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Políticas para la respuesta al cambio climático y la preservación de la biodiversidad

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International negotiations and agreements on climate change

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Hayley Stevenson[1]

Summary

This policy paper describes the international negotiations and agreements on climate change, emphasizing the repercussions for countries of Latin America and the Caribbean. The paper analyzes the political economy of international climate change negotiations, with emphasis on the perspectives of countries in this region. It offers an overview of the historical and recent negotiations and agreements; explains the relevance of key biodiversity agreements for climate change; explores the institutional challenges that parties face in implementing their domestic mitigation plans (nationally determined contributions, NDCs); and discusses the commercial aspects of climate change agreements (including carbon trading, border carbon adjustment, carbon clubs, low-carbon product requirements, green bonds, and carbon offset markets).

Negociaciones y acuerdos internacionales en materia de cambio climático

Hayley Stevenson[2]

Resumen

Este documento de política describe las negociaciones y acuerdos internacionales en materia de cambio climático, enfatizando las repercusiones para países de América Latina y el Caribe. El documento analiza la economía política de las negociaciones internacionales en cambio climático, con énfasis en la perspectiva de los países de la región. Se ofrece un resumen de las negociaciones y acuerdos históricos y actuales, explica la relevancia para el cambio climático de acuerdos clave en materia de biodiversidad, explora los retos institucionales que se enfrentan cuando se instrumentan planes nacionales de mitigación (contribuciones determinadas nacionalmente), y discute los aspectos comerciales de los acuerdos de cambio climático (incluyendo comercio de carbono, mecanismos de ajuste en frontera, requerimientos de carbono, bonos verdes y mercados de compensación de carbono).

1. Introduction

This working paper describes the international negotiations and agreements on climate change, emphasizing the repercussions for countries of Latin America and the Caribbean (LAC). The paper analyzes the political economy of international climate change negotiations, with emphasis on the perspectives of countries in this region. It begins in section 2 with an overview of the negotiations and agreements (including key tensions, evolution of the negotiations, the shift from top-down to bottom-up governance, net-zero targets and negative emissions technologies, forestry and finance). Section 3 explains the most relevant agreements on biodiversity and their implications for climate change. Section 4 explores the institutional challenges that parties face in implementing their domestic mitigation plans (NDCs: nationally determined contributions). Section 5 discusses the commercial aspects of climate change agreements (including carbon trading, border carbon adjustment, carbon clubs, low-carbon product requirements, green bonds, and carbon offset markets). Each section begins with a roadmap to orient the reader.

2. International negotiations and agreements on climate change

This section explains the most important aspects of international negotiations and agreements on climate change, highlighting the tensions that have marked multilateral debates over three decades. These debates revolve around the criteria for distributing responsibility for climate change mitigation (including reducing emissions and financing emissions reductions), and the types of actions and commitments that are appropriate for mitigation (including different types of emissions targets, and different technologies and mechanisms for reducing or sequestering emissions). The section begins with an overview of key tensions in the negotiations (2.1), followed by historical background to contextualize how these tensions have emerged and developed over time (2.2). This is followed by a review of the different approaches proposed for distributing responsibility (total emissions, historical emissions, per capita emissions), and the implications of these approaches for the LAC region (2.3). A flexible approach was adopted in the Paris Agreement, which allows each country to decide and justify their own fair contribution to global mitigation efforts. This represents a shift from top-down to bottom-up commitments, which is explained in section 2.4. A new trend has emerged in climate negotiations over the past year whereby countries are increasingly adopting net-zero emission targets; this is explained in section 2.5, followed by the viability of different technological options for meeting these targets (2.6). The issue of forestry is important for many countries in the LAC region, and section 2.7 explains how this has been treated in the negotiations. The section concludes with an explanation of how finance has been debated in the UNFCCC, and the pledges that have been made to support developing countries with mitigation and adaptation (2.8).

2.1 Overview of key tensions in the negotiations

The climate change negotiating agenda has grown considerably since negotiations on a climate change convention began thirty years ago. Negotiations on the Paris Agreement focused on the following issues: mitigation (including market mechanisms), adaptation, finance, technology development and transfer, capacity building, and transparency. A set of cross-cutting tensions characterizes the negotiations, which can be summarized as distribution of responsibility for reducing greenhouse gas emissions and providing finance (see sections 1.2, 1.3, 1.4, 1.8); and what counts as appropriate mitigation action (see section 1.4, 1.5, 1.6, 1.7, also 4.7). There is also increasing attention to the question of transparency, and vulnerable countries are advocating for greater attention to loss and damage (i.e.,

compensation for climate change impacts that are both unavoidable and beyond the limits of adaptation).

Countries typically negotiate as part of a bloc rather than individually. Historically, the most significant division has been between the Global North and Global South, often referred to as Annex I and non-Annex I countries (or parties). These categories originally appeared in the 1992 Convention on Climate Change (UNFCCC) to differentiate the more stringent commitments and obligations agreed by countries with more advanced economies and higher historical emissions. However, over the past three decades of multilateral climate change negotiations, various smaller negotiating blocs have played an important role in shaping agreements. Many countries are members of more than one bloc, and the relevance of different blocs tends to change over time depending on the divergence and convergence of interests on different topics under discussion. For example, most developing countries are members of the Group of 77 (G77), a negotiating bloc with 135 members including large and emerging economies like China and Brazil, and micro-states like Tuvalu. Given the diverse interests among G77 members, many countries have formed smaller alliances such as the African Group, Arab States, Like-Minded Developing Countries, Alliance of Small Island States (AOSIS), Small Island Developing States (SIDS), Least Developed Countries (LDCs), Independent Alliance of Latin America and the Caribbean (AILAC), Cartagena Dialogue, and the Bolivarian Alliance for the Peoples of our America (ALBA). Countries of the Global North also negotiate as part of smaller groups, including the European Union, the Umbrella Group (Australia, Canada, Iceland, Israel, Japan, New Zealand, Kazakhstan, Norway, Ukraine and the United States; Russia and Belarus were also key members of this bloc until 2022), and the Environmental Integrity Group (Mexico, Liechtenstein, Monaco, the Republic of Korea, Switzerland and Georgia).

2.2 Background: negotiating the UNFCCC and Kyoto Protocol[3]

Multilateral efforts to protect the climate system began in the late 1980s. A key moment that influenced early multilateral negotiations on climate change was the 1988 Toronto Conference on the changing atmosphere. It was not a UN conference, but it shaped subsequent UN negotiations. The Toronto Declaration defined climate change as an urgent issue that required immediate action:

> "Humanity is conducting an unintended, uncontrolled, globally pervasive experiment whose ultimate consequences could be second only to a global nuclear war. The Earth's atmosphere is being changed at an unprecedented rate by pollutants resulting from human activities, inefficient and wasteful fossil fuel use and the effects of rapid population growth in many regions. These changes represent a major threat to international security and are already having harmful consequences over many parts of the globe" (The Changing Atmosphere, 1988)

The declaration recognized that industrialized countries "have a responsibility to lead the way," and should work towards a global goal of reducing GHG emissions by 20% below 1988 levels by 2005 (The Changing Atmosphere, 1988). These two statements shaped expectations of how the international community should address climate change. They came to define international norms defining *who* should take responsibility for mitigating climate change, and *how* such mitigation should be pursued (Stevenson, 2013). The first norm proposed that international efforts to reduce emissions should be based on universal participation of states but guided by the principle of common but differentiated responsibilities and respective capabilities

[3] This section draws on (Stevenson 2018), chapter 7.

