USING TRADE TOOLS FOR INDUSTRIAL TRANSFORMATION

THE ROLE OF CARBON BORDER ADJUSTMENTS

SIERRA CLUB

December 2023

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Acknowledgements

The authors thank the following individuals for their insights and perspectives: **Hebah Kassem**, **Ben Beachy**, **Ilana Solomon**, **Morgan Rote**, and our many partners with whom we have been discussing these important issues.

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Executive Summary

For the United States, the amount of carbon emissions caused by the goods we import (1.4 gigatons per year) equals the total annual carbon emissions of all U.S. factories combined. Global trade rules currently contribute to this dynamic by enabling corporations to outsource their industrial pollution to other countries rather than invest in cleaner industrial production at home.

Carbon Border Adjustments have increasingly been advanced as means of addressing this carbon loophole. The European Union began implementing its Carbon Border Adjustment policy in October 2023 with full adoption scheduled for January 2026. Some members of the U.S. Congress have also put forward Carbon Border Adjustment proposals. These measures are not intended to single-handedly address all pollution from manufacturing, but serve to bolster complementary domestic and international initiatives to catalyze a just industrial transformation.[1]

Three general methods stand out in recent proposals:

A. The pollution intensity method multiplies the number of tons of a given imported product by the pollution intensity of that product (e.g. carbon dioxide equivalent (CO_2e) emissions per ton), then multiplies that total by a preset value of carbon (such as the Social Cost of Carbon, which ranges from about $50 to $124 per ton of CO_2).[2] The proposed Clean Competition Act and the Foreign Polluter Fee Act in the U.S. use versions of this method, applying the fee to products with emissions intensities above the domestic average emissions intensity of that product.

B. The carbon market method multiplies the number of tons of carbon embodied in a given imported product by the price per ton of carbon set dynamically in the domestic carbon market. The European Union's Carbon Border Adjustment Mechanism (CBAM) proposal is an example of this method: The price of carbon is set in the EU's carbon market, called the Emissions Trading System (the price per ton of carbon is defined by the buying and selling of permits to pollute in the domestic carbon market).

C. The policy costs method multiplies the estimated costs (per ton) of complying with environmental regulations by the GHG emissions (per ton) of the product, then multiplies that total by the number of tons of the imported product. The proposed Fair Transition and Competition Act in the U.S. is an example of this method.[3]

This discussion paper examines these proposals and their suggested Carbon Border Adjustment designs.

The Carbon Border Adjustment proposed under the Clean Competition Act (CCA) is currently the most far-reaching proposal on the table in the U.S. The establishment of a fee for both domestic and imported goods penalizes high polluters abroad and pushes domestic laggards toward higher performance, thereby further elevating standards for global producers.

CCA still has shortcomings. It provides significant exemptions for industrial gas and chemical manufacturing. While providing Least Developed Countries (as defined by the United Nations) with more time and space to transition to a more sustainable industry, the proposed legislation also relies on their capacity to ensure that producers from nonexempt countries do not use exempted markets to reroute goods to the U.S.[4] Like other Carbon Border Adjustment proposals, the CCA currently does not assess pollution beyond greenhouse gases, which limits its ability to mitigate impacts on the environment and public health.

Nonetheless, CCA offers a good foundation to encourage the development of cleaner industrial production, while supporting jobs and community wellbeing.

This paper also highlights areas unaddressed in current Carbon Border Adjustment proposals, such as environmental degradation, shortfalls in industrial capacity, human rights violations, and other concerns, which are critical to resolve when seeking a just outcome. Carbon Border Adjustment that truly supports the transformation of local and global industrial production may not initially address all these issues, but must be sufficiently flexible to incorporate the following omissions through an iterative process:

1. ***Failing to account for pollution along the full value chain.*** For example, effective abatement of pollution from the steel industry should address emissions from the mining of raw materials and transportation of the finished product to the market, not just the carbon released during the refining of the iron ore and steelmaking processes.
2. ***Failing to account for greenhouse gases besides CO_2.*** For example, the mining of coal for metallurgical coke used in steel production releases methane. This greenhouse gas is more than 25 times as potent as carbon dioxide at trapping heat in the atmosphere. Only focusing on CO_2 would not effectively curb emissions that are accelerating climate change.

3. *Failing to account for pollution besides greenhouse gases.* For example, iron and steel facilities emit air pollutants that are harmful to the respiratory system, such as nitrogen oxides (NO_x). Exposure to these air pollutants have been linked to chronic illnesses and death. A narrow focus on greenhouse gas emissions reduction can lead to measures that are counterproductive to public health, such as burning a blend of hydrogen and natural gas for steel forging — which could reduce carbon dioxide emissions but increase NO_x emissions vis-á-vis directly burning natural gas.
4. *Failing to account for critical environmental impacts besides pollution.* A policy intervention could succeed in reducing all manner of pollutants, but do so at the expense of unsustainable extraction of natural resources. For example, the steel industry is piloting the use of hydrogen in place of fossil fuels in energy-intensive processes. However, hydrogen production is highly water-intensive: Supplying hydrogen for a 288-megawatt power plant using 100 percent hydrogen would require the equivalent of an Olympic-size swimming pool of water every 12 hours. So, unless it is produced in a setting with great water abundance, hydrogen production could threaten neighboring food production or access to drinking water.
5. *Failing to account for ethically and practically relevant non-environmental factors.* Unless policies are designed in close collaboration with the communities that will be directly impacted by the effects of those policy shifts, they are likely to sow mistrust and generate pushback, which might jeopardize further efforts to reduce climate pollution emissions. Stakeholders include workers, environmental justice communities, and developing countries, which face strict restrictions on their policy space and have the fewest resources to contribute to the transition.

Addressing these common pitfalls may require the adoption of complementary measures like establishing protocols for emissions measurement and forums for engagement with both domestic and international stakeholders. In addition, the scope of the coverage should take into account not only the embodied carbon emissions and toxic releases but also the broader burden on the local environment and community. Most critically, policymakers should look to measure the success of a Carbon Border Adjustment policy holistically and not exclusively in terms of revenue raised or tons of greenhouse gases abated.

Below is a comparison of the Carbon Border Adjustment designs we examine in this paper.

Comparison of Four Carbon Border Adjustment Proposals: General Features

	EU CBAM[5]	The Clean Competition Act[6]	FAIR Transition and Competition Act[7]	Foreign Pollution Fee Act
SECTORS COVERED	Iron, steel, cement, aluminum, fertilizers, electricity, hydrogen; certain precursors, some downstream products such as screws and similar articles of iron or steel.[8]	Fossil fuels, refined petroleum products, petrochemicals, fertilizer, hydrogen, adipic acid, cement, iron and steel, aluminum, glass, pulp and paper, and ethanol.	Steel, iron, aluminum, cement, and other products to be determined by federal agencies.	Aluminum, biofuels, cement, crude oil, glass, hydrogen, methanol, ammonia, iron and steel, lithium-ion batteries, natural gas, petrochemicals, plastics, pulp and paper, refined petroleum products, solar cells and panels, wind turbines, and several key minerals. Some finished goods containing these covered materials.
EMISSIONS COVERED	Carbon dioxide, nitrous oxide, perfluorocarbons.[9] Emissions covered vary by product. See Annex I EU Parliament CBAM proposal for more detail.	GHGs defined by Section 211(o)(1)(G) of the Clean Air Act: carbon dioxide, methane, nitrous oxide, perfluorocarbons, sulfur hexafluoride, any other anthropogenically emitted gas that is determined by the EPA Administrator, after notice and comment, to contribute to global warming.	GHGs defined by 42 USC § 17321(3): carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, or sulfur hexafluoride.	GHGs defined by 40 C.F.R. 98.6: carbon dioxide, methane, nitrous oxide, sulfur hexafluoride, hydrofluorocarbons, perfluorocarbons, and other fluorinated greenhouse gases.

