

A key starting point for determining the impact of a BCA is the volume of exports to the BCA area. Various studies have looked at exports of CBAM products to the EU. For example, the FDA paper shows that, using 2019 figures, the countries with the greatest volume of exports are China, India, Republic of Korea, Russia, Turkey, Ukraine, and the US[14].

Exports of CBAM products to EU countries in USD bn, by country (2019 historical data)



Source: French Development Agency "Impact of CBAM on EU trade partners: consequences for developing countries" page 12

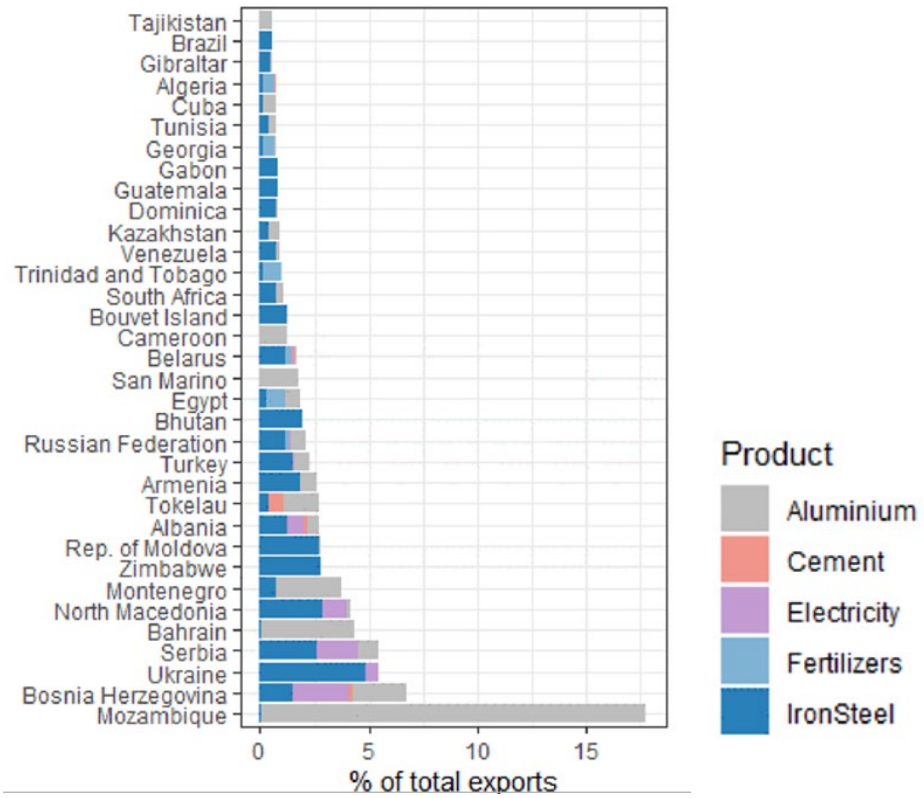
It is interesting to note that the UNCTAD paper (page 10) has a similar graph based on 2019 data as in the FDA one, but the figures for the total exports while very similar are not exactly the same. This underlines the fact that all these studies should be taken as indications and not precise estimates.

1.2.3 Share of exports made up of CBAM goods

The FDA paper also looks at the share of CBAM covered goods as a percentage of total export as the impact will depend upon the relevant significance of such export – and not just the absolute volume. If a country is more reliant on the export of covered goods as a total share of exports, it may be impacted to a greater extent than a country with a larger volume of such exports but which represent a smaller proportion of overall exports.

[13] https://www.worldbank.org/en/topic/trade/brief/technical-note-for-the-cbam-exposure-index
[14] Russia's invasion of Ukraine and ensuing sanctions will have altered these figures

Exports of CBAM products to EU countries from developing countries as a percentage of total exports (2019 historical data)



Source: French Development Agency "Impact of CBAM on EU trade partners: consequences for developing countries" page 12

The FDA paper concludes (on page 11):

> "…except for Ukraine and Russia, the most impacted developing countries in terms of volume are not the same in terms of the share of exports. Mozambique is the most impacted economy as almost 20% of its exports are Aluminium to EU countries. Serbia, Bosnia-Herzegovina, Montenegro, North Macedonia and Bahrain are also very impacted countries (more than 5% of Serbian and Bosnian exports are CBAM products to the EU, and more than 3% in Montenegro, North Macedonia and Bahrain), but differently from Mozambique, in some of these countries, the impact is not due to a specific product export. In the case of the first two, it is due to the export of Iron and Steel, Electricity and Aluminium, and, in the case of North Macedonia, it is due to the exports of Iron and Steel and Electricity. Other countries that are very impacted relatively to total exports are Armenia, Tokelau, Albania, Moldova and Zimbabwe. In all these economies, CBAM products' exports to EU represent more than 2.5%, and the product mix varies significantly from one country to another. In the case of Zimbabwe and Moldova, it is due mainly to exports of Iron and Steel, while in the case of Armenia and Albania, the product mix is more heterogeneous."

1.2.4 Implied tariffs arising from BCA measures

To calculate the impact of a BCA on a country's exports it is also necessary to look at the carbon intensity of the goods and the prevailing carbon price in the BCA area to estimate the charge. This will determine the BCA charge which will be applied on imports and so the impact on the price of the goods. The ACF/LSE paper looks at various scenarios depending upon the carbon price, range of goods covered, and whether or not free allowances under the EU ETS have been withdrawn. One table in that

paper shows the implied tariffs on certain goods which would be imposed by CBAM – that is the ad valorem charge on goods which results from a charge on the embedded carbon content. It demonstrates that for iron, steel, aluminium, fertilizer and cement, the implied tariff on imports from Africa will be higher than for other parts of the world. This reflects the fact that the production of these goods is more carbon intensive (and so will face a higher CBAM charge) than production in all other regions.

That paper also analyses the impact if a BCA was extended to other areas such as agriculture, energy and manufacturing which are not in the scope of CBAM since they are not within the scope of the EU ETS (Note this scenario does not take account of the phasing out of free allowances under the ETS.)

Implied Tariffs of a BCA at €87/tonne					
	Africa	China	India	USA	RoW
Agriculture	0.9	2.8	4.1	1.5	
Fertiliser	6.3	4.6	3	1.1	5.4
Electricity[15]					
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: African Climate Foundation and London School of Economics, Firoz Lalji Institute for Africa, Implications for African Countries of a Carbon Border Adjustment Mechanism in the EU, page 13