(CBDR). This norm has an established history in environmental governance and appears in the Conventions on the Law of the Sea, the Vienna Convention on the Protection of the Ozone Layer and its Montreal Protocol, the Basel Convention on Control of Transboundary Movements of Hazardous Wastes, and the Rio Declaration on Environment and Development (Rajamani, 2000: 121). It emphasized the main responsibility of industrialized countries on the basis of their historical contribution to pollution and/or their greater capacity to bear the costs incurred.

The second norm proposed that climate change mitigation should be achieved through domestic emission reduction targets and timetables. Like CBDR, this norm had already been institutionalized in earlier environmental agreements, including the Montreal Protocol and the European Community's Large Combustion Plant Directive. In the late 1980s many rich countries adopted a version of the "Toronto Target":

- Australia, Austria, and Denmark pledged to reduce emissions to 20% below 1988 levels by 2005;
- Norway committed to stabilize CO2 emissions at 1989 levels by the year 2000;
- Luxembourg, Finland, Switzerland, Canada, and the United Kingdom all pledged to stabilize their CO2 emissions at 1990 levels by the year 2000;
- France and Japan set per-capita stabilization targets;
- The European Community pledged to stabilize emissions at 1990 levels by the year 2000 (Stevenson, 2013: 25).

These norms shaped two important multilateral agreements on climate change: the 1992 United Nations Framework Convention on Climate Change (UNFCCC), and the 1997 Kyoto Protocol. But over time some states (Parties) came to see CBDR and domestic targets and timetables as obstacles to effective global action. To understand how this perception was formed, it is helpful to analyze the debates that took place during negotiations on the UNFCCC and the Kyoto Protocol, and what was eventually decided in each of these agreements.

The UNFCCC was negotiated during 1991 and 1992. The idea that developed countries should assume leadership and responsibility was not disputed. But states disagreed over how to define the categories of "developed" and "developing". Some wanted to set a per capita income threshold, while others wanted to simply list the countries belonging to each category. In the end they adopted three categories to acknowledge that not all "developed" countries are the same: Annex I countries were the wealthiest countries; Annex II countries were 'economies in transition' (Europe's post-communist countries), and all the rest were non-Annex I countries. The principle of common but differentiated responsibilities was included in the Convention under Article 3:

> "The Parties should protect the climate system for the benefit of present and future generations of humankind, on the basis of equity and in accordance with their common but differentiated responsibilities and respective capabilities. Accordingly, the developed country Parties should take the lead in combating climate change and the adverse effects thereof" (UNFCCC, 1992).

Most industrialized countries accepted that "taking the lead" meant adopting domestic emission reduction targets. But the US strongly resisted this approach, considering it too rigid and unaccommodating of each state's unique circumstances. With the support of oil producing states, the US pushed for a Convention based on more general national programs and strategies. Japan proposed a compromise approach of "pledge and review" whereby each state would pledge strategies for limiting GHG emissions, which would later be evaluated by an expert panel (Bodansky, 1993: 486). In the end, the Convention listed mostly *qualitative*

commitments (such as compiling national emission inventories, national strategies, and reporting) rather than *quantitative* targets (such as the Toronto-style targets). A fairly loose collective target was agreed in Article 4.2, which required industrialized countries to adopt and report on national policies 'with the aim of returning individually or jointly to their 1990 (GHG) levels' (UNFCCC, 1992).

The Convention was intended as a first step towards a more detailed multilateral agreement. Soon after it entered into force in 1994, parties began negotiations on what would become the Kyoto Protocol. They continued to debate how CBDR should be interpreted. Germany and the US both pushed the idea of differentiating between developing countries to allow discussions on limiting emissions growth in "more advanced developing countries", like China, South Korea, and Brazil. Developing countries rejected this proposal, arguing that wealthy countries needed to show real leadership in reducing their own emissions given their historical responsibility for creating the threat of climate change. Developing countries were able to resist efforts to differentiate them into groups of more advanced and less advanced developing countries, but pressure for them to increase action was strong during the Kyoto Protocol negotiations.

By the mid-1990s it was becoming evident that reducing GHG emissions was going to be difficult and expensive. Negotiations increasingly focused on the challenge of efficiently reducing global emissions while protecting economic growth. The idea of "flexible mechanisms" emerged as way of facilitating action in developing countries while minimizing the cost of meeting emissions targets in developed countries. Flexible mechanisms would allow developed countries to meet their commitments by investing in GHG mitigation in less developed countries or buying emissions credits through a trading system. Three market-based mechanisms were agreed as part of the Kyoto Protocol:

- *Emissions trading* whereby countries (or businesses within them) could buy and sell emission permits to seek an economically efficient distribution of the burden of reducing overall emissions.
- *Joint Implementation* whereby a country could invest to reduce emissions in another developed country, while claiming the "credit" towards their own emissions target.
- *Clean Development Mechanism*, whereby countries (and businesses within them) could claim emissions credits by investing in emission reduction projects in developing countries. This mechanism had the additional requirement that projects must contribute to sustainable development in the developing country.

Together these mechanisms established what became known as the global "carbon market". The rationale for relying on a carbon market to reduce global emissions is that the precise location of reducing emissions is irrelevant; if it is cheaper to reduce emissions in some countries then it makes sense to pursue mitigation there. The argument against this approach is that wealthy fossil fuel-intensive economies need to decarbonize their economies, and carbon markets simply distract from this process. Nevertheless, with these mechanisms in place developed countries agreed to emissions reduction or limitation targets under the Kyoto Protocol. The parties agreed on a global reduction target of 5% below 1990 levels by 2012. Individual targets were negotiated including -8% for wealthy European countries, -7% for the US, and zero growth for Russia (UNFCCC, 1997). Developing countries still did not have quantified targets but they were expected to take action towards managing their emissions, including by participating in the carbon market.

The market mechanisms weren't enough to make the Kyoto Protocol successful. They did help some states fulfil their modest commitments although while significantly growing their domestic GHG emissions. But even with the option of market

mechanisms, many countries found the task of reducing GHG emissions too difficult and expensive. The US withdrew support for the agreement in 2001, Canada failed to reach its target, and others including Japan and Russia announced that they would not sign up to new targets under the Kyoto Protocol once the initial commitment period ended in 2012. This cast doubt over the future of the UN's climate change regime and reopened debate over who should take responsibility for mitigating climate change, and how such mitigation should be pursued. Throughout the first decade of the 21st century, disagreement over these questions obstructed multilateral efforts to negotiate an agreement for the period beyond 2012. As GHG emissions in large industrializing countries like China began to eclipse those of wealthy countries, it became increasingly impractical to exempt them from emission reduction or limitation commitments. But these countries maintained their position that wealthy countries had still failed to limit their own emissions and had failed to deliver on technological and financial commitments. They also had a strong moral argument on their side: the per capita emissions in developing countries were considerably smaller than in wealthy countries, and poverty reduction would require continued reliance on fossil fuels for some years to come.