Comparison of Four Carbon Border Adjustment Proposals: General Features, continued				
	EU CBAM[5]	**The Clean Competition Act[6]**	**FAIR Transition and Competition Act[7]**	**Foreign Pollution Fee Act**
EMISSIONS PRICE	Set in the EU carbon market (weekly average of ETS auctions — currently about €90/ton).	$55 per ton and increase by 5% above inflation each year.	Varies by sector: The average domestic cost of compliance with environmental rules and policies for the relevant sector.	Varies by sector: the difference in average emissions intensity between the United States and the importing market is assigned a variable charge and multiplied to the value of the imported goods.
CALCULATION METHOD	Carbon market method (see above).	Emissions intensity method (see above).	Policy costs method (see above).	Emissions intensity method (see above).
USE OF REVENUES	Revenues directed to the EU budget; also to member states for climate action. Potential technical assistance to developing and least developed countries for adoption of their own carbon border adjustment policy.	75% to fund investments in decarbonization; 25% to fund investment in decarbonization in least developed countries.	50% to fund investments in decarbonization; 50% grants for worker training, climate adaptation and frontline communities.	Not specified.
EXCEPTIONS FOR LEAST-DEVELOPED COUNTRIES AND OTHER COUNTRIES	LDC exception not included initially. EU Commission to conduct review by 2027.	Exempts LDCs (unless their export of covered materials constitutes over 3% of the global export market) and foreign producers with emissions intensities below the U.S. average. Fees may be lowered for countries with corresponding fees on greenhouse gas emissions.	Exempts LDCs and countries with comparable legal regimes to limit/reduce GHGs.	Imports from low-income countries or lower-middle-income countries (as defined by the World Bank) may be reprieved from enforcement for 12 months if they are working towards an international partnership agreement with the U.S. Products within 50% of the average emissions intensity of the U.S. industry from countries with a free trade agreement or international partnership agreement with the U.S. are initially exempt. Low-income countries or lower-middle-income countries with an international partnership agreement receive a waiver for five years.

SOURCE: AUTHORS AND CSIS, 2022[10]

PHOTO: ISTOCK.COM/24K-PRODUCTION

I. Introduction

In the United States, the amount of carbon emissions caused by the goods we import (1.4 gigatons per year) equals the total annual carbon emissions of all U.S. factories combined.[11] Trade — and trade rules — contribute to this dynamic by enabling corporations to outsource industrial pollution to other countries rather than invest in cleaner industrial production at home (see Section II). In addition to amplifying the climate crisis and undermining the domestic industrial base, today's trade regime challenges human rights by stimulating investments in countries with weaker labor standards.[12] These headwinds represent systemic obstacles to reshaping of the global system of production — a prerequisite to building a cleaner and fairer world.

In response, trade tools are gaining importance in the climate policy toolkit.

In hopes of informing future policymaking, this discussion paper outlines some of the design challenges that policymakers face as they attempt to innovate trade-based measures capable of transforming local and global industrial production to address pressing environmental challenges, build industrial capabilities, respect human rights, and create quality jobs.

This analysis focuses on one particular trade tool that has gained political momentum as a potential means of curbing the global race to the bottom in environmental standards: Carbon Border Adjustments, also known as carbon dumping fees. We compare four Carbon Border Adjustment designs: the EU's Carbon Border Adjustment Mechanism and three proposals in the U.S. — the Clean Competition Act, the FAIR Transition and Competition Act, and the Foreign Pollution Fee Act (Section III).

We conclude that Carbon Border Adjustments can — if well designed — encourage the development of cleaner domestic industrial production, support American jobs, and avoid placing undue burdens on developing countries. However, in order for such trade measures to result in meaningful change, policymakers must avoid a range of policy design pitfalls (Section IV).

PHOTO: ISTOCK.COM/INDUSTRYVIEW

II. Trade, Global Production, and Industrial Transformation

A. The Social, Economic, and Environmental Impacts of Global Trade

To understand the role that trade tools can play in environmental action, we first have to understand what role trade plays in our current environmental, economic, and social challenges.

Trade — the movement of goods (and certain services) across national borders — is neither an inherently positive nor inherently negative practice for people or the environment.

At its best, trade between nations can facilitate a more efficient global system of production: an international division of labor that can help us all produce more essential goods with fewer resources and lower environmental impact, satisfying more fundamental human needs and increasing overall wellbeing. At its worst, trade enables a global race to the bottom, whereby governments all over the world lower labor and environmental standards to attract foreign investors. This pattern artificially reduces local production costs and in turn offers higher profits, but at the expense of human rights and sustainable resource management. Trade also enables governments to externalize the social and environmental costs of doing business.

Unfortunately, trade rules have historically been used to bring out the worst in global trade. From the constituent agreements of the World Trade Organization (WTO) to the proliferation of multilateral and bilateral agreements of past decades, global trade rules have progressively blocked countries from using mechanisms like tariffs, quotas, and local content preferences to support and develop local industrial capabilities.

International trade and investment rules have gone even further to undermine human health, human rights, and global development by tightly protecting intellectual property and the "rights" of corporations more broadly. For, example, the restrictions in the WTO's Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) place regulatory limits on the free flow of scientific and technological knowledge. This limits access to life-saving generic medications and prevents low-income countries from utilizing the available technology to develop local industrial capabilities, while protecting superfluous profits for pharmaceutical companies and industrial manufacturers.[13]

Similarly, Bilateral Investment Treaties (BITs), Free Trade Agreements (FTAs), and the Investor-State Dispute Settlement (ISDS) system embedded in those agreements have been used to deleterious effect. These tools arguably go to extremes to protect the "right of investors" at the expense of workers, the environment, and human rights. ISDS cedes the jurisdictional sovereignty of nation states to a panel of international arbitrators who can decide, for example, that a country's environmental protection measures or labor regulations violate a corporation's "rights" (including "rights" to expected profits). Recent attention to this issue from U.S. lawmakers and civil society groups highlights how out of step ISDS is with a model for responsible trade.

ISDS has been particularly detrimental to developing countries, which find it difficult to defend themselves in international arbitration because of their limited resources and weak geopolitical positions. And globally, the threat of ISDS has proven effective in inducing "regulatory chill" that dissuades countries from implementing progressive labor and environmental reforms or even basic health measures.[14]

In short, rather than enabling an efficient international division of labor that supports an efficient use of resources and enhances global wellbeing, current global trade rules make our global system of production dirtier, more inequitable, and more undemocratic.