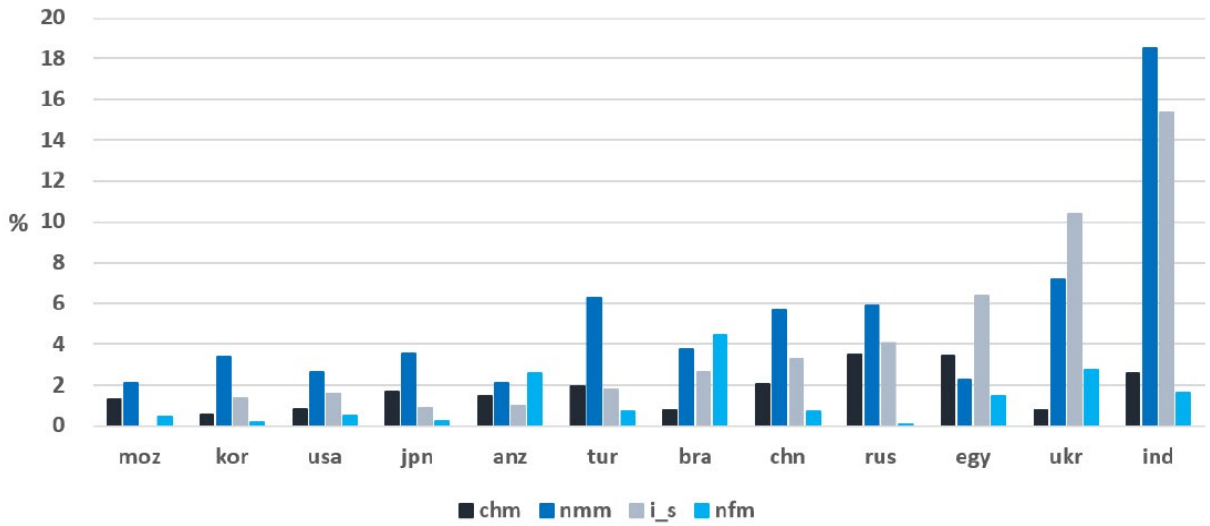
The TFCD/IMF paper contains a more detailed breakdown of implied tariffs by certain country and product range using a CBAM price of $75 per tonne. It has two scenarios. The first (the "realistic scenario") looks at the application of a CBAM to the initial restricted categories of goods (iron, steel, aluminium etc. – although three of the five categories of goods have been broadened due to data limitations) and only on scope 1 emissions.

The second is an extreme case where a BCA is applied to all goods and all emissions. This does seem unrealistic and does not reflect CBAM as it has in the interim been adopted nor the fact that any possible extension would be limited to sectors already covered by the EU ETS. At the time of writing, no countries are discussing introducing such an all-encompassing BCA. We therefore focus on the first, realistic scenario in this paper.

It can be seen that while the range of tariffs in the ACF/LSE and TFCD/IMF papers is broadly in line there are differences. In the realistic scenario, the TFCD/IMF paper shows some much higher implied tariffs – for example15.4% and 17.3% on the price of iron and steel from India whereas the ACF/LSE paper shows a 7.6 percent tariff from India – while some are lower – for example 3.3% on Chinese iron and steel as opposed to 6.3% in the ACF/LSE paper.

[15] According to the source of the information in the table, most of the countries in the aggregation do not export electricity to the EU so it was excluded from the table.

Implied Tariffs of CBAM at $75/tonne



Note: Figures in the chart indicate the percentage point increases in tariff equivalent in 2030 due to the CBAM for exporting regions/sectors. Chm, nmm, i_s and nfm refer to chemicals (fertilisers), non-metallic metals(cement), iron and steel, and non-ferrous metals (aluminium), respectively.

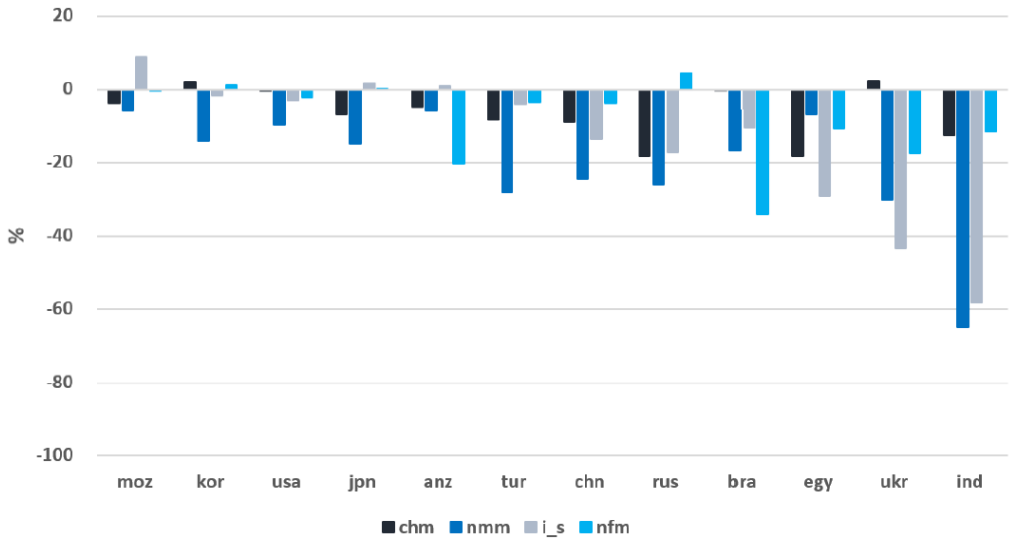
Source: Task Force on Climate Development and IMF, The Global Impact of a Carbon Border Adjustment Mechanism, A Quantitative Assessment, page 8

1.2.5 Impact on exports

Once the implied tariff imposed by a BCA is known, it is possible to model the impact on exports. The TFCD/IMF paper suggests that there could be a significant impact in certain sectors for some countries – for example iron and steel exports from Egypt and India to the EU fall by around 30% and nearly 60% respectively; It also shows that cement exports to the EU could drop by around 65% and 44% from India and South Africa However, cement exports to the EU tend to play a very small role for the respective countries, e.g. cement exports to the EU accounted for a negligible 0.008% of India's cement exports in 2022.

Impact on Exports of CBAM Products to the EU with CBAM at $75/tonne

FIGURE 4 Impact on Exports of CBAM Products to the EU: Scenario 1 (% change from baseline)



Source: Task Force on Climate Development and IMF, The Global Impact of a Carbon Border Adjustment Mechanism, A Quantitative Assessment, page 9

However, as noted in part 1.1 above, EU producers will also have to pay fully for their emissions in future. The more relevant angle for the impact of CBAM on exports is therefore the relative carbon intensity of products in scope, which determines whether exports to the EU will become more or less competitive in comparison with EU produced products. The World Bank's Relative CBAM Exposure Index reflects this much more limited impact and shows that some countries would indeed gain competitiveness (biggest gains identified for Albania, Colombia, Jordan, Israel, Chile, Morocco, UK, Ghana, Cambodia), whereas others are relatively more exposed due to the relative carbon intensity of export sectors in scope (such as Mozambique due to aluminum exports).

The RIETI Paper focus in particular on Asia and notes that, according to its modelling, South Asia will see the largest fall in exports, estimated between -1.15% (aluminium) to -10.52% (iron and steel). It concludes, that most regions are expected to witness a fall in exports of crude iron and steel, as the emission intensity of production (and thus CBAM certificate price) is especially high for those sectors.