Efforts to reach agreement on mitigation, adaptation, finance, and technology reached a stalemate at the Copenhagen climate summit in 2009. Here parties stumbled over two more hurdles: the expectation of universal participation in multilateral negotiations, and the rule on consensus. Unable to find compromises and broker deals among 194 parties, the US broke with tradition and gathered in secret with Brazil, Russia, India, China and South Africa (BRICS) to produce the briefest of documents that would accommodate their interests and preferences. Excluded parties objected to what they called an "undemocratic" move to "minilateralism".

Because the parties of the UNFCCC have never managed to agree on formal rules of procedure, consensus remains the default way of making decisions (Depledge, 2004: 432-3). This means that any party can object to any clause in a negotiated text, and their objection has to be accommodated somehow. While most excluded parties agreed to endorse the text drafted by the US and BRICS in the final hours of the Copenhagen summit, a very small number of states objected (Tuvalu, Sudan, as well as the Latin American bloc, ALBA). As a result, the parties were only able to "take note" of the text without formally adopting it. The Copenhagen Accord was therefore a very weak piece of soft law universally deemed insufficient for delivering effective action on climate change.

The negotiating process continued after Copenhagen and it took a further six years to produce a new climate change treaty. In 2015, states managed to achieve a new UN treaty on climate change: the Paris Agreement. Leadership from the US and China was particularly important in rebuilding political ambition and confidence in the UN process. These two countries alone account for about 40% of global GHG emissions. Through a series of bilateral meetings in 2014, the presidents of China and the US agreed to reduce their emissions as part of a UN agreement. Diplomatically this was significant because the lack of US leadership had long been a stumbling block in climate change negotiations, and the US had long argued that it wouldn't act without comparable commitments from China.

2.3 Distributing responsibility for mitigation: different approaches

The great strength of the Paris agreement is that it includes emissions commitments from a larger number of countries than ever before: over 190 countries representing 98% of 2019 global emissions and 99% of global population pledged action (UNFCCC Secretariat, 2022; and own estimations based on Minx et. al., 2022; Friedlingstein et al., 2022 and World Bank, 2023). This was achieved by abandoning the global deal approach that characterized the Kyoto Protocol. The change in global climate

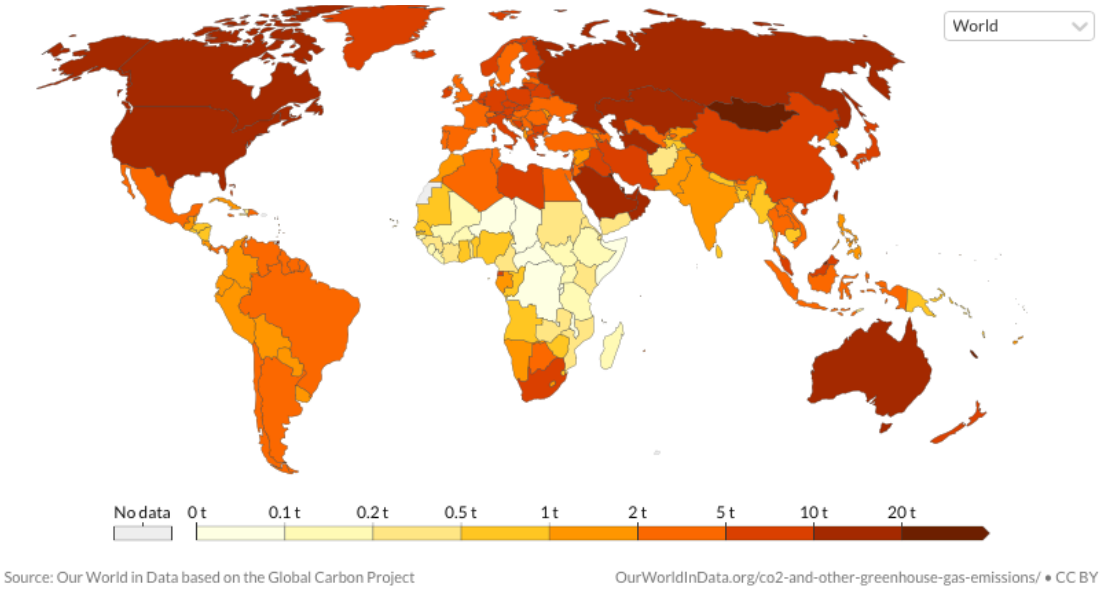
governance has been captured by the terms "top-down" (Kyoto) and "bottom-up (Paris).

Under the top-down approach of the Kyoto Protocol, a collective emission reduction target of -5% was agreed, and then industrialized states negotiated individual, economy-wide, legally-binding targets within that limit. In Paris this was replaced with a bottom-up "pledge and review" model, whereby states independently pledged their own goals (with different types of actions, targets and timetables), and agreed to have these periodically reviewed by a UN committee. By moving to this flexible model, developing countries were persuaded to pledge their own goals. This was important because the distinction between Annex I and non-Annex I countries had long been a sticking point in negotiations. The agreement still refers to developed and developing countries but does not allocate states to each category. Developed countries are expected to reduce GHG emissions, while developing countries are expected to make mitigation efforts gradually moving towards emission reduction and limitation targets.

The shift to a bottom-up approach in the negotiations reflects a failure to agree on principles of fairness in terms of the distribution of responsibility for mitigating climate change. Negotiations stalled during many years in part due to disagreement over whether the mitigation burden should be distributed on the basis of historical emissions, current and projected emissions, or per-capita emissions.

When responsibility for global emissions is understood in per capita terms, Latin American countries bare less responsibility than the global average (although the region's share of responsibility increases when emissions from land use change are taken into account). The global average per capita emissions of CO2 in 2020 was 4.47 tons, up slightly from 4.27 in 1990 (Friedlingstein et al., 2021). Chile is the country with per capita emissions closest to the global average, with 4.25 tons in 2020. Most other Latin American countries have per capita emissions of between about 1 and 3 tons, as shown in the following map (graph 2.1). By comparison, per capita emissions in the US are 14.24 tons; 7.69 tons in Germany; 14.2 tons in Canada; 15.37 tons in Australia; and 7.41 tons in China.