However, when well designed, trade rules can also be used to promote equity, sustainability, and wellbeing.

B. Trade Rules as Tools for Industrial Transformation

It can be tempting to think about the greening of trade merely as a matter of increasing trade of green goods such as solar panels and batteries, but this perspective does not fully capture the extent of the problem we need to address: reshaping the global system of production.

If we want to foster a global economy that supports a resource-efficient global system of production that promotes the wellbeing of people and fits within ecological boundaries, we need to design trade rules with those (very complex) goals in mind.

Many trade-based proposals have been put forth in recent years to help move global trade in the right direction. Sierra Club's overview of climate-friendly trade tools, for example, proposes 15 specific changes to status quo trade policies[15] that could support family-sustaining jobs, manufacturing renewal, clean air, and climate action. These include policies as diverse as a climate peace clause (a moratorium on the use of trade or investment rules in international agreements to challenge governments' climate policies), ending the closed-door system of corporate trade advisors, and relaxing intellectual property restrictions to facilitate the transfer of green technologies.

Among these proposals, one climate-friendly trade tool that has gained traction in recent years is the use of fees on goods made with a high degree of pollution, known as carbon dumping fees or carbon border adjustments.

PHOTO: ISTOCK.COM/MOFLES

III. Carbon Border Adjustments and Their Role in Industrial Transformation

A. What Is Carbon Border Adjustment?

Carbon border adjustments, or carbon dumping fees, come in many forms but share a common feature: the imposition of some form of tariff or duty on highly polluting imports. By adopting a properly designed Carbon Border Adjustment, countries can make access to their domestic market contingent on foreign producers meeting environmental standards similar to their own, reducing the pressures of the race to the bottom in environmental standards, while incentivizing an industrial transformation that reduces pollution, creates quality jobs, and improves the health and wellbeing of communities.

The approaches to calculating Carbon Border Adjustments can vary widely, but three general methods stand out in recent proposals:[16]

1. **The pollution intensity method** multiplies the number of tons of a given imported product by the pollution intensity of that product (e.g. carbon dioxide equivalent (CO_2e) emissions per ton), then multiplies that total by a preset value of carbon (such as the Social Cost of Carbon, which ranges from about $50 to $124 per ton of CO_2).[17] The proposed Clean Competition Act and the Foreign Polluter Fee Act in the U.S. use versions of this method, applying the fee to products with emissions intensities above the domestic average. However, only the Clean Competition Act couples the fee on imports with an equal fee on domestic products above the domestic average emissions intensity.
2. **The carbon market method** multiplies the number of tons of carbon embodied in a given imported product by the price per ton of carbon set dynamically in the domestic carbon market. The European Union's CBAM proposal is an example of this method: The price of carbon is set in the EU's carbon market, called the Emissions Trading System (the price per ton of carbon is defined by the buying and selling of permits to pollute in the domestic carbon market).
3. **The policy costs method** multiplies the estimated costs (per ton) of complying with environmental regulations by the GHG emissions (per ton) of the product, then multiplies that total by the number of tons of the imported product. The proposed Fair Transition and Competition Act in the U.S. is an example of this method.

The design of Carbon Border Adjustments also requires policymakers to make choices about many other design features, such as which types of pollution should be included, which industrial sectors should be covered, how to distribute revenues, and whether or not developing countries or Least Developed Countries should be exempt from fees. The next section provides a brief overview of how four different versions of Carbon Border Adjustment have dealt with these design choices. Section IV then discusses in greater detail some of the shortcomings of Carbon Border Adjustments and other industrial policy measures in terms of their ability to adequately address the full range of relevant environmental impacts of global production and trade, as well as social and equity concerns.

B. Current Carbon Border Adjustment Proposals in the United States and in the European Union

Four key Carbon Border Adjustment policies have emerged in recent years (see Table 1).

1. The EU's Carbon Border Adjustment Mechanism

The Carbon Border Adjustment proposal advanced by the European Union is currently being implemented. Following negotiations between the EU Commission, the EU Council, and the European Parliament in December 2022, the EU reached a provisional agreement for CBAM implementation. Beginning in October 2023, importers are required to collect carbon data (first reporting by the end of January 2024); from 2026, importers will begin to pay a duty linked to the EU's domestic carbon market price (currently about €90/ton, or about $96/ton[18]).[19] Imports from countries with a carbon pricing scheme equivalent to the EU will be exempt from the tariffs.

One of the key shortcomings of the EU CBAM is that its application may confuse the goal of reducing emissions with advancing one single policy tool (a domestic carbon tax). As a consequence, the policy imposes costs for international partners who are misaligned with the European carbon price.

One of the stated aims of the EU CBAM is to incentivize trade partners to establish their own carbon tax, so that the levy is not entirely collected by European authorities.[20] However, Europe does not offer a rebate for goods that are coming from a jurisdiction with a carbon tax or fee that is set higher than the EU's domestic carbon market

price. As such, CBAM pushes trade partners to either not exceed EU carbon market price levels or submit to unfair treatment if a country opts to raise internal duties in accordance with domestic demand and priorities.

The EU's CBAM limits space for countries to choose from an array of policy pathways to achieve emissions reduction. It not only pushes the policy of domestic carbon pricing, but also establishes the EU's internal carbon market price as the optimal policy mechanism for reducing emissions. These are highly contested claims. The U.S., for example, has followed a public investment focused approach to green industrial transformation, and there is little reason to think that the approach will compare unfavorably to the EU's in terms of domestic emissions reductions.[21] Nevertheless, the EU's leadership in the green trade arena has stimulated U.S. lawmakers to respond in kind, with multiple legislative Carbon Border Adjustment proposals introduced in 2022 and 2023.

2. The Clean Competition Act

The Clean Competition Act (CCA), introduced in 2023 by Senator Sheldon Whitehouse (D-RI), follows the pollution intensity calculation method (see above). It applies a fee on key imported products (see Table 1) if the average pollution intensity of the industry in the exporting country is higher than the average emissions intensity of domestic facilities producing the same goods. A fee is also applied to domestic products that exceed the domestic average carbon intensity. The adoption of a domestic carbon price ensures compliance with the WTO's national treatment principle, which stipulates that imported and locally produced goods should be treated equally.[22]

The CCA proposes to reinvest 75 percent of the revenue raised from industry laggards in domestic decarbonization projects in the covered sectors. These grants will prioritize investments to facilities that promise to deliver the greatest emissions reduction, benefits to communities that are economically distressed or suffering from cumulative pollution burdens, or improvements in air quality. The remaining quarter of the funds would be dedicated to supporting the greening of industries in Least Developed Countries, so that these vulnerable countries are not left behind.

The bill's push to reduce the emissions intensity of domestic facilities represents a key strength of the bill. U.S. proposals that employ the domestic industry's average emissions intensity as a benchmark but do not include mechanisms to improve the climate performance of domestic facilities that release above-average emissions create space for freeriding. CCA levies a fee on laggards to signal that there is a cost to falling behind, and permits some of the payment to be recouped if the capital goes toward reinvestment in decarbonization or improving environmental justice outcomes.