Effects of CBAM on exports (ETS price: 87 USD/tCO2)

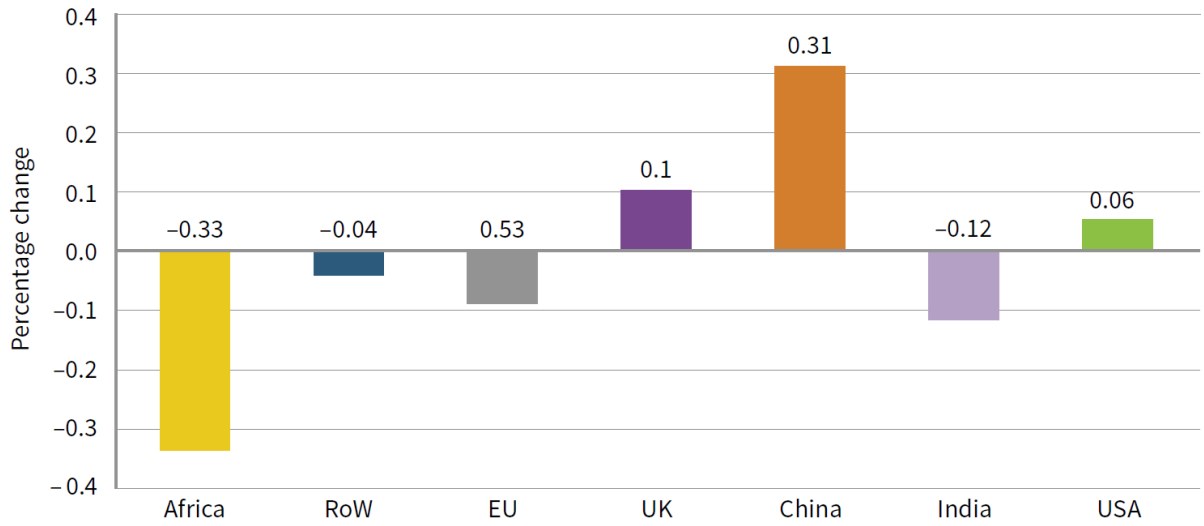
Unit: percentage		Asia & the Pacific	South East Asia	South Asia	Central Asia	Middle East	EU31	Rest of Europe	North America	South America	Africa	World
Exports	Iron & steel	-0.67	-1.73	-10.52	-4.01	-2.22	-1.21	-2.01	-1.06	-2.24	-3.21	-1.49
	Aluminium	-0.28	-0.24	-1.15	-0.4	-0.72	-0.82	-0.16	-0.18	-0.57	-0.51	-0.46
	Ferrous metal products	-0.18	-0.19	-1.59	-1.73	-0.28	-0.34	-0.4	-0.17	-0.19	-1.09	-0.29

Source: Page 16 Effect of a European Carbon Border Adjustment Mechanism on the APAC Region: A structural gravity analysis", produced by The Research Institute of Economy, Trade and Industry (RIETI Discussion Paper Series 23-E-058). In the table EU 31 indicates the EU and EFTA countries implementing CBAM.

1.2.6 Impact on GDP

The impact on a country's GDP depends on a number of factors including the implied tariffs and the resulting reduction in exports to the BCA region caused by their carbon intensity and the resulting implied tariff, and the relative importance of those exports to a country's GDP. On the basis of CGE analysis, the ACF/LSE paper also shows that the impact of CBAM on GDP will be larger in Africa than other regions even though African countries are not the largest exporters to the EU. The following table shows the effect of CBAM at €40 once account is taken of the phasing out of free allowances under the ETS.

Impact of the CBAM at €40 on GDP with removal of free allowances (% change)



Source: African Climate Foundation and London School of Economics, Firoz Lalji Institute for Africa, Implications for African Countries of a Carbon Border Adjustment Mechanism in the EU, page 21

Note: there is an error in the above graph which comes from the AFC/LSE paper as the text above the bar for the EU says "0.53" but the bar shows a negative value. The author has confirmed that it should be negative 0.08%. At the time of writing, it appears that the on-line version of the ACF/LSE Paper still contains the error.

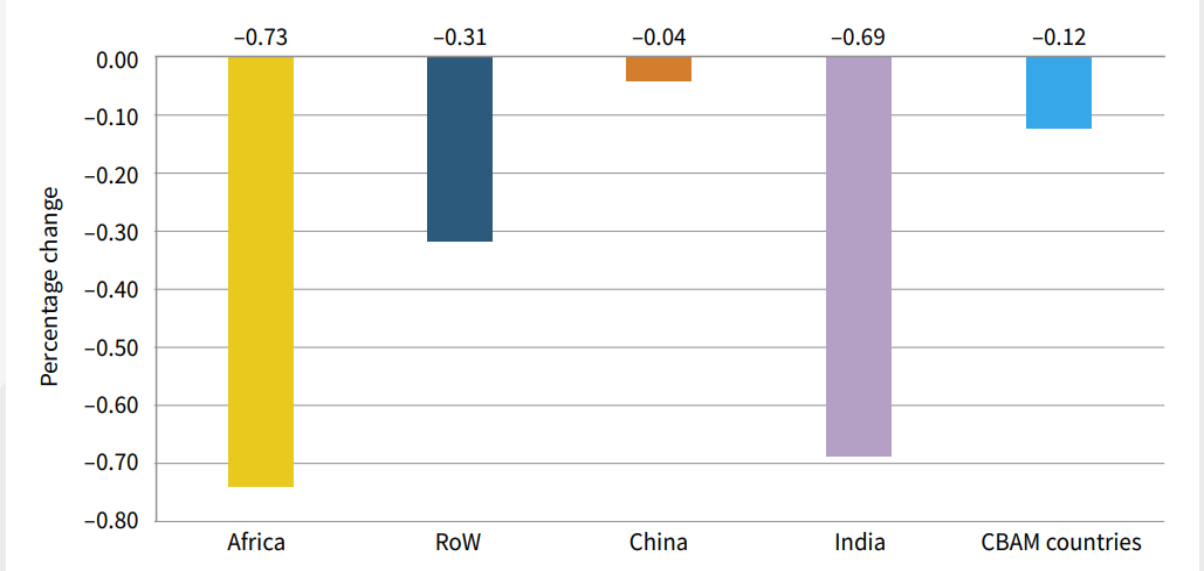
This modelling predicts that there would be an increase in GDP in China – as well as the UK and US – as consumers switch to less carbon intensive products. Also, there would be a slight fall in GDP in the EU due price increases driven by CBAM.

The ACF/LSE paper notes that the disproportionately large impact on Africa as opposed to other regions of CBAM is due to two factors (see page ix in the summary at the start of the paper). First, African exports of certain commodities have a higher carbon intensity than other countries which means the implied tariffs on impacted African goods will be higher than on those from competitor countries. It is suggested this will lead EU consumers to switch supplies to countries with a less carbon intensive production such as US, UK or China.

Secondly, the EU is a major export market for Africa. The EU accounts for 26% of Africa's exports of fertilizer, 16% of iron and steel, 12% of aluminium, 12% of cement and 33% of manufacturing. The paper concludes: "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."

The ACF/LSE paper also contains a scenario (6) assuming that a BCA with limited coverage and a €40 carbon price is implemented in other jurisdictions (US, UK, Canada, and Japan) – as well as the EU. In this scenario, Africa's GDP would fall by 0.73% - more than twice compared to the EU CBAM only scenario. However, it is other economies (such as China and India) that would be relatively more substantially impacted by such a wider implication of border carbon adjustments in all of these countries. This is because a larger share of their exports goes to these non-EU countries, and especially the US.

Impact of a BCA at €40 applied by EU, UK, Canada, US and Japan on GDP (% change)



Source: African Climate Foundation and London School of Economics, Firoz Lalji Institute for Africa, Implications for African Countries of a Carbon Border Adjustment Mechanism in the EU, page 26

1.2.7 Collateral effects

In considering the impact of a BCA it is important to consider not just the immediate effect on covered goods exported to the BCA region but potential spillover effects on other industries and also whether or not exports can be relocated to other markets.

The ACF/LSE paper contains a hypothetical Scenario 1 where CBAM has limited coverage, the carbon price is €40 but there is no phasing out of free ETS allowances. At page 15 the paper notes:

> "The exports of other commodities from Africa to the EU that are not covered by the CBAM are additionally forecast to decline. Africa's exports of manufacturing, transportation and other services to the EU fall…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."