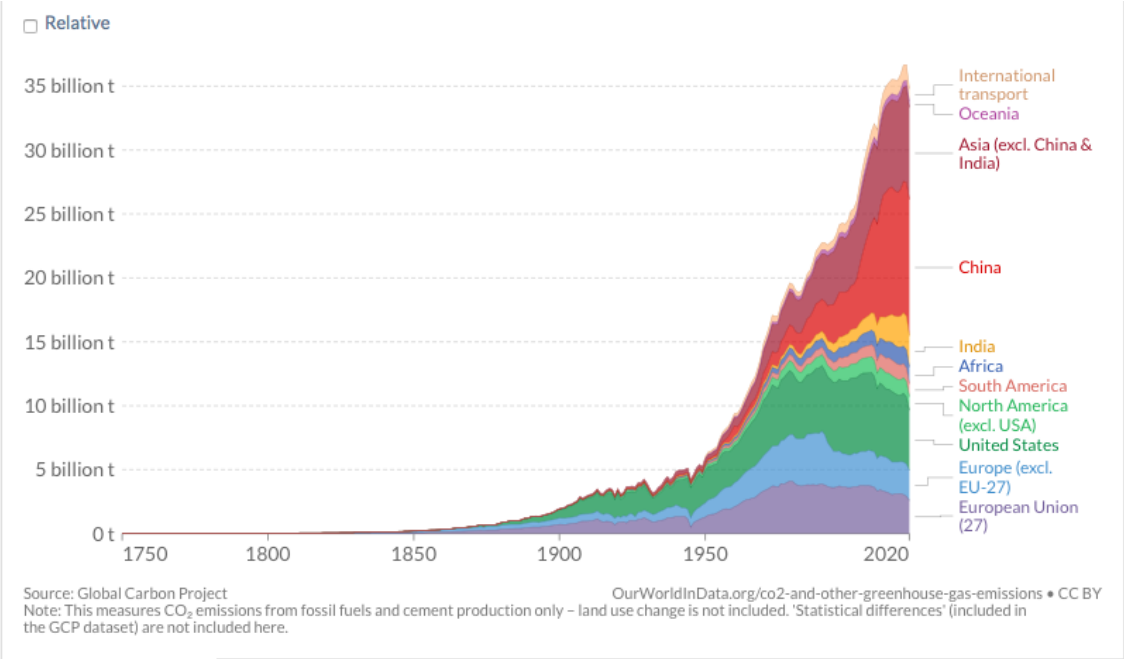
Graph 2.1: Per capita CO_2 emissions, 2020 (excluding land use change)



Notes: Graph 2.1: Per capita CO_2 emissions, 2020. Source: Our World in Data, No date (1)

When responsibility is measured in terms of total annual emissions, we can see that Europe and North America have historically been responsible for the largest share of global emissions. In 1950, these countries' annual emissions accounted for 85% of global emissions (Our World in Data, No date (2). This trend began to shift in the latter half of the 20th century as emissions from China and the rest of Asia began to grow. Europe and North America now account for about one-third of annual emissions, and China accounts for about 27%. By comparison, Latin America's largest emitters, Mexico and Brazil, account for 1.4% and 1.3% of global annual emissions respectively. South America as a whole accounts for just 3.2% of global emissions (Our World in Data, No date (2).

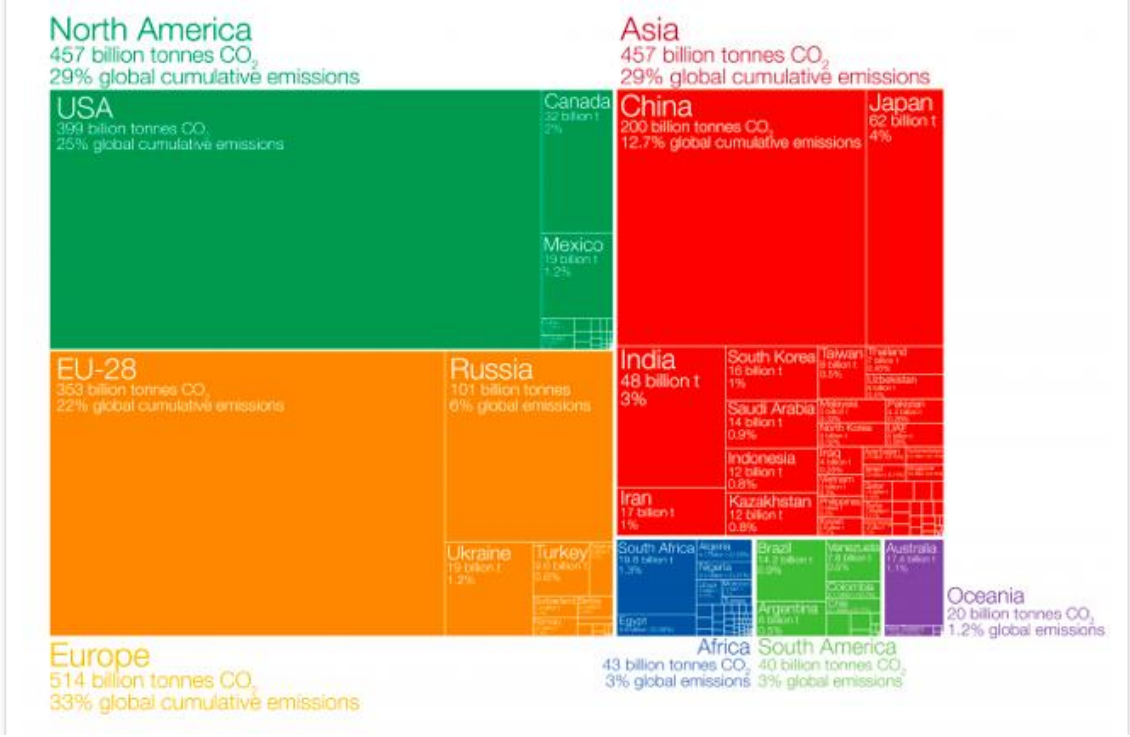
Graph 2.2: Annual CO2 emissions from fossil fuels, by world region



Notes: Graph 2.2: Annual CO2 emissions from fossil fuels, by world region. Source: Our World in Data, No date (2)

When responsibility is measured in terms of historically accumulated emissions, the United States is the largest emitter (25% of global cumulative emissions), followed by the 28 member countries of the European Union (22% collectively), and by China (12.7%). South America accounts for just 3% of global cumulative emissions (Our World in Data, No date (2).

Graph 2.3: Who has contributed most to global CO2 emissions?