Simultaneously, the CCA still creates opportunities for carbon offshoring if U.S. administrative capacities are not expanded.

The bill permits the administration to extend waivers for imports from countries that impose a comparable cost on greenhouse gas emissions. This creates the need to distinguish between imports that were manufactured in a country enjoying this waiver and imports produced elsewhere that were merely transported by ships originating from a country with a waiver. The legislation's exemption for imports from Least Developed Countries faces a similar "trans-shipment" problem. While the intention of this exemption is to minimize the harm to local manufacturers and workers in the world's poorest countries, this waiver creates an incentive for manufacturers in nonexempt markets to reroute their products to the United States through operations in exempted markets. Stronger enforcement and more stringent review of documentation to properly close these loopholes require the relevant agencies to receive more resources.

The CCA's employment of average emissions intensity of covered materials manufactured abroad to calculate a pollution fee for imports at the U.S. border may also produce warped incentives in foreign markets. Manufacturing plants abroad that release lower greenhouse gas emissions per unit of output compared to the average emissions intensity of the national industry will face the same fee at the U.S. border as those in their national industry that release above-average emissions. This could not only curb the incentive for the best actors to continue improving their performance, but also fail to target the punishment on the manufacturers that inflict outsized harm on the climate.

Similarly, the CCA instructs the administration to use the whole country's emissions intensity (calculated by dividing the total greenhouse gas emissions of a nation by its gross domestic product) if industry-level data is not available or reliable. This may also incentivize bad faith actors in highly-polluting industries that are in countries with relatively low total emissions per GDP to obfuscate their emissions data to pay a lower fee at the U.S. border.

Creating a more targeted incentive system that rewards good climate performers both at home and abroad requires the administration to have the capacity to distinguish the best and worst facilities and recognize the emissions profile of a national industry. Like the challenge of closing the loopholes created by waivers, the CCA could be strengthened by dedicating resources to relevant agencies to collect, calculate, and report key data points to the administration.

3. The FAIR Transition and Competition Act

The FAIR Transition and Competition Act, proposed in 2022 by Senator Chris Coons (D-DE), uses the policy costs method described above. This proposal is perhaps the least methodologically practicable of the three, due to the particular difficulties of calculating the costs of compliance with regulatory regimes and comparing those regimes across countries. It also faces a similar strategic problem as the EU CBAM because it is constructed around policy (the means) rather than emissions (the ends). This structure undermines the incentive to develop cost-efficient regulations to maximize emissions and neglects to account for non-regulatory pathways toward emissions reductions, such as public investments. A strength of the FAIR Act, however, is that it explicitly sets aside 50 percent of Carbon Border Adjustment revenues for worker training, climate adaptation, and frontline communities (see Table 1), recognizing a range of stakeholders affected by both pollution and the green transition.

4. Foreign Pollution Fee Act of 2023

Proposed in 2023 by Senator Bill Cassidy (R-LA), the Foreign Pollution Fee Act (FPF) employs the pollution intensity method. Unlike the CCA, which also uses the pollution intensity method (see above), the FPF does not include a fee for domestic producers. Imports will be assigned a percentage figure ("variable charge") based on the difference in the average emissions intensity of the covered industry in the country of origin and its U.S.counterpart. The higher the gap between the average emissions intensity of the imported and U.S.-produced goods, the higher the variable charge applied to the imported product. This variable charge is multiplied to the value of the imported product and levied at the border.

The FPF empowers the Department of Energy National Laboratories to establish the domestic average emissions intensity for covered industries using information currently collected by the Environmental Protection Agency. For products coming from abroad, the U.S. government will either accept verifiable sources or generate estimates using a model established by the National Laboratories. This expansion of public capacity to track sources of international emissions represents a positive development.

Among the strengths of this bill is its design to reward foreign manufacturing facilities that can demonstrate better performance than the average emissions intensity of peers in their home market. The FPF invites these producers to negotiate a separate variable charge under facility-specific agreements with the U.S. Trade Representative. Under such agreements, goods from these facilities could enter the U.S. with a lower levy than products made from facilities in the same country of origin without such an agreement. In return, the facilities must abide by standards consistent with those observed by U.S. manufacturers (e.g., Clean Air Act, Toxic Substances Control Act, etc.), deploy monitoring equipment, submit to data reporting, and take measures to lower pollution intensity if it is above the U.S. average.

This discourages freeriding by facilities with much worse emissions intensity than the industry average in the country of origin. However, freeriding is only avoided if peer manufacturers in that country with higher environmental performance negotiate separate facility agreements with the U.S. This is not inevitable, and facilities leading the industry in these markets may choose not to break from their domestic peers for various reasons, including sharing the same owner as worse environmental performers.

Meanwhile, the onus for calculating the pollution intensity falls on the U.S. government which gives Washington not only more agency but also greater administrative burdens. FPF further tasks the U.S. Trade Representative and the Treasury Department with identifying actions intended to circumvent the payment of fees, such as artificial price deflation or trans-shipment of products through countries with higher climate performance. Purported circumventions through these methods will be difficult to identify. Effective enforcement may be contingent on additional resources extended to these agencies to build up their capacity.

Similar to the CCA, the FPF partly focuses on climate outcomes rather than specific policies adopted abroad. Simultaneously, the bill encourages countries to join "international partnership agreements" that harmonize trade policies for pollution reduction and adopt compatible pollution reporting practices. In return for participation, the FPF offers fee exemptions and waivers.

Some of the potential climate gains may be muted by the bill's wide latitude extended to new and existing international partnerships. For instance, products within 50% of the domestic pollution intensity that are

manufactured in countries that have ratified a Free Trade Agreement with the U.S. are initially exempted from paying a fee. This weakens the effectiveness of this policy in deterring carbon offshoring and rewarding climate innovators (both at home and abroad). Moreover, this rewards a country's trade policy rather than the climate performance of the industry in said-country — a potential challenge that the European Union's CBAM also faces. In conjunction with the absence of a fee or incentives for domestic producers to decrease their pollution, the bill may face criticisms for appearing to create an exclusive trade bloc with limited benefits on greenhouse gas emissions.

Finally, all facilities are eligible as long as they are not fully or partially owned by governments of non-market economies. Most prominently at the time of the bill's introduction, these governments include: China, Russia, and Vietnam.[23] This is certain to raise criticisms for giving preferences to countries on the basis of internal policy as opposed to environmental merits.