However, it also states that:

> "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 [fertilizer, iron and steel] will increase to China and India…..]. 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."

This scenario is hypothetical as it assumes that free allowances under the EU ETS are not phased out – which would mean domestic producers would have an advantage over importers - whereas the actual EU rules provide for CBAM to be fully implemented in step with free allowances being phased out. The ACF/LSE paper also contains such a scenario (Scenario 4) but that does not comment on the potential impact on none covered industries nor on the effect of relocation to other markets.

Nevertheless, it could be assumed that – even with the phase out of free allowances – CBAM will have some impact on other industries and there may be some mitigation through relocation of exports. However, the fact that the EU is eliminating free allowances at the same time as CBAM is being introduced needs to be taken into account – or more broadly, a BCA which is neutral as between domestic production and imports will have different impacts from one which favours domestic production. As the AFC/LSE paper states on page 21:

> "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%."

1.2.8 Impact on welfare, terms of trade, volume of trade and real wage effects

Probably the most important question is how do all the various factors – volume and relative proportion of trade in CBAM goods, carbon intensity and implied tariffs, impact on GDP, employment in the particular sector etc. – combine to impact welfare. The TFCD/IMF paper contains a table with changes in welfare in terms of increase or decrease in household income measured in $billions. The results considering the realistic scenario (Scenario 1) are shown below. As stated in part 1.2.4 above, Scenario 1 uses a carbon price of $75 per tonne, a restricted scope of the BCA and only applies to scope 1 emissions.

Change in Welfare from Baseline (in USD bn, 2030)[16]

Countries/Regions	Scenario 1
Selected Advanced Economies	
Australia and New Zealand (anz)	-0.3
Japan (jpn)	0.2
Canada (can)	-0.2
United States of America (usa)	-0.2
South Korea (kor)	0.3
EU (eur)	10.7
UK, Switzerland and Norway (usn)	0.7
BRICs	
China (chn)	-1.1
India (ind)	-1.8
Brazil (bra)	-0.2
Russia (rus)	-4.7
South Africa (zaf)	-0.2
Selected Developing Economies	
Kazakhstan (kaz)	-0.2
Ukraine (ukr)	-0.7
Turkey (tur)	-0.3
Mexico (mex)	-0.3
Egypt (egy)	-0.2
Mozambique (moz)	0.0
Selected Regions	
Association of South East Asian Nations (ASEAN)	-0.5
Latin American Countries (lac)	-0.7
Sub-saharan Africa (SSA)	-0.5
Middle East & North Africa (MENA)	-2.7
Least developed country (LDC)	0.0
Rest of the world (row)	-0.4

The TFCD/IMF paper concludes: While "…depressed external demand and worsening terms of trade hurt many developing economies […], the macroeconomic impact on most of these countries is modest…" (see page 11)

The ACF/LSE paper models the effect on welfare, terms of trade, volume of trade and real wages in African countries (see Appendix 1 to this paper). In the model, welfare is conceptually equivalent to

[16] Source: Task Force on Climate Development and IMF, The Global Impact of a Carbon Border Adjustment Mechanism, A Quantitative Assessment, page 20

GDP. As the workings, parameters and calculations used for this set of models is different to those used for the regional assessments referred to above, there are some differences in the results – which highlights that any impact assessment on CBAM is sensitive to modelling decisions. The paper notes (on page 29): "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."

The FDA paper analyses the socio-economic impact looking at the share of employment and wages bill affected by CBAM. It should be noted that the analysts have taken what they call an extreme view assuming all CBAM exports and associated inputs are impacted[17]. It concludes (on page 15):

> "The most exposed countries in socio-economic terms are Moldova (MDA), Mozambique (MOZ), Bosnia-Herzegovina (BIH), Serbia (SRB), Macedonia (MKD), Ukraine (UKR), Montenegro (MNE), Bahrain (BHR), Albania (ALB). In these countries, the potential reduction in production puts at risk more than 0.5% of the wage bill and of the employment. In the case of Moldova and Mozambique, about 2% of employment is exposed." It continues: "Other countries, such as São Tome and Principe (STP), Armenia (ARM), Russia (RUQ), Georgia (GEO), Turkey (TUR) and Zimbabwe (ZWE), also present an important degree of socioeconomic exposure since more than 0.5% of the wage bill will be impacted. However, in these economies (with special regards to Zimbabwe), the share of employment at risk is not as high as the share of wages, indicating that few but well-payed [sic] jobs are those that may be impacted by the introduction of CBAM in the European Union."

The RIETI Paper notes on page 15 "A first conclusion that we can draw from the results is that we expect the policy [ie CBAM] to have a small impact on welfare, both globally and regionally. Regardless of the region, our simulation shows that changes in welfare are expected to be smaller than 1%."

Effects of CBAM on welfare (ETS price: 87 USD/tCO2)

Unit: percentage		Asia Pacific	South East Asia	South Asia	Central Asia	Middle East	EU31	Rest of Europe	North America	South America	Africa	World
Welfare	Iron & Steel	-0.02	0.16	0.23	0.07	0.07	-0.55	-1.8	-0.06	0.04	0.06	-0.17
	Aluminium	-0.15	-0.06	-0.02	-0.18	-0.02	-0.08	-0.09	0.25	-0.13	-0.18	-0.07
	Ferrous metal products	-0.01	0.02	0.01	0.01	0.00	-0.03	-0.02	0.00	0.00	0.01	0.00

Source: Page 16, Effect of a European Carbon Border Adjustment Mechanism on the APAC Region: A structural gravity analysis", produced by The Research Institute of Economy, Trade and Industry (RIETI Discussion Paper Series 23-E-058). For the key see the note to the diagram on page 13 of this paper.

It should also be noted that even if there is not a significant reduction in overall employment in a country, there could be a much greater impact in an effected sector which might create political sensitivities.

[17] "Differently from other studies that use general equilibrium models, and hence rely on strong assumptions about price-elasticities of substitution among countries and technological substitutions, we focus on two extreme scenarios. First, we identify the maximum carbon revenue generated for the EU by the introduction of CBAM if countries' exports' volumes to the EU are not impacted (which relies on the idea that these exports are inelastic in relation to price). Second, we assume on the contrary that all exports are impacted, as well as all suppliers of inputs for the industries that produce these export goods."

1.2.9 Conclusions

The outcomes are based on modelling which has inherent limitations and requires assumptions to be made. The conclusions are therefore not precise and can only be taken as indicative. The various papers examined use different assumptions (such as the prevailing carbon prices) making direct comparison difficult. The results also vary significantly depending upon the scenarios which are modelled – for example the breadth of products and scope of emissions which are covered. Finally the various models do not take account of any policy developments in impacted countries – such as introducing or increasing carbon pricing, converting implicit into explicit carbon pricing, redirecting exports, or taking other decarbonization measures. Nevertheless, the results are broadly in line with each other and a number of tentative conclusions can be made:

- The impacts of CBAM are not evenly distributed with developed countries not as affected as developing countries and, in some cases, benefiting from CBAM.
- The countries most negatively affected are those which are more dependent on exports of CBAM goods to the EU, especially where their exports are comparatively carbon intensive in comparison with other countries.
- Generally, the most vulnerable countries are Least Developed Countries and LowIncome Countries in Africa or developing countries neighbouring the EU.
- Several studies single out Mozambique, Zimbabwe, Ukraine, Bosnia and Herzegovina, and Serbia as the most impacted. Other countries mentioned include Moldova, Macedonia, Montenegro, Bahrain, Albania, São Tome and Principe, Armenia Georgia and Turkey.
- Nevertheless, a key conclusion is that if the CBAM charge is around €87 and applied only to the initial category of goods - iron and steel, aluminium, cement, fertilizer, electricity - the impact is moderate (e.g., "according to the ACF/LSE paper 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%." – See page ix in the Summary. Similarly, the RIETI Paper notes on page 15 "Regardless of the region, our simulation shows that changes in welfare are expected to be smaller than 1%.").
- If, however, other developed countries (US, UK, Japan, Canada) also introduced a BCA the impact would be significantly greater. According to the ACF/LSE modeling, at €40/tonne Africa as a whole could see a 0.73% drop in GDP, India 0.69% and China 0.04%. Compared with the scenario in which only the EU implements a BCA, there is a proportionately larger fall in GDP for China, India and the rest of the world than for Africa. This stems from the relatively smaller concentration of exports from Africa to the non-EU markets.
- If hypothetically, the EU CBAM was extended to significantly more products the impact on developing countries could also be substantial (e.g., the ACF/LSE paper notes "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." See page 29) However, that is an extreme example and not one which is currently under consideration in the EU or elsewhere.

2. Potential policy measures to address the impact of BCAs

2.1 Introduction

Although the key overall assessment of the impact on third countries of the current EU CBAM (i.e., with a limited scope is marginal), note should be taken of two issues of general consideration (i) the potential future expansion of such a measure either in terms of CBAM's scope or by other countries or regions introducing a BCA; and (ii) the political dimension of being subjected to a BCA measure.

There are various voices calling for multilateral approaches whether in terms of Carbon Clubs or creating a carbon floor price. Therefore, even if the CBAM example seems new and unique, countries ought to be prepared for similar action from other countries. The UK has announced that a CBAM will be introduced as of 2025[18]. Australia[19] launched a review into carbon leakage and a potential CBAM in the summer of 2023. Canada held a consultation in 2021 although the findings are not yet public.[20] Japan's 2020 Green Growth Strategy calls for consideration of BCA, while proposals are still pending in the United States,[21] where there have been some discussion about imposing a fee on imports from high greenhouse-gas emitting countries.[22]

In general terms, BCAs may be administered in the context of three different types of policy instruments, namely: (i) a fiscal instrument, such as a carbon tax, (ii) a market-based instrument, such as an Emissions Trading Scheme (ETS), and (iii) a non-price based regulatory instrument, such as a command-and-control measure to increase efficiency. The first two instruments (carbon taxes and ETS) are more traditional and more widely accepted as policies for which a BCA may be employed. The last option, involving a BCA to address effects following a non-price based regulatory measure, are more novel and untested, being discussed in countries which do not possess a corresponding national explicit carbon pricing approach. However, such measures may not strictly qualify as BCAs and could potentially raise concerns regarding compliance with WTO regulations. These latter measures are outside the scope of this paper. For the purposes of this paper, we consider potential responses to a BCA which is based on a carbon pricing mechanism such as a carbon tax or ETS.
The political dimension denotes that the application of a BCA measure by any one state can be considered as a corresponding loss in potential tax revenues for the country of origin (the country exporting those goods to the country where the BCA measure is imposed). That is the case because, in the absence of a carbon tax or an ETS in the country of origin, it is the country of destination that both imposes the BCA levy and keeps the revenue associated with the cross-border transaction. As a result, the application of a BCA measure by one or more countries could be seen as a loss or surrender of important domestically mobilized revenue resources that could be used particularly by middle- and low-income countries to foster the green transition, even if they are not a significant proportion of GDP.

The following sections consider different ways in which developing countries could address these issues.

2.2 Introduction of explicit carbon pricing

One of the ways in which countries can react to the introduction of a BCA is through the application of a domestic carbon price which means that they could keep the revenues from their exports which otherwise would be collected by the BCA region. It is important that any domestic carbon price is one for which the BCA region is obliged to give a credit – otherwise it would be an additional cost but not reduce the BCA charge.

The importing state applying the BCA should give a credit for the carbon price in the exporting jurisdiction to be compatible with WTO rules, and in particular the exception in Article XX (g) of the GATT.[23] However, there is as of yet no formal international consensus on what a carbon price means,

[18] Factsheet: UK Carbon Border Adjustment Mechanism - GOV.UK (www.gov.uk)
[19] Carbon Leakage Review - Australian Hydrogen Council (h2council.com.au)
[20] Exploring Border Carbon Adjustments for Canada - Canada.ca
[21] See for example 4 New Carbon Border Adjustment Bills in the US | World Resources Institute (wri.org)
[22] 4 New Carbon Border Adjustment Bills in the US | World Resources Institute (wri.org)
[23] Article XX(g) provides that a measure restrictive of trade may be justifiable if it is related to the conservation of exhaustible natural resources, provided that it is made effective in conjunction with restrictions on domestic production or consumption.

although there is literature emanating from the OECD,[24] IMF[25] and WBG[26] that covers – in varying degrees – explicit carbon prices, implicit carbon prices and negative carbon prices. Nevertheless, when designing a BCA measure, countries need to consider the operation of rules in place for domestic producers in order to ensure compliance with WTO rules. For example, the EU CBAM legislation is connected to the EU's ETS. Therefore, only explicit pricing effectively paid in the country of origin – for example carbon taxes and ETSs – gives rise to abatement of the CBAM price imposed at the border.[27] This means that where the country of origin applies (or introduces) an implicit carbon price (for example through excise taxes levied on an ad valorem basis or on weight or volume units not relating to carbon content, like energy taxes and fossil fuel taxes) this will not be enough to allow for a corresponding reduction in the charge under CBAM.

The situation could be different if a country was to introduce a BCA based on an implicit carbon pricing measure but this does not appear to be likely at present.

As a result, in practice, countries wishing to ensure the additional revenue accrues to them, may need to consider introducing an explicit carbon price such as a domestic carbon tax, or an emissions trading scheme, as these are both schemes where the monetary amount paid is calculated on greenhouse-gases covered by such a scheme and released during the production of goods. This is the case even if such a country already imposes an implicit price on carbon such as through a fuel tax (although the latter could alternatively be converted into an explicit pricing scheme, see further section 2.3 below).

Both a carbon tax and an ETS can be designed to be equally effective at pricing carbon and allowing recognition of the domestic price in a foreign market employing a BCA measure. However, ETS markets take, on average, five to ten years to be on a full working status and requires extensive monitoring, review, and verification processes (MRV)[28] to assess the level of pollution being emitted by the selected industries and set the cap under that threshold. Through the operational life of the ETS, MRV functions are also key to making sure the covered industries are compliant. Therefore, this instrument requires time and human resources from governments and tax administrations.

Carbon taxes on the other hand, can be introduced from one fiscal year to the next, and are capable of pricing the whole of the economy, particularly if employed at "choke points" at the upstream level.[29] This, as is further outlined in the 2021 UN Handbook on Carbon Taxation for Developing Countries, would be especially true if a carbon pricing scheme is implemented following the Fuel Approach, expressing carbon tax rates in the legislation in weight or volume units using commonly acknowledged

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[24] OECD, Pricing Greenhouse Gas Emissions: Turning Climate Targes into Climate Action, November 2021, available at: https://www.oecd-ilibrary.org/sites/e9778969-en/1/3/1/index.html?itemId=/content/publication/e9778969-en&_csp_=52c8137b50988e25208d117dee9bbae3&itemIGO=oecd&itemContentType=book (last accessed 3/1/2023)

[25] IMF Working Papers, A Framework for Comparing Climate Mitigation Policies Across Countries, (S. Black ; D. Minnett ; I. Parry ; J. Roaf ; K. Zhunussova), pg. 4, December 2022, available at: https://www.imf.org/en/Publications/WP/Issues/2022/12/16/A-Framework-for-Comparing-Climate-Mitigation-Policies-Across-Countries-527049, last accessed 5 Jan 2023.