Notes: Graph 2.3: Who has contributed most to global CO2 emissions? Source: Our World in Data, No date (2) Figures are based on production-based emissions, excluding LULUCF

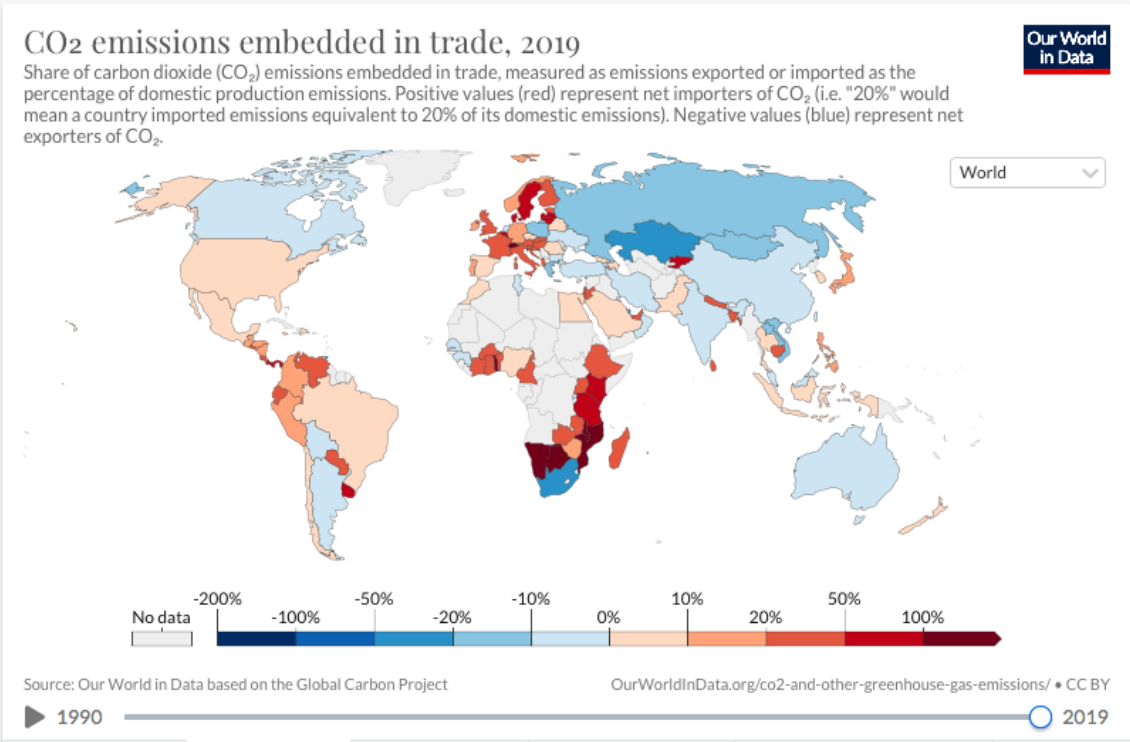
Debates about responsibility for climate change and about fair burden-sharing are further complicated by the distinction between production-based emissions and consumption-based emissions. Some climate change campaigners have argued that countries should be responsible for the emissions embedded in their consumption, not only for the emissions produced within their territory. The feasibility of distributing the mitigation burden among countries on the basis of their consumption emissions is undermined by technical problems (in addition to political disagreement about whether this is a fair way to apportion responsibility). For many years, environmental economists have debated the relative benefits and drawbacks of production-based and consumption-based accounting for greenhouse gas emissions (E.g., Peters, 2008; Afionis et al., 2016). The rules of the UNFCCC hold countries responsible for mitigating the emissions produced within their own borders (UNFCCC 2014). Parties to the convention are required to submit National Emission Inventories to track changes in the greenhouse gases emitted and removed in their jurisdictions (onshore and offshore) over time.

Consumption-based accounting has been proposed as an alternative to production-based accounting because it has the advantage of attributing responsibility to the ultimate beneficiaries of goods produced. Consumption-based accounting is considered by some to provide a more accurate representation of responsibility because it includes the emissions embedded in international trade. The concept of *embedded emissions* captures the sum of greenhouse gases emitted in the production of a good and transportation to its destination of consumption. Large amounts of GHG emissions are embedded in trade. This means they appear on the emissions inventories of exporting countries and can give a distorted impression of an importing country's progress in transitioning towards more sustainable economic development. Asymmetrical trade patterns mean that some countries are net importers of greenhouse gas emissions and others are net exporters of emissions. By importing emissions-intensive goods, countries can effectively avoid responsibility for mitigation while enjoying the benefits of consumption. Some analysts are

therefore critical of claims made by some advanced economies that their economic growth has been "decoupled" from pollution and resource-use. For example, the UK claims to show "evidence of absolute decoupling" because between 1985 and 2016 GDP grew by 70.7% per capita, while carbon dioxide emissions fell by 34.2% (ONS, 2019). In recent years the EU has begun to acknowledge that its "ecological footprint" extends beyond European territory and draws on carbon, water, land, and materials of other regions (Tukker et al., 2016: 171). This means that the goods imported into the EU contain greater quantities of these elements than the goods that the EU exports to other countries.

Most Latin American countries are net importers of CO2 emissions. This means that their consumption-based emissions are higher than their production-based emissions. Exceptions are Argentina, whose consumption-based emissions are 0.58% lower than its production-based emissions; and Bolivia, whose consumption emissions are 2.02% lower than production emissions. By contrast, Uruguay's consumption-based emissions are 76.24% higher than its production-based emissions (Our World in Data. No date (2). International patterns are shown in the following map (with blue countries reflecting net exporters of emissions, and orange/red countries reflecting net importers of emissions).

Graph 2.4: CO2 emissions embedded in trade, 2019



Notes: Graph 2.4: CO2 emissions embedded in trade, 2019. Source: Our World in Data, No date (2)

The relative disadvantage of consumption-based accounting, and the key reason why the UNFCCC uses production-based accounting, is that calculating the emissions embedded in trade is a highly complex task. Many goods have complex production chains; data for each point of production is not always complete, available, or reliable. A car purchased in the United States, for example, may contain bauxite mined in Australia, which is transformed into aluminum in China, which in turn is transformed into a chassis for a car manufactured in Germany and exported to the US (Wiedmann and Lenzen, 2018: 314). Production-based accounting makes each country responsible for the greenhouse gases emitted at their point of the production chain, rather than requiring the consuming country to include these emissions in their national inventory.

2.4 Nationally Determined Contributions: a flexible approach

Given entrenched disagreement about which principles should apply to burden-sharing in the post-Kyoto period, parties to the UNFCCC adopted a flexible approach in which the concept of "national circumstances" is prominent. This allows each state to be the judge of what constitutes a fair contribution to global mitigation efforts, while demanding justification for their judgments. Since the Paris Agreement entered into force on 4 November 2016, parties have been legally obliged to submit plans for domestic climate change action (Nationally Determined Contributions, or NDCs), and have these updated and reviewed by an expert panel every five years. But reporting is the only legal element – there is no international legal obligation to fulfil the pledge, and no punishment is imposed if the pledge is broken (Falkner, 2016). The change in terminology from commitments to contributions is important and captures the increased flexibility of the Paris Agreement.