Table 1. Comparison of Four Carbon Border Adjustment Proposals: General Features

	EU CBAM[24]	The Clean Competition Act[25]	FAIR Transition and Competition Act[26]	Foreign Pollution Fee Act
SECTORS COVERED	Iron, steel, cement, aluminum, fertilizers, electricity, hydrogen; certain precursors, some downstream products such as screws and similar articles of iron or steel.[27]	Fossil fuels, refined petroleum products, petrochemicals, fertilizer, hydrogen, adipic acid, cement, iron and steel, aluminum, glass, pulp and paper, and ethanol.	Steel, iron, aluminum, cement, and other products to be determined by federal agencies.	Aluminum, biofuels, cement, crude oil, glass, hydrogen, methanol, ammonia, iron and steel, lithium-ion batteries, natural gas, petrochemicals, plastics, pulp and paper, refined petroleum products, solar cells and panels, wind turbines, and several key minerals. Some finished goods containing these covered materials.
EMISSIONS COVERED	Carbon dioxide, nitrous oxide, perfluorocarbons.[28] Emissions covered vary by product. See Annex I EU Parliament CBAM proposal for more detail.	GHGs defined by Section 211(o)(1)(G) of the Clean Air Act: carbon dioxide, methane, nitrous oxide, perfluorocarbons, sulfur hexafluoride, any other anthropogenically emitted gas that is determined by the EPA Administrator, after notice and comment, to contribute to global warming.	GHGs defined by 42 USC § 17321(3): carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, or sulfur hexafluoride.	GHGs defined by 40 C.F.R. 98.6: carbon dioxide, methane, nitrous oxide, sulfur hexafluoride, hydrofluorocarbons, perfluorocarbons, and other fluorinated greenhouse gases.
EMISSIONS PRICE	Set in the EU carbon market (weekly average of ETS auctions — currently about €90/ton).	$55 per ton and increase by 5% above inflation each year.	Varies by sector: The average domestic cost of compliance with environmental rules and policies for the relevant sector.	Varies by sector: the difference in average emissions intensity between the United States and the importing market is assigned a variable charge and multiplied to the value of the imported goods.

Table 1. Comparison of Four Carbon Border Adjustment Proposals: General Features, continued

	EU CBAM[24]	The Clean Competition Act[25]	FAIR Transition and Competition Act[26]	Foreign Pollution Fee Act
CALCULATION METHOD	Carbon market method (see above).	Emissions intensity method (see above).	Policy costs method (see above).	Emissions intensity method (see above).
USE OF REVENUES	Revenues directed to the EU budget; also to member states for climate action. Potential technical assistance to developing and least developed countries for adoption of their own carbon border adjustment policy.	75% to fund investments in decarbonization; 25% to fund investment in decarbonization in least developed countries.	50% to fund investments in decarbonization; 50% grants for worker training, climate adaptation and frontline communities.	Not specified.
EXCEPTIONS FOR LEAST-DEVELOPED COUNTRIES AND OTHER COUNTRIES	LDC exception not included initially. EU Commission to conduct review by 2027.	Exempts LDCs (unless their export of covered materials constitutes over 3% of the global export market) and foreign producers with emissions intensities below the U.S. average. Fees may be lowered for countries with corresponding fees on greenhouse gas emissions.	Exempts LDCs and countries with comparable legal regimes to limit/reduce GHGs.	Imports from low-income countries or lower-middle-income countries (as defined by the World Bank) may be reprieved from enforcement for 12 months if they are working towards an international partnership agreement with the U.S. Products within 50% of the average emissions intensity of the U.S. industry from countries with a free trade agreement or international partnership agreement with the U.S. are initially exempt. Low-income countries or lower-middle-income countries with an international partnership agreement receive a waiver for five years.

SOURCE: AUTHORS AND CSIS, 2022[29]

CARBON CLUBS

Reviewing proposed climate measures at the border, the U.S. public must also consider how trade partners might respond to each policy option. This is important to long-term plans for climate change mitigation, because newly-industrializing and rapidly-growing countries outside North America and Western Europe, particularly China and India, contribute a growing share of global carbon emissions.[30] Moreover, growth and industrialization in Africa and Southeast Asia — regions which contribute a small share of carbon emissions today — are anticipated to lead the growth in demand for carbon-intensive goods in the decades ahead. In this environment, unilateral carbon abatement by the U.S. and the EU may be insufficient to forestall a climate crisis if the policies do not also shape international responses.

One proposal to mobilize a wider collective action is for like-minded countries to harmonize their Carbon Border Adjustment policies as part of a "Carbon Club."

The adoption of a carbon fee by a single country still acts as a sanction against importers of carbon pollution. Nonetheless, foreign manufacturers in carbon-intensive sectors may not be sufficiently incentivized to invest in new technologies and processes when other markets continue to allow products to be imported without reflecting their climate costs. Moreover, manufacturers in countries with an internal carbon price that principally export to markets without a border fee may opt to move their pollution-intensive production abroad. Investment opportunities presented by this "carbon leakage," in fact, may discourage some countries from adopting stricter climate rules with an eye toward attracting foreign capital.[31] Simultaneously, the adoption of a carbon fee at the border and/or an internal carbon price carries uncertainties to producers and consumers that make unilateral adoption politically challenging.[32]

The adoption of common trade penalties by many countries under a "Carbon Club" increases the likelihood of inducing pollution abatement while further decreasing the share of the global market that pollution-intensive producers can enter without a cost. A "Carbon Club" consisting of the EU, the United Kingdom, Canada, Japan, and the U.S. would cover 44 percent of global international trade.[33] This represents a sizable share that increases the incentive for manufacturers to make capital investments that lower barriers to entry into this common market, compared to each market acting alone.

Differences in methods for calculating Carbon Border Adjustment pose an immediate challenge in the creation of this prospective "Carbon Club." In particular, the question of a domestic carbon price remains a point of divergence between the U.S. and the EU. Tensions emerging from ongoing bilateral discussions around the Global Arrangement on Sustainable Steel and Aluminum (GASSA) — a proposal to establish common measures that would curtail market access for carbon-intensive steel and aluminum — serves as a spotlight.[34] According to the latest news from these negotiations, the emerging U.S. position proposed restrictions on the import of materials that are more carbon-intensive than what is produced domestically.[35]

Some European observers believe that the absence of a domestic fee for industrial emissions in the U.S. would disincentivize the worst-polluting facilities in sectors that have a low average emissions intensity from investing in abatement.[36]

Meanwhile, the U.S. administration is pursuing ways to incentivize current laggards in carbon-intensive sectors without a fee on carbon through higher standards for curbing industrial pollution releases, public procurement standards, and grants contingent on pollution abatement. However, these efforts are stymied by substantial challenges ranging from accurate emissions data to unwillingness of corporations to participate in many of these voluntary programs.

Acknowledging political hurdles to implementing either a domestic carbon fee in the U.S. or a common

approach to investments in the EU, some critics have suggested that proposals for a "Carbon Club" places the cart before the horse because domestic politics is "the main obstacle to faster progress on decarbonisation" (sic) in the Global North.[37]

Nonetheless, advocates of a "Carbon Club" point to successful precursors such as the 1987 Montreal Protocol, which banned the trade in substances that depleted the ozone layer between members who were subject to varying internal compliance measures and non-members.[38]

U.S. National Security Advisor Jake Sullivan framed the administration's prospective agreement with the European Union on curbing emissions intensity in the steel and aluminum trade as a potential model for wider agreements with international partners.[39] Sullivan viewed such carbon arrangements not as a disavowal of the World Trade Organization, but as a complementary institution to both address climate concerns missing in existing multilateral frameworks and boost overall global economic resilience. He also characterized these arrangements as one vehicle for creating space for "partners around the world to restore the compacts between governments and their voters and workers" through targeted domestic investments in sustainable industrial technologies.