[26], https://doi.org/10.1093/wbro/lkad009

[27] The definition of "carbon price" in Article 3(29) of the CBAM Reg is 'carbon price' means the monetary amount paid in a third country, under a carbon emissions reduction scheme, in the form of a tax, levy or fee or in the form of emission allowances under a greenhouse gas emissions trading system, calculated on greenhouse gases covered by such a measure, and released during the production of goods"

[28] Based on the practical experience from China, and the EU.

[29] There is extensive literature on the mechanics of a carbon tax. See, for example: United Nations, UN Handbook on Carbon Taxation for Developing Countries, United Nations, 2017; Metcalf, G.E. 2019. *On the Economics of a Carbon Tax for the United States,* Brookings Papers on Economic Activity,.; IMF, *Fiscal Policies for Paris Climate Strategies – from Principle to Practice*, IMF Policy Papers, (May 2019); IMF, Fiscal Monitor,(Chapter 1), *How to Mitigate Climate change?* (2019), Pg. 3; Ramseur, J. and Parker, L. 2009. *Carbon tax and greenhouse gas control: Options and considerations for Congress*, CRS Report for Congress (2009), p. 2.

average carbon content values when determining the tax rates. An upstream carbon tax is simple to administer and is capable of impacting both the formal and the informal economies, a point that might be of particular relevance for middle- and low-income countries.[30] It therefore is the most efficient and readily available instrument to price carbon in the short-term, for countries wishing to address the introduction of the EU CBAM.[31] It is also the instrument most likely to find correspondence in other countries for countries wishing to establish cooperative approaches in the future.[32]

It is to be noted that the introduction of a carbon tax does not prevent countries from employing other measures that might ultimately add to the policy mix required for any one country to meet its Nationally Determined Contributions (NDCs).

Carbon pricing can be one of the most powerful tools to help countries reduce emissions. According to the World Bank's annual "State and Trends of Carbon Pricing 2024" report, there are now 75 carbon pricing instruments in operation worldwide. In 2024, carbon pricing revenues reached a record $104 billion. Over half of the collected revenue was used to fund climate and nature-related programs. However, while the introduction of explicit carbon pricing may seem a natural response to the imposition of BCAs, such an approach may not be easy, especially for low-income countries (LICs) and least developed countries (LDCs) due to such factors as lack of administrative capacity or concern about the impact on the domestic market.

Research[33] carried out by the Centre for Global Development looking at the World Bank's data base on carbon pricing shows that none of the 26 LICs covered in that document have a pricing scheme under consideration. Just one lower-middle-income country (Ukraine) has implemented a carbon pricing system (2%); and only six (6) such countries (11%) have one scheduled or under consideration. Even among upper-middle-income countries, the uptake of carbon pricing remains modest at 16%. However, many countries already apply other excise taxes than carbon taxes on at least some fuels. The way such excise taxes are levied and administered can be used to introduce explicit specific carbon taxation, see further under section 2.3.

2.3 Convert existing implicit pricing into explicit pricing

Many countries already have implicit carbon pricing in the form of a general fuel duty on at least certain fuels. As noted above, the EU CBAM does not allow this as a credit against the CBAM charge and this may also be the case with any other form of BCA which is introduced in future. An option for a country with such implicit pricing could therefore be to slightly modify the nature of that tax to create an explicit carbon price. For example, a fuel duty could be modified so that it will be directly linked to the carbon content of the fuel. To the extent this creates an explicit carbon price it should then be much more likely to be creditable against a BCA. At the time of writing, several countries are examining or have effected such changes.

Uruguay is an example of a country which from 1 January 2022 has converted its implicit pricing to explicit pricing by introducing a carbon tax.

Vietnam levies several taxes on fossil fuels (special consumption tax, VAT and environmental protection tax on both domestic and imported fuels) as well as a custom duty on imported fuels. It is

[30] [30] T. Falcão, Paying the Piper: On the Legal Qualification of Carbon Prices, January 2023, available at: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4336765

[31] While CBAM took effect from October 2023, there is only a reporting requirement until 2026 which does give some lead time for countries considering this option.

[32] IMF, Carbon Price Floor, 2022; T. Falcão, A Climate Treaty for the Global Taxation of Carbon, ICTD Policy brief, 2023 (forthcoming)

[33] The EU's Carbon Border Tax: How Can Developing Countries Respond? | Center For Global Development (cgdev.org)

understood that the integration of a carbon tax into the existing environmental fee or the environmental protection tax has been discussed as a potential response to CBAM.

2.4 Apply a tax only on carbon intensive exports

The 2021 UN Handbook on Carbon Taxation for Developing Countries gives detailed practical guidance on the implementation of a carbon tax including how to address issues of public acceptance and any undesired impacts on households and firms. Nevertheless, for many reasons a country may be reluctant to introduce a carbon tax at present. A potential solution would be to introduce a carbon tax only on exports and potentially only on exports to a BCA area. This would clearly not be consistent with driving decarbonization domestically and net zero commitments, as the price burden would not impact the country's own economy and would only produce effects towards the country of destination to which the product was exported. Provided it was recognized by the BCA, a carbon tax on exports would ensure that the tax revenues flowed to the country in question rather than the country or region imposing a BCA. It could therefore be a good instrument for domestic resource mobilization purposes, although it would not count towards the country's mitigation targets under the Paris Agreement (as established by the Nationally Determined Contributions), as it would not in fact impact production for the domestic market.

It is understood that India is considering such an exports tax.[34]

Another potential version of this approach could apply where a country already has a carbon price but it is lower than the equivalent price applied in the BCA region. In that case a "top up" carbon tax on exports to the BCA area could be considered to ensure that a full credit against the BCA charge will be received and the exporting country receives all the revenues.

The effectiveness of such an export/top up tax would depend upon how it was implemented and the rules of the relevant BCA. Potentially, a tax levied on carbon emissions occurring during the production of CBAM goods exported to the EU could be creditable under the CBAM regulations if it would be compliant within the definition of a carbon price within the CBAM Regulation: a carbon price effectively paid in the country of origin, under a carbon emission reduction scheme[35].

It would also be necessary to consider the WTO implications of an export-only carbon tax. Arguably, it would fall under the exception of Article XX (d) of the GATT which allows a contracting party to enforce measures necessary to secure compliance with laws or regulations which are not inconsistent with the provisions of the GATT, including those relating to customs enforcement. However, it must not be applied in a manner which would constitute "a means of arbitrary or unjustifiable discrimination between countries where the same conditions prevail" and not be a disguised restriction on international trade, so as to satisfy the requirements of the introductory paragraph of Article XX.

If a tax applied only to goods destined for a BCA region was found to be contrary to WTO provision, the exporting country could, alternatively, consider the implications of introducing an export-only carbon tax on exports to all jurisdictions and not only those having introduced a BCA measure.