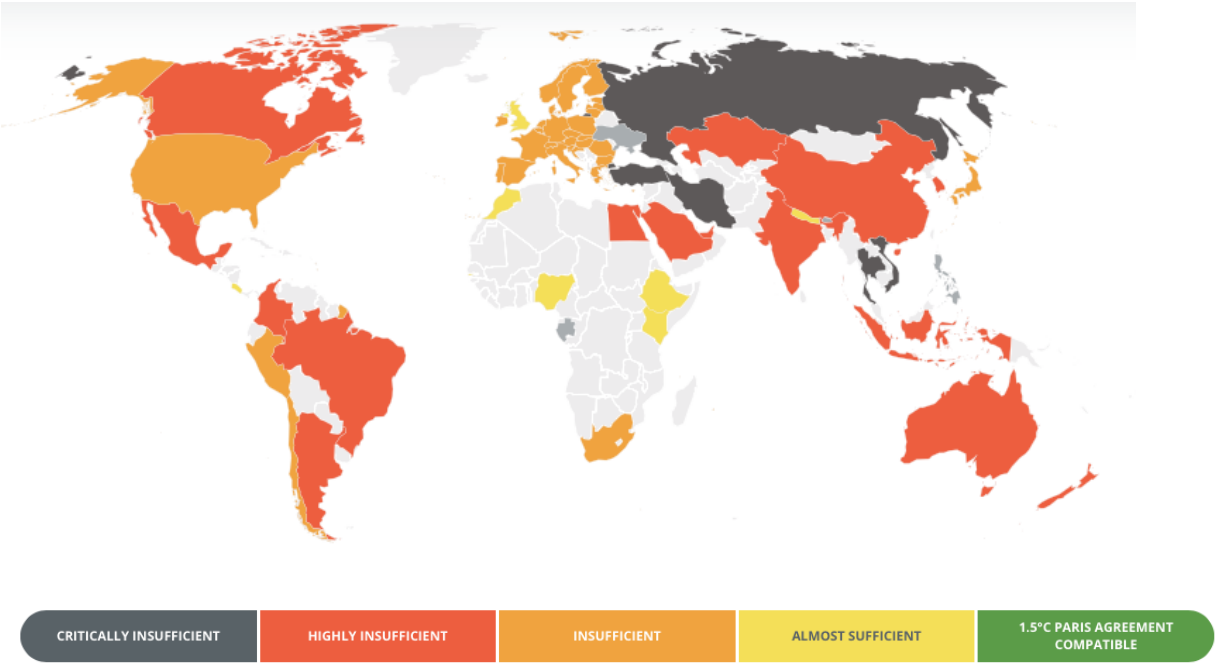
NDCs outline the measures that a party pledges to mitigate its greenhouse gas emissions. Under the flexible bottom-up approach of the Paris Agreement, parties are free to select their own baseline year (rather than use the baseline of 1990 as adopted in the Kyoto Protocol), as well as the type of emissions target. A variety of emissions targets have been pledged: pledges to reduce emissions against a business-as-usual baseline; pledges to reduce the emissions intensity of the national economy; pledges to reduce absolute emissions; and pledges to make the economy carbon-neutral (or reduce emissions to net-zero). This makes it difficult to compare the ambition and fairness of NDCs. The most comprehensive approach to comparison is the Climate Action Tracker (CAT): "an independent scientific analysis that tracks government climate action and measures it against the globally agreed Paris Agreement aim of "holding warming well below 2°C, and pursuing efforts to limit warming to 1.5°C." A collaboration of two organizations, Climate Analytics and NewClimate Institute, the CAT has been providing this independent analysis to policymakers since 2009" (Climate Action Tracker, No date. (1)).

CAT does not evaluate all countries, but its coverage is extensive and accounts for about 85% of global emissions and approximately 70% of global population (Climate Action Tracker. No date. (1). Given that there are no official UNFCCC guidelines for evaluating the "fair share" of a party's contribution, CAT designed its own method to produce a "fair share range" rating system (Climate Action Tracker, No date (2)). This method is based on the scientific literature on burden-sharing, which considers a range of perspectives on what is fair. The studies that informed this method "cover very different viewpoints of what could be fair, including considerations of equity such as historical responsibility, capability, and equality. We take into account results from studies that are originally compatible with the former 2°C goal, as well as the 1.5°C limit in the Paris Agreement, to cover the full range of perspectives and historical developments of the long-term temperature goals" (Climate Action Tracker. No date (2)). The levels of ambition that define the fair share range "corresponds to the temperature outcomes that would result if all other governments were to put forward targets with the same relative position on their respective fair share range, i.e. the same ambition level." (Climate Action Tracker, No date (2)). There are five levels:

1) Critically insufficient (as end-of-century warming above 4°C)
2) Highly Insufficient (as end-of-century warming below 4°C with a two-thirds chance)
3) Insufficient (as end-of-century warming below 3°C with a two-thirds chance)
4) 2°C compatible (as end-of-century warming below 2°C with a two-thirds chance)
5) 1.5°C Paris Agreement compatible (warming limited to below 1.6°C over the 21st century, and below 1.5°C with two-thirds chance in 2100)

The following map indicates the position of each evaluated country within the fair share range (as of May 2022):

Graph 2.5: Fair share performance by country



Notes: Graph 2.5: Fair share performance by country. Source: Climate Action Tracker, No date (2).

Across the Latin American region, countries are individually ranked as highly insufficient (Argentina, Brazil, Colombia, Mexico), and insufficient (Chile, Peru). Only Costa Rica is ranked as almost sufficient. This is broadly consistent with global trends, and the result is that the planet is on track to warm by over 2ºC by the end of the century. While many countries have made net zero goals, their 2030 actions and targets remain inconsistent with this goal (Climate Action Tracker, No date (2)).

Parties were due to submit updated NDCs in 2020, and more than 75% did so. This allows the first "global stocktake" to be carried out, which began in November 2021 and will conclude at the end of 2023 (UNFCCC, 2022 (a). This process is designed to assess progress towards meeting the goals of the Paris Agreement, and to encourage parties to ratchet up ambition as necessary. There are three overlapping phases to the global stocktake: Phase 1 involves collecting and preparing information and is expected to be completed in early 2022; Phase 2 involves technical assessment of efforts on mitigation, adaptation, and implementation support, this will be carried out between June 2022 and June 2023; and Phase 3 will involve presentation of the findings at the end of 2023 (UNFCCC, 2022 (a).

Information that has become available during Phase 1 of the global stocktake shows that countries are not on track to meet the objectives of the Paris Agreement. This agreement entails an expectation that Parties will progressively increase their ambition. Enhanced ambition can be indicated by a range of measures, such as:

- strengthening or adding an emissions target
- strengthening or adding a sectoral target
- strengthening or adding policies and actions
- aligning the NDC with a long-term goal (UNDP and WRI, 2019: 14).

However, not all the revised NDCs reflect the expectation that ambition will be enhanced (Climate Action Tracker 2022 (a)). The following table shows those countries that have increased ambition and those that have not (excluding the smaller countries that are not included in CAT evaluations).

Table 2.1: Status of ambition in updated NDCs (as of May 2022)

SUBMITTED A STRONGER NDC TARGET	PROPOSED A STRONGER NDC TARGET	DID NOT INCREASE AMBITION*	WILL NOT PROPOSE A MORE AMBITIOUS TARGET
ARGENTINA BHUTAN CANADA CHILE CHINA COLOMBIA COSTA RICA EU JAPAN KENYA MOROCCO NEPAL NEW ZEALAND NIGERIA NORWAY PERU SAUDI ARABIA SOUTH AFRICA SOUTH KOREA UAE UKRAINE UNITED KINGDOM USA	INDIA	AUSTRALIA BRAZIL ETHIOPIA INDONESIA MEXICO PHILIPPINES RUSSIAN FEDERATION SINGAPORE SWITZERLAND THAILAND THE GAMBIA VIET NAM	

Notes: Status of ambition in updated NDCs (as of May 2022). Source: Climate Action Tracker, 2022 (a).