Given the current momentum, a "Carbon Club" could become a potential mechanism to address the global climate crisis in the trade space. However, the persistent desire for political expediency carries the risk of sacrificing essential components of achieving global pollution abatement through just and equitable avenues.

"Carbon Club" initiatives led by global north countries are also viewed by some developing countries with suspicion — as another vehicle for reproducing the inequities of existing global trade rules[40] that both render innovation adoption in developing countries costly and limit market access for goods from developing countries in the Global North. For instance, the current over-protection of intellectual property enforces cash transfers from developing countries to the Global North.[41]

Meanwhile, excessive indebtedness among many developing countries — often byproducts of historical injustices — act as a hurdle to both effective public revenue utilization and access to global capital markets to engage in sustainable industrial development.[42] The failure to address these and other outstanding issues will also hamper efforts to evade the climate crisis.

PHOTO: ISTOCK.COM/SERGEY BUKHAREV

IV. Environmental Justice, Health, Equity, and Ecological Implications

A. Potential Pitfalls in Policy Design

Much like other policy measures intended clean up industrial production, Carbon Border Adjustments might not effectively contribute to a more livable planet and healthy communities unless they also incorporate and cohere with broader objectives — namely:

- Tackling critical environmental challenges like reducing toxic land, air, and water pollution, resource and biodiversity depletion, and building ecosystem resilience; and
- Addressing the localized impacts of industrial production — including the disproportionate impact of pollution on low-income communities and Black, Indigenous, and people of color; and the impact of industrial transformation on workers and communities tied to existing manufacturing facilities.

To be effective, green trade policy needs to be more than pro-climate trade policy. It needs to incorporate broader health, wellbeing, and environmental justice objectives. Although not a universally agreed upon approach to public policy, tackling many objectives through one policy tool is sometimes referred to as multi-solving, which can be achieved through strategic policy design or the inclusion of safeguards and standards.[43] Carbon Border Adjustments can benefit from a multi-solving approach and so should be designed with future iterations in mind and scope to cover an increasingly complete list of traded materials and pollutants. Correspondingly, the value created by improving environmental and health conditions should not be reduced only to monetary terms.

Neglecting to do so risks enabling incomplete or even counterproductive solutions that fail to address the impacts of industrial production on the wellbeing of communities and on the ecosystems that sustain them.

Specifically, the design of policies for industrial transformation, including trade measures like Carbon Border Adjustments, should strive to avoid the below common industrial policy pitfalls. (See Table 2 for a summary of how these pitfalls relate to the four Carbon Border Adjustment proposals above.)

1. Failing to account for pollution along the full value chain (aka point-source reductionism or narrow boundaries)

Trade policies aimed at industrial pollution reductions might fail to reduce pollution if they do not account for emissions along the full (local and global) value chain. For example, to effectively reduce pollution from steel production, policy interventions should be based on an understanding of pollution from the beginning to the end of the steel production process. This ranges from the mining of raw materials, like iron ore and limestone, to the transportation of those materials, to the energy-intensive processing of those materials into steel, to the transportation of that steel to market, to management of the ensuing pollution and waste.

However, pollution accounting tends to be limited to facility-level emissions, or at best incorporates emissions from associated electricity generation. This is the case for the European CBAM, which only includes on-site (air) emissions, as well as for the proposals from members of the U.S. Congress discussed above, which only include on-site (air) emissions and emissions from electricity generation (see Table 2) and exclude non-air pollution and pollution further upstream, such as water and land pollution from mining, if non-greenhouse gas emissions are discussed at all.

To address this pitfall, governments must begin mandating the measurement of emissions from assets or activities that are outside a reporting firm's control but integral to its supply chain (commonly called "Scope 3 emissions"). Adoption of such a protocol may require the establishment of human and digital infrastructure for additional data collection. In addition, the definition of what constitutes the boundaries of a supply chain must be both uniform and total. These challenges must be addressed in order to integrate pollution along the full value chain in a Carbon Border Adjustment policy.

2. Failing to account for greenhouse gases besides CO_2 (aka CO_2 reductionism)

Policy solutions exclusively targeted at CO_2 reduction may also fail to mitigate climate change if they do not factor in greenhouse gas emissions besides CO_2. Failing

to account for such emissions may lead to solutions that are effective in reducing CO_2, but that inadvertently increase emissions from other greenhouse gases — some of which can have a far greater impact on global warming than CO_2. For example, one metric ton of perfluorocarbon (PFC) emissions from aluminum production[44] is equivalent to 7,390 to 12,200 metric tons of CO_2 emissions. The mining of coal for the production of metallurgical coke used in steel production is responsible for an enormous amount of methane emissions; methane is more than 25 times as potent as carbon dioxide at trapping heat in the atmosphere. Moreover, converting other greenhouse gases to tons of CO_2e can also obscure important differences in how different gases contribute to climate change.

Though today's most prominent Carbon Border Adjustment proposals are called "carbon" border adjustments, they do account for some other greenhouse gases. These most frequently include methane, nitrous oxide, and hydrofluorocarbons. The scope of coverage varies widely across proposals, however (See Table 2).

3. Failing to account for pollution besides greenhouse gases (aka greenhouse gas reductionism)

Policies exclusively focused on reducing CO_2 and other greenhouse gas emissions may avoid the above pitfalls and yet still fail to contribute to a more livable planet if they do not factor in highly dangerous pollutants that are not greenhouse gases. Iron and steel facilities, for example, emit nitrogen oxides (NO_x, a collective term used to refer to nitrogen monoxide (nitric oxide or NO) and nitrogen dioxide (NO_2)). Studies have demonstrated that exposure to NO_x damages the pulmonary system, particularly in children and people with existing respiratory conditions. A 2018 review by the German Environment Agency further added a strong link between long-term nitrogen dioxide in causing cardiovascular mortality.[45] Additional studies have also linked higher levels of NO_x exposure to higher levels of fatality during the coronavirus (COVID-19) pandemic.[46]

As such, reduction of NO_x is a vital component of building a more sustainable industry, alongside reduction of climate pollution. However, some current efforts to decarbonize the iron and steel industry include pathways that would increase NO_x emissions. This includes ongoing efforts to use a blend of natural gas and hydrogen in steel forging with the aim of reducing the burning of fossil fuels. Current studies have suggested that burning hydrogen-enriched natural gas (even if we assume that hydrogen is produced from renewable sources) could increase NO_x emissions up to six times that of directly burning natural gas.[47]

NO_x is hardly the only pollutant produced by the steel industry with significant potential harm to human health. Other toxics like lead — which accumulates in bones, blood, and soft tissues of the body and can affect development of the central nervous system in young children, resulting in devastating neurodevelopmental effects (even in minuscule amounts) — contaminate land and water in addition to air, and can even be transmitted through consumer products.

Therefore, industrial transformation policies that aim to mitigate the *immediate*, localized health impacts of pollution — and not only the *systemic* health impacts that arise from climate change — need to take into account, and aim to reduce, the full range of pollutants associated with particular industries, as well as the various vectors through which those pollutants impact human health. Failure to do this can lead to counterproductive measures like adopting hydrogen-enriched natural gas as a feedstock in steelmaking or replacing coal with the burning of toxic waste in cement kilns.