2.5 Redirect exports to countries without a BCA

Where a country is unable or does not wish to introduce any form of explicit carbon pricing a potential defensive measure would be to try to redirect exports which would be impacted by a BCA to countries

[34] India wants to charge its own carbon tax on the lines of CBAM from exporters - The Hindu BusinessLine

[35] Article 3(29) of the CBAM Regulation states 'carbon price' means the monetary amount paid in a third country, under a carbon emissions reduction scheme, in the form of a tax, levy or fee or in the form of emission allowances under a greenhouse gas emissions trading system, calculated on greenhouse gases covered by such a measure, and released during the production of goods;"

which do not impose such a charge. Such a response would not be consistent with decarbonization aims and whether or not it would be feasible would depend upon such factors as whether not such markets exist for the export, the cost of switching markets and the likelihood of the new markets introducing a BCA at a later point in time.

An important point to consider is the fact that there are domestic debates on the introduction of a BCA type measure in several markets (e.g., Canada and the USA) while the UK has already announced it will introduce one as of 2027. As a result, the availability of alternative international markets may diminish over time.

2.6 Promoting international cooperation

2.6.1 Introduce exemptions for LDCs

Developing countries could push for an exemption – at least for LDCs – in any new BCA which is introduced. There is, however, no exemption in the EU CBAM although this contrasts with the EU's Everything but Arms (EBA) scheme which removes tariffs and quotas for all imports of goods (except arms and ammunition) coming to the EU from LDCs. It is understood that an exemption was not included in CBAM because (i) the measure applies to specific goods, not countries; and (ii) including such a measure could breach WTO rules on equal treatment and most favoured nation status.

However, one point of further consideration by LDCs and other third party countries impacted by the BCA is the proportionality between the measure imposed by the country applying the BCA and the regulatory requirements effectively imposed on businesses exporting to the BCA area in terms of monitoring, verifying and reporting emissions having to comply with those rules.

2.6.2 Use BCA revenues to compensate developing countries

In principle, the revenues from a BCA could be returned by the collecting state to the state of export. During the negotiations between the EU co-legislators, the European Parliament argued that CBAM revenues should be ear-marked to finance decarbonization in LDCs but the final agreement on the CBAM Regulations between the European Parliament and the Council of the EU did not include such a provision. As set out below, the EU is however providing financial and technical support to LDCs, for example, using the European Fund for Sustainable Development plus (EFSD+) to support the development of industrial production structures that are compatible with long-term global climate objectives.

2.6.3 Call on developed nations to fulfill their obligations regarding climate financing

As noted in a London School of Economics blog (LSE) on 12 June 2023[36],

> "Given that low-carbon technologies are at present mostly owned by developed countries, trade rules that favour 'cleaner' exporters imply a transfer of market share from developing to developed economies. In the absence of policies to support these countries' ability to compete (primarily in terms of access to finance), such measures in isolation can be seen as being in conflict with [the UN principle of "common but differentiated responsibilities."

It is therefore important that developed countries fulfill their obligations in terms of climate finance and transfer of green technologies.

As regards finance, in the Copenhagen Accord produced in 2009 at the 15th Conference of the Parties to the UN Framework Convention on Climate Change (UNFCCC) (COP15), developed countries

[36] How do climate policy and carbon border adjustments affect international trade? - Grantham Research Institute on climate change and the environment (lse.ac.uk)

committed to "a goal of mobilizing jointly USD 100 billion dollars a year by 2020 to address the needs of developing countries. This funding will come from a wide variety of sources, public and private, bilateral and multilateral, including alternative sources of finance."

At subsequent COPs, in Paris in 2015 and Katowice in 2018, the Parties agreed to maintain the $100 billion a year target until 2025, when they would adopt a new collective quantified climate finance goal – with a floor of $100 billion a year. The $100 billion target was – for many reasons – not reached in 2020 and 2021 with many developed countries falling short of their obligations. However, OECD research has suggested it will have been met as of 2022.[37] One avenue for developing countries to explore is therefore to use available channels to call upon developed countries to deliver on and step up their commitments. Investment in green technologies should enable embedded emissions in BCA covered goods to be reduced to help ensure that BCA charges do not make imports from developing countries less competitive thereby driving down their market share.

In the context of EU CBAM, the European Commission services have identified LDCs which are potentially affected and are carrying out an outreach strategy to identify gaps and needs at industry level and to deploy appropriate capacity building and technical assistance. The EU is supporting LDCs through technical assistance, technology transfer, extensive capacity building and financial support, with the objective of developing industrial production structures that are compatible with long-term climate objectives.

In December 2021, the EU launched the Global Gateway, a new strategy supporting partner countries in bringing about transformative action along low-carbon development pathways. Between 2021 and 2027, the European Union and its Member States will mobilize up to €300 billion of investments for sustainable and high-quality projects, taking into account the needs of partner countries and ensuring lasting benefits for local communities. For example, the Global Gateway comprises programs such as the Africa-EU Green Energy Initiative (AEGEI) or the Just Energy Transition Partnerships (JETP) with South Africa, India, Indonesia, Vietnam, and Senegal, which will contribute to decarbonising energy systems and reducing emission intensity in production, thus reducing embedded carbon emissions in exports. The Technical Assistance and Information Exchange (TAIEX) initiative and twinning projects provide support to beneficiary countries in the implementation of CBAM, while guarantee programmes from the European Bank for Reconstruction and Development support green investments in partner countries[38]. As mandated by the CBAM regulation, the EU Commission will conduct a study before the end of the transitional period in 2025 on the impact of CBAM on developing countries, particularly LDCs, and assess the effects of the technical assistance provided.

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[37] At the request of donor countries, the OECD has been tracking progress towards $100 billion goal since 2015. The last OECD assessment, published in November 2023, states that climate finance provided and mobilised by developed countries for climate action in developing countries reached USD 89.6 billion in 2021: *Climate Finance and the USD 100 Billion Goal - OECD*. Further, on the basis of preliminary and yet unverified data at the time, the OECD also issued a press release stating that the goal looks likely to have been met as of 2022: *Growth accelerated in the climate finance provided and mobilised in 2021 but developed countries remain short and must continue scaling up to reach the USD 100 billion goal - OECD*

[38] Examples of projects include : the support to the transition of eight partner countries in the Southern Neighbourhood towards sustainable, low-carbon and climate-resilient development (Clima-Med); Support to the development of Green Electrons and Molecules' (GEM) in the Southern Mediterranean Neighbourhood (MED-GEM); Support to countries of the Western Balkan to greening their economies in consultation with all relevant partners and in enhancing monitoring and reporting (EU4Green); Promoting the clean energy transition and empowering consumers through better regulation in Eastern Partnership countries (EU4Energy); Aiding governments in the six EU Eastern Partner countries (Armenia, Azerbaijan, Belarus, Georgia, the Republic of Moldova and Ukraine) to take action against climate change and towards a low-emissions and climate resilient economy (EU4Climate). Supporting member countries of the Energy Community to adapt to CBAM; Advancing the external dimension of the European Green Deal in Morocco through action on the ground with a focus on climate and energy, the environment including marine and maritime issues, and the green economy (Green Partnership).

2.6.4 Bilateral/multilateral consultations

There are concerns that BCAs will result in trade barriers. To mitigate any potential adverse impacts, it is important to foster international cooperation to address these challenges. This could include efforts to coordinate measures to ensure that as far as possible they operate in a similar manner – for example with one definition of carbon pricing measures to be credited against a BCA charge, and with agreed monitoring, verification and reporting (MVR) process so that exporters do not have to comply with multiple sets of regulations. The World Trade Organization (WTO) has during 2024 convened a Task Force on Climate Action, Carbon Pricing, and Policy Spillovers, which has been joined by the International Monetary Fund (IMF), Organisation for Economic Co-operation and Development (OECD), World Bank, United Nations Framework Convention on Climate Change (UNFCCC), and United Nations Trade and Development (UNCTAD), and this could be a useful forum to raise issues.