We can see that LAC countries feature among those countries that have raised ambition and those that have not (keeping in mind that those that have increased ambition may still be rated as insufficiently ambitious; as of May 2022, the Climate Action Tracker was still being updated with the new NDC data).[4]

Among the ambition increasing countries is Chile, which was one of the first countries to submit a revised NDC (in April 2020). Its new pledge includes a target to peak emissions in 2025 and reduce emissions by 2030. This absolute emissions reduction target replaces its previous emissions intensity target (Maxwell et al., 2020). Colombia previously had a target to reduce emissions by 20% by 2030, and this target was revised to 51%. Costa Rica bolstered its target to be carbon neutral by 2050 with a Decarbonization Plan, which, if fully implemented, would achieve this target (the original NDC pledges would have decarbonized in 2085) (Climate Action Tracker, 2021 (b)).

Among the "laggards" is Mexico, which reaffirmed its 2015 pledge in 2020 (to reduce GHG emissions by 22% by 2030), thus failing to increase ambition. Brazil was the only country to reduce its level of ambition when submitting the revised NDC: "Brazil's targets to reduce emissions by 37% and 43% from 2005 levels by 2025 and 2030 respectively are unchanged on paper, but an increase in the base year emissions used as a reference means that Brazil can continue to increase its emissions and still meet its targets." (Climate Action Tracker, 2022 (b)). In 2021, Brazil announced a goal of achieving net zero by 2050 but no information has been provided as to how this will be achieved (Climate Action Tracker, 2022 (b)).

The UNFCCC NDC Synthesis Report shows that countries varied in how they justified the fairness of their contributions, with different countries referencing the different approaches outlined above (past and current/projected emissions; per capita and total emissions) (UNFCCC, 2021: 25).

2.5 The net-zero target trend

A pledge to reduce a country's emissions to net-zero implies that greenhouse gas emissions will be reduced as much as possible, and any emissions that cannot be reduced will be re-absorbed from the atmosphere (for example, through afforestation, or carbon capture and storage technology). This condition is often

[4] Further details are available in UNFCCC 2021

called "carbon neutral", although when this term is used it sometimes means "greenhouse gas neutral". The adoption of net-zero targets has become a strong trend in the seven years since the Paris Agreement was negotiated. In 2015, just three countries had adopted such targets; this has now risen to 128 (as well as 236 cities, and 699 companies), with most of these being announced in late 2021 (Hale et al., 2022; Höhne et al., 2021). The EU pledged a climate neutrality goal in 2020, followed by China in the same year, then followed by South Africa, Japan, South Korea and Canada (Höhne et al., 2021). Many Latin American countries have joined this trend, although few have backed up their pledges with policy plans.[5]

- Argentina: pledged to have net zero emissions by 2050, but this has not been accompanied by a publicly available plan
- Barbados: pledged to have net zero emissions by 2030, but the plan to achieve this is incomplete[6]
- Bolivia: no net zero target
- Brazil: pledged to have net zero emissions by 2050, but this has not been accompanied by a publicly available plan
- Chile: pledged to have net zero emissions by 2050, but the plan to achieve this is incomplete
- Colombia: pledged to have net zero emissions by 2050, but the plan to achieve this is incomplete
- Costa Rica: pledged to have net zero emissions by 2050, but the plan to achieve this is incomplete
- Ecuador: pledged to have net zero emissions by 2050, but this has not been accompanied by a publicly available plan
- Jamaica: *proposed* to have net zero emissions by 2050, but this has not been accompanied by a publicly available plan
- Mexico: no net zero target
- Panama: pledged to have net zero emissions by 2050, but the plan to achieve this is incomplete
- Paraguay: no net zero target
- Peru: *proposed* to have net zero emissions by 2050, but this has not been accompanied by a publicly available plan
- Dominican Republic: *proposed* to have net zero emissions by 2050, but this has not been accompanied by a publicly available plan
- Trinidad & Tobago: proposed to have net zero emissions by 2030, but the plan to achieve this is incomplete
- Uruguay: pledged to have net zero emissions by 2050, but this has not been accompanied by a publicly available plan
- Venezuela: no net zero target

While many observers of international climate policy welcome the net zero pledge trend, others express concern about the vagueness of these declarations (Rogeli et al., 2021). Consistent with the flexible, bottom-up approach of the Paris Agreement, parties are free to define the details of their net zero pledges. Some cover only carbon dioxide, while others cover all greenhouse gas emissions; some are based on absolute emission reductions, while others are intended to be reached through the use of carbon offsets. There are calls to define best practice in net-zero pledges, which may involve clarifying the following aspects:

- Scope: which greenhouse gases emissions will be reduced? When will net zero be reached? Will emissions be reduced, removed, or offset? (Rogeli et al.,

[5] "A plan is defined as a technical document that outlines concrete steps and measures that will be taken to advance toward the target, including a timeframe in which they will be taken" (Hale et al. 2022).
[6] A complete plan would include: 1. Measures for all emission scopes that are covered by the target; 2. Information on the emission reductions expected from these measures within a certain time period.; 3. Information on the extent to which measures will be applied; and 4. Schedule for regular review of measures (Hale et al. 2022).

2021).

- Adequacy and fairness: The Paris Agreement requires Parties to justify how their short- and mid-term targets are fair and adequate; this expectation does not extend to long-term goals but it should do so. When net-zero targets are defined in relatively unambitious ways (e.g., by limiting scope or using cheap offsets), this shifts the burden to other countries to take more ambitious actions to limit global warming to 1.5 or 2ºC. The degree of burden-sharing implicit in a net-zero target should be explicit and justified. Parties should be clear about the fairness criteria they have applied, and the implications of all other Parties applying the same criteria (Rogeli et al., 2021).
- Long-term road map: net-zero pledges should be accompanied by detailed and coherent plans that set out milestones, implementation plans, and longer-term intentions. Long-term goals should be supported by consistent shorter-term goals (Rogeli et al., 2021).

Long-term net-zero goals are likely to provoke greater discussion in the UNFCCC in the coming years, with emphasis on clarifying expectations about the appropriate scope of these targets, the fairness principles applied (including the extent to which they rely on offsets), and monitoring and review.