Unfortunately, none of the EU or U.S. Carbon Border Adjustment proposals discussed above currently account for these kinds of highly damaging emissions — they only include GHGs (See Table 2) — despite the fact that industries like steel emit a range of pollutants damaging to public health.[48]

To address local pollution, a Carbon Border Adjustment should either have guardrails that require or incentivize such emissions reductions (for example on an average basis for each type of covered good or industry) or it should add the cost of the environmental and public health harms from these pollutants to the Carbon Border Adjustment fee value. To effectively deploy these guardrails or fees, the U.S. government, academia, industry, and other stakeholders should first define parameters for classifying industrial processes based on their capacity to abate greenhouse gas emissions and toxic pollutants. By defining attributes of available and emergent industrial processes and identifying toxic emissions that require abatement — as opposed to specific technology pathways — policymakers can incentivize industrial facilities to adopt the technologies that most effectively and comprehensively reduce health and environmental harms.

4. Failing to account for critical environmental impacts besides pollution (aka pollutant reductionism)

Industrial transformation policies may adequately account for all relevant pollutants but still make matters worse for people and the planet if they fail to factor in the broader impacts of the industry they seek to transform on critical ecosystems and their services.

For example, a policy intervention may succeed in reducing all manner of pollutants, but do so at the expense of unsustainable extraction of scarce natural resources. Such a policy may degrade the ability of ecosystems to produce critical goods efficiently, such as by depleting soil through tillage, which threatens food security, or depleting aquifers in water-scarce areas for industrial production.

For example, industry observers see hydrogen-based ironmaking as a promising pathway to decarbonization. However, the production of hydrogen through electrolysis is highly water-intensive: Supplying hydrogen for a 288-megawatt power plant using 100 percent hydrogen would require the equivalent of an Olympic-size swimming pool of water every 12 hours. So, unless it is produced in a setting with great water abundance, hydrogen production could threaten neighboring food production or access to drinking water.

Even more dramatic examples of potential ecosystem harm and biodiversity depletion come from materials critical to industrial transformation that are not yet included in existing Carbon Border Adjustment proposals. In the lithium-rich Andean regions of Argentina, Bolivia, and Chile, Indigenous farmers increasingly compete with miners (and implicitly downstream industries like electric vehicle battery manufacturing) for highly scarce water supplies. In Chile's Salar de Atacama, lithium and other mining activities consumed 65 percent of water resources, causing groundwater depletion and environmental degradation to the point that local communities were forced to abandon ancestral settlements. Policies aimed at industries like solar, which rely on large-scale expansion of mineral extraction in delicate ecosystems and vulnerable communities, have to be particularly sensitive to these kinds of impacts in their accounting of costs and benefits.

The Carbon Border Adjustment proposals discussed in this paper do not currently contemplate any impacts of industrial production on biodiversity and resource depletion or degradation, even though the production of steel, aluminum, and other covered materials relies heavily on manufacturing methods that cause catastrophic damage to ecosystems down the supply chain (see Table 2).[49] Given this backdrop, governments currently in the process of designing or implementing Carbon Border Adjustments should consider a fee that also penalizes damaging methods and prepare the expansion of the covered materials to include critical minerals and other resources with outsized impact on the environment.[50]

5. Failing to account for ethically and practically relevant non-environmental factors (aka environmental reductionism)

Even if the primary function of green industrial policies is to reduce the negative *environmental* impacts of industrial production, there are good reasons — both ethical and practical — to contemplate non-environmental impacts in policy design, including human health, workers' rights, and the distribution of social and economic costs and benefits.

Some policy solutions may be so well designed that they improve environmental factors across the board, simultaneously reducing greenhouse gas and toxic pollutants, as well as resource and biodiversity depletion and ecosystem resilience — but they may still make matters worse for workers and communities. For example, transferring a steel plant with high greenhouse gas and toxic emissions that provides well-paying jobs to a distant location with better access to clean energy sources may improve air, land, and water quality and create new jobs, but it could also have a devastating impact on the community losing it local facility, including the capacity of families to pay for food and shelter and the capacity of local governments to provide public basic services.

Unless industrial transformation policies are designed in close collaboration with the communities that will be directly impacted by the effects of those policy shifts, they are likely to not only have a net negative impact on wellbeing, but also to create strong — and valid — resistance to green transitions.

This is why the Sierra Club has argued that "the design of a carbon dumping fee should be a joint project between labor unions, environmental groups, frontline communities, and other key stakeholders across borders, working alongside legislators and administration officials."

Similarly, some have called for existing Carbon Border Adjustment proposals to include exceptions for Least Developed Countries, and even developing countries, noting potential income and job impacts. Current U.S. Carbon Border Adjustment legislative proposals exempt Least Developed Countries but not other developing

countries. The EU CBAM does not exempt Least Developed Countries (See Table 2).

Flexibilities for developing countries are certainly a legitimate concern. As discussed in Section II, rich countries have a long track record of imposing strict economic rules on developing countries that hinder their development — including their industrial development. At the same time, the interests of developing are not homogenous. People living near highly polluting industrial facilities in a developing country may hold different attitudes than representatives of their country's government. To ensure that the interests of developing countries are truly represented, all relevant stakeholders must be engaged and alternatives to lax standards — such as reparative and compensatory measures for developing countries, including debt relief — should be explored.

B. Addressing Pitfalls

Some pitfalls mentioned above are easier to address than others. Governments, industries, and international partnerships have gained significant grounds defining and standardizing the measurement of greenhouse gas emissions across the full supply chain of key sectors like cement and steel. However, accounting for the impact of toxic releases and the disproportionate consequences on the health of communities around the facilities have not yet been integrated in these assessments.

Recognizing that this is necessarily an iterative process, this paper puts forward three principles for establishing a Carbon Border Adjustment design that complements the transformation of the global system of production.

First, Carbon Border Adjustment should be designed with the explicit acknowledgement and commitment that its coverage of materials, pollutants, and processes would expand in the future. While few Carbon Border Adjustment proposals today consider the expansive inclusion of non-greenhouse gas pollutants and other environmental harms, they should actively signal commitment to building the capacity to account for factors that degrade public health or natural resources. It should be made clear that the government adopting the Carbon Border Adjustment intends to penalize production methods that decrease greenhouse gas emissions while producing higher toxic releases.

These include processes like the burning of hydrogen-blended natural gas that threaten to release higher air pollutants at the cost of lower carbon emissions. Simultaneously, products made at facilities with carbon capture, utilization, and storage (CCUS) that promise to reduce carbon emissions, but not abate the release of harmful pollutants, should be differentiated from comparable goods manufactured through technologies that reduce emissions and pollutants at the process level. In addition, ecological and community harm from the extraction of minerals should be factored into the Carbon Border Adjustment design. Acknowledging there are unknowns, resources should be geared toward developing methodologies for measuring impact and harmonizing approaches with trade partners.

Clear messaging by the government of its intent to continue expanding its Carbon Border Adjustment coverage encourages industries and trade partners to consider pathways that are more transformative, albeit more costly in the short term.