The EU CBAM has a transition period – from 1 October 2023 to 1 January 2026 – during which CBAM importers will only have to report a set of data, including emissions embedded in their goods, without paying a financial adjustment. The transition period will enable the EU Commission to collect and analyze the information provided by the operators of installations producing CBAM goods in the CBAM reporting and by third countries' stakeholders in their meetings with the Commission services in order to fine tune the CBAM implementing regulations[39]. There will then be a gradual phasing in of the financial charges from 2026 to 2034.

International cooperation is needed not just to ensure that BCAs operate with the least friction possible but to try to facilitate and coordinate investment into green technologies and avoid a race to the bottom in subsidies. As noted in the LSE blog of 12 June 2023 referred to in section 2.6.3 above:

> "there are high risks associated with innovation in some of the less mature technologies, a lack of certainty and an expectation that this is a 'subsidies war to the bottom', which could disincentivise much-needed climate investments; coordination is critical to minimise this uncertainty….. Crucially, global collaboration and cooperation are needed to avoid harmful competition and facilitate large-scale technological breakthroughs, innovation and nurturing of new industries supportive of a low-carbon future."

As set out in section 3.5 of Part A of Workstream 4 (contained in Annex B-1 to document E/C.18/2023/CRP35), there are a number of carbon club or collaborative initiatives where multilateral conversations could be held to facilitate the smooth implementation and operation of any BCAs. These include the OECD Inclusive Forum on Carbon Mitigation Approaches (IFCMA) and the G7 Climate Club initiative. There is also the WTO Committee on Trade and Environment. The Commission services are part of these fora which could be used to agree common MVR processes and best practices to minimize disruption to trade; to help to coordinate subsidies and financing towards the most needed technologies; to facilitate technology transfer to developing countries; and to direct financing towards countries and projects where it is most needed. It is especially important that any multilateral process is genuinely inclusive and in particular takes account of practical difficulties faced by developing countries.

2.7 Leverage cleaner production technologies, potentially using the TRIPS Agreement

According to the ACF/LSE paper it may also be possible for developing countries to avail themselves of the provision of the Trade Related Aspects of Intellectual Property Rights Agreement (TRIPS). TRIPS provides for compulsory licensing of intellectual property rights to developing countries in certain specified circumstances. Such provisions could potentially be applied to environmentally sound

[39]For example, the South Centre made an informal presentation to the Environmental Sub-Committee of a paper it has produced highlighting perceived issues with CBAM; the transitional period could be used to address these matters with the Commission.

technologies such as energy storage, greenhouse gas reductions methods and industrial processes. One obstacle, however, is that compulsory licensing generally only applies to use in the domestic market. TRIPS also requires developed countries to incentivize enterprises in their territory to transfer technologies to developing countries in certain circumstances. While the application of TRIPS to the licensing and transfer of environmentally sound technologies is not clear or straightforward, there could well be opportunities for developing countries to work with developed countries to facilitate such transactions.

3. Administrative considerations

3.1 Measurement, reporting and verification (MRV) of emissions

The precise administrative measures to be applied by importers into a BCA region and the information required to be supplied by the producing facilities will depend upon the details of the relevant BCA regime. However, it is likely that information will be required on the embedded carbon content of covered goods – as for example in the EU CBAM. This means that producers in developing countries will have to be able to monitor and report such emissions. Where actual emissions cannot be reported, an importer would likely have to use a proxy such as the average emissions for the particular industry in the country of export or a deemed value based on a percentage of the worst performing facilities in the BCA zone. Such default values could be higher than the actual emissions and therefore disadvantage the exporting facility.

Calculating embedded emissions is complex. The EU Commission has for example, produced a 252-page document, "Guidance Document on CBAM Implementation for Installation Operators Outside the EU" to assist producers. It has been translated into 11 languages, including Arabic, Chinese, Hindi, Korean, Turkish and Ukrainian. However, anecdotal evidence at the time of writing suggests that many EU importers are finding that suppliers outside the EU do not have the information required to report under the CBAM Regulation.

It is not the purpose of this paper to examine or comment on the detail of the EU regulation but rather to make some general factual observations. To comply with any BCA regime, it is likely that an exporting facility will need to:

- Identify which of its products are covered by the BCA regime;
- Determine if the reporting applies only the particular goods being produced or also to embedded emissions in precursor goods used in the process;
- Understand the scope of the emissions covered, in particular whether the regime requires reporting of scope 2 emissions (i.e., emissions from purchased electricity, steam, heat or cooling) or only scope 1 emission (i.e., direct emissions from the facilities owned and controlled resources);
- Understand whether there is a required method or methods for calculating embedded emissions and if there is a choice, which will be the most convenient to apply (for example, following the initial transition period the EU CBAM has detailed rules which allow the use of a calculation method – which considers the embedded emissions of all the inputs into a process – or alternatively a measurement method whereby actual emission are measured at the facility. (It also allows certain other methods during the transitional phase);
- Put in place procedures to apply the relevant calculation measure.

Once the facility has put in place a process for measuring emissions it will need to work with the importers who will have to make declarations to ensure that the information is provided in the stipulated form.

It is also likely that the BCA regime will require verification of the reports. There are various enterprises which carry out verification services, However whether or not any particular verifier is accepted under the relevant BCA will depend upon its rules and it might be necessary for verifiers to be accredited by designated authorities in the BCA area.

While it is not possible to give a detailed explanation of MRV procedures in this paper, it is clear that there will be a significant amount of work for exporting facilities to carry out in order to be able to provide the required information to benefit from the possibility of paying a carbon charge based on their actual emission. Developing country governments may be able to assist their local enterprises by coordinating information sharing and training. They may also be able to be involved – singly, in partnership or through international organizations – in negotiating with jurisdictions considering introducing a BCA to try and ensure that common standards are applied so their domestic industries do not have to comply with multiple sets of rules if they are exporting to more than one BCA area. Finally, they may have a role to play in ensuring that accredited verifiers are able to operate in their jurisdictions.

Appendix 1

Impact on welfare: Limited CBAM coverage with a carbon price of €87 per tonne

Country[40]	Welfare	Terms of Trade	Volume of Trade	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	0.121	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
Chad	-0.017	-0.013	-0.0038	-0.027
Congo	-0.0071	-0.0062	-0.0092	0.0006
Côte d'Ivoire	0.064	0.063	0.0015	0.28
Democratic Republic of the Congo	-0.044	-0.036	-0.008	0.079
Djibouti	0.32	0.24	0.078	0.81
Egypt	0.018	0.011	0.0065	0.12
Eswatini	-0.013	-0.016	0.0022	-0.012
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	0.0039
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	0.0039	0.16
Nigeria	-0.0011	-0.00092	-0.00016	-0.00075
Rwanda	-0012	-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
Tanzania	0.0057	0.0038	0.0019	0.0075
Togo	0.052	0.044	0.008	0.13
Tunisia	0.094	0.056	0.038	1.2

[40] The country names have been updated to reflect the official names of the United Nations membership.

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

Source: African Climate Foundation and London School of Economics, Firoz Lalji Institute for Africa, Implications for African Countries of a Carbon Border Adjustment Mechanism in the EU, page 29.