Second, governments should measure the impact of Carbon Border Adjustment in a holistic manner and not exclusively in monetary terms. Effects of the climate crisis, toxic pollution, and natural resources are often measured in cash equivalence, but such calculations create the false perception that the policy goal is to maximize economic value. Moreover, approaches that focus solely on the economic utility of nature (for instance, the importance of mangroves and coastal dunes are sometimes reduced to their role in preventing soil erosion, thus securing the real estate value of local homes) fail to fully appreciate the role that the environment plays in securing biodiversity (mangroves serve as nurseries for a variety of marine species that are not commercially valued but play a critical role in the ecosystem).

Third, governments should engage and address the concerns of the most impacted communities at home and abroad, with particular attention to developing countries. Concerns from developing or Least Developed Countries range from essential goods becoming unaffordable to economy-supporting export markets losing a competitive edge. The economic ramifications of a Carbon Border Adjustment may be felt at the household level, in both good ways and bad. But targeted policies like Carbon Border Adjustments are not typically designed to address the diversity of circumstances and anticipate unintended consequences in every corner of the world. Recognizing this inherent limitation and acknowledging that there will be a learning curve, a climate-forward trade policy should be iterative and malleable. For example, this could include provisions for proactive solicitation of feedback and space to make revisions that ameliorate any disproportionate burdens imposed on vulnerable communities at home and abroad. The longevity of the

critical trade component of the fight against climate change will rely on broad, popular buy-in. This requires balancing communities' many needs, including the desire for economic wellbeing and the preservation of cultural heritages.

In summary, efforts to adopt and expand a Carbon Border Adjustment policy must be supplemented with transparency requirements and capacity building to better understand the cumulative impact of the anticipated industrial transformation on the living environment globally. Recognizing that the government cannot be everywhere, this necessarily requires active participation by, and constant engagement with, public health professionals, frontline communities, labor unions, and other key stakeholders.

Table 2. Comparison of Four Carbon Border Adjustment Proposals: Environmental and Equity Features

	E.U. CBAM[51]	The Clean Competition Act[52]	FAIR Transition and Competition Act[53]	Foreign Pollution Fee Act
POLLUTION TYPES COVERED Does it cover land, air, water, and end-product pollution?	**No.** Does not cover land, water, or end-product pollution. Only covers some air pollution.	**No.** Does not cover land, water, or end-product pollution. Only covers some air pollution.	**No.** Does not cover land, water, or end-product pollution. Only covers some air pollution.	**Possibly.** If a facility-specific agreement is adopted, that foreign facility would be subject to substantially similar environmental standards (e.g., compliance with the Clean Air Act) as firms in the U.S.
GHG EMISSIONS COVERED Which GHG emissions are covered?	Carbon dioxide, nitrous oxide, perfluorocarbons. Emissions covered vary by product. See Annex I EU Parliament CBAM proposal for more detail.	Includes GHGs defined by Section 211(o)(1)(G) of the Clean Air Act: carbon dioxide, methane, nitrous oxide, perfluorocarbons, sulfur hexafluoride, any other anthropogenically emitted gas that is determined by the EPA Administrator, after notice and comment, to contribute to global warming.	Includes GHGs defined by 42 USC § 17321(3): carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, or sulfur hexafluoride.	Includes GHGs defined by 40 C.F.R. 98.6: carbon dioxide, methane, nitrous oxide, sulfur hexafluoride, hydrofluorocarbons, perfluorocarbons, and other fluorinated greenhouse gases.
TOXIC EMISSIONS/ HEALTH IMPACT ACCOUNTING Does it cover harmful emissions besides GHGs?	**No.** No emissions covered besides GHGs above. No health impacts accounted for.	**No.** No emissions covered besides GHGs above. No health impacts accounted for. Grants from revenue can go towards investments that improve air quality in industrial communities.	**No.** No emissions covered besides GHGs above. No health impacts accounted for.	**No.** No emissions covered besides GHGs above. No health impacts accounted for.

Table 2. Comparison of Four Carbon Border Adjustment Proposals: Environmental and Equity Features, continued

	E.U. CBAM[51]	The Clean Competition Act[52]	FAIR Transition and Competition Act[53]	Foreign Pollution Fee Act
FULL SUPPLY CHAIN ACCOUNTING Does it account for emissions along the full value chain?	**No.** Only includes Scope 1 air emissions. Indirect emissions will be covered in the scope after the transitional period.	**No.** Only includes Scope 1 and 2 air emissions (from manufacturing and on-site electricity consumption).	**Unclear.** Methodology to be defined by federal agencies.	**Unclear.** Includes references to upstream emissions and fugitive emissions.
BIODIVERSITY AND NATURAL RESOURCE DEPLETION ACCOUNTING Does it account for critical environmental impacts besides pollution?	**No.** Does not factor in impacts on biodiversity of resource depletion and degradation.	**No.** Does not factor in impacts on biodiversity of resource depletion and degradation.	**No.** Does not factor in impacts on biodiversity of resource depletion and degradation.	**No.** Does not factor in impacts on biodiversity of resource depletion and degradation.
SOCIAL AND EQUITY FACTORS Does the design contemplate social and equity factors?	No exceptions for developing or least-developed countries. EU regulation voices intention to provide technical assistance in addressing carbon pricing to developing and least-developed countries. No specific provisions for workers and communities.	Exemptions for least-developed countries (unless their export of covered materials exceeds 3% of the global export market). 25% of the revenue to go to assist decarbonization in least-developed countries (see Table 1). Grants will prioritize industrial projects that have environmental justice implications.	Exempts least-developed countries. Some grants targeted for worker training and environmental justice communities.	No exemptions for countries unless negotiating an international partnership agreement or already in a similar treaty. (See Table 1 for more detail) No specific provisions supporting workers or local communities. A provision calls on the import fee to consider effects on domestic costs.

Source: Authors

PHOTO: ISTOCK.COM/YAYAERNST

V. Conclusions

This discussion paper has given an overview of the role of trade in industrial transformation, current Carbon Border Adjustment proposals, and some of the pending challenges that face policymakers as they develop trade tools, including Carbon Border Adjustments, in the service of industrial transformation.

In principle, Carbon Border Adjustments can encourage the development of cleaner industrial production, while supporting jobs and community wellbeing. However, in order for such trade measures to achieve meaningful change, policymakers need to avoid a range of common pitfalls in industrial policy design — from failing to include measures to reduce land and water pollution to failing to address the concerns of workers and communities.

The politics (and ethics) of industrial decarbonization demands that green industrial transformation be paired with environmental justice, good union jobs, and support for workers and communities in transition, at home and abroad. Though there can often be tradeoffs between climate objectives and broader environmental and social objectives, these must be acknowledged and carefully weighed when designing policy.

Whether trade rules can be used to promote equity, sustainability, and wellbeing is largely a political question: Current global trade rules have been a reflection of global power dynamics and the concentration of power in the hands of few corporations with outsized influence in policymaking. Advancing more progressive trade rules requires navigating these power asymmetries while aligning the interests of very diverse stakeholders. A first step is for policymakers to meaningfully engage those stakeholders — including workers and environmental justice communities and environmental organizations — in the discussion and design of trade policy.

Endnotes

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