2.6 Negative emissions technologies and geoengineering

A key point of contention in debates about net-zero targets is likely to be the use of "negative emissions technologies". Climate change campaigners are likely to exert increasing pressure to clarify the extent to which net-zero targets depend on these technologies, and the implications of this dependence for the integrity of targets. There is growing use of these technologies in modelling and national target-setting, however there remain considerable uncertainties about how reliable these technologies are (Fajardy et al., 2019). Emissions modelling, including that informing the Paris Agreement, now tends to include large-scale use of "negative emissions technologies" (Larkin et al., 2018). Most scenarios developed by the Intergovernmental Panel on Climate Change (IPCC) for limiting warming to 1.5 or 2°C are based on large-scale deployment of negative emissions technologies from 2020 onwards (van Vuuren et al., 2017). While still unproven, these technologies are expected to remove carbon dioxide from the atmosphere. Scenarios that exclude these technologies are based on a much larger reduction of greenhouse emissions by 2050: 60-75% reduction relative to 2010 levels, compared to 40-60% reduction if negative emissions technologies are used (van Vuuren et al., 2017: 902). Yet, despite their "pivotal role" in mitigation scenarios, negative emissions technologies are "almost completely absent from climate policy discussions" (Anderson and Peters, 2016: 183). Some negative emissions technologies are benign and mundane: many countries already discount the emissions absorbed by afforestation and reforestation. But modelling for 1.5 and 2°C depends on a technology known as BECCS, bioenergy combined with carbon capture and storage. It assumes that carbon will be absorbed during the growth of biomass (trees), then captured before or during the burning of biomass for energy, and finally stored permanently in underground deposits (Anderson and Peters, 2016: 183). As of February 2019, only one pilot demonstration plant is in existence (Drax, 2019) but lack of investment in technological development and its still nascent technological demonstration are not deterring its use in emissions planning. It is not simply that we are at an early stage of research; according to Anderson and Peters "(t)wo decades of research and pilot plants have struggled to demonstrate the technical and economic viability of power regeneration with CCS, even when combusting relatively homogenous fossil fuels. Substituting for heterogenous biomass feedstock adds to the already considerable challenges" (2016: 183).

The most common carbon dioxide removal approaches are afforestation and reforestation; BECCS (bioenergy combined with carbon capture and storage); DACCS

(Direct Air Capture with Carbon Storage); enhancing soil carbon content with biochar; enhanced weathering, ocean alkalinization, and ocean fertilization. A description of each of these approaches follows, together with a brief explanation of their potential benefits and limitations, as well as details of relevant research in the Latin American region.

1. *Afforestation and reforestation*:

Afforestation involves planting trees in areas not previously covered by trees, while reforestation involves replanting depleted forested areas. Approximately a third of global GHG are stored in trees and increasing tree coverage is seen as a promising and natural approach to increase carbon storage (IPCC, 2019; CarbonBrief, 2015). China is the world's largest tree planting country: "Since the 1990s, China has invested more than $100bn in afforestation programs and, according to its government, planted more than 35bn trees across 12 Chinese provinces" (CarbonBrief, 2015). The IPCC has shown that reforestation and afforestation can be effective for sequestering carbon dioxide, but urges policymakers to consider how increased demand for land conversion would impact on food security. The IPCC (2019) also warns that afforestation and reforestation need to be deployed appropriately (at an appropriate scale and with appropriate selection of tree species) to avoid negative ecosystem impacts, such as land degradation and desertification:

> "Widespread use at the scale of several millions of km^2 globally could increase risks for desertification, land degradation, food security and sustainable development (*medium confidence*). Applied on a limited share of total land, land-based mitigation measures that displace other land uses have fewer adverse side-effects and can have positive co-benefits for adaptation, desertification, land degradation or food security" (IPCC, 2019).

It should be noted that adverse socio-economic impacts remain hypothetical because there is little research documenting cases of intense afforestation (Fajardy et al., 2019). Tropical regions are considered more appropriate than boreal and northern hemisphere areas for afforestation and reforestation because of the difference in earth albedo (the degree of solar radiation reflection) (Fajardy et al., 2019). This makes it particularly relevant for many LAC countries.

Most LAC countries have laws, regulations and national plans that support afforestation and reforestation; there are already some large-scale projects in the region, and in some countries (Argentina, Brazil, and Chile) there are "policies and plans promoting the use of wood from sustainably managed forests for industry and construction" (Samaniego et al., 2021: 5). Chile, for example, has proposed to reforest 100,000 hectares of native forest (Sohngen, 2020: 147). Under its current presidency, Mexico has been implementing an afforestation and reforestation initiative of unprecedented ambition: *Sembrando Vida* (Sowing Life). The initiative aims to plant 1 billion fruit and timber trees on 1,157,500 hectares of land and is intended to have multiple social and environmental co-benefits (Gobierno de México, 2020). However, the program has been questioned by some environmentalists who argue that it is resulting in *decreased* forest coverage in Mexico because it creates an incentive to clear jungle land to receive the monthly payment of $225 for planting trees (De Haldevang et al., 2021; Carabaña, 2021). Whether or not these criticisms are supported by evidence, the case serves as a reminder that afforestation and reforestation are not a panacea and need to be carefully planned on the basis of ecological and social science.

Another important limitation of tree planting as a climate change mitigation mechanism is the risk of impermanence. Costa Rica is considered a model of forest

regeneration, but even there "new forests may not persist more than about 20 years before being recleared" (Nepstad et al., 2020, p.42). Given that Latin American countries have struggled to control deforestation, there are legitimate questions about whether afforestation could be an effective mitigation option in this region. A study of reforestation in Bolivia, Brazil, Colombia, Guyana, Mexico, Peru and Venezuela found that many trees planted in the early 2000s had been cleared by 2014 (Schwartz et al., 2020). The study found that "these reversals severely limit carbon sequestration … in their absence, second-growth forests could have sequestered over four times more carbon between 2001 and 2014" (Schwartz et al., 2020). This study is consistent with wider research that suggests that "regenerating and restored forests have a high probability of being cleared" (Schwartz et al., 2020).

2. BECCS (bioenergy combined with carbon capture and storage)

BECCS combines two technologies to remove carbon dioxide from the atmosphere. First, biomass is converted into energy (heat, electricity, or fuel), the carbon emissions from this process are then captured, compressed and injected into underground geological formations below the seabed, or in longstanding products such as cement (American University. 2020 (a). As explained above, climate modelling depends heavily on the expected success of this carbon capture and storage technology, but it remains largely unproven and the IPCC has raised concerns about its large-scale deployment. There are risks of CO2 leakage, seismic activity, and water pollution (American University, 2020 (a). Without a better understand of the leakage risk, it is impossible to know how reliable this technology will be for mitigating climate change. The bioenergy component of the approach is proven in practice but there are concerns about the viability of deploying this on the scale that would be necessary to meet climate targets. Average models assume that between 380-700 million hectares of land would be available for growing crops for BECCS. The World Resources Institute puts this into context by explaining that "the entire global area dedicated to growing crops was 1.6 billion hectares in 2010. That means we'd have to expand the land area for BECCS around 24 million hectares per year, about 7 times the global rate of expansion for soybean and sugarcane combined" (Levin, 2019). Crop expansion of this scale would inevitably have negative impacts on food production and ecosystems, as well as displacing communities for land conversion (American University, 2020 (a). In addition to concerns about the viability and negative socio-environmental consequences of deploying BECCS, the cost factor is also significant. Estimates vary between US$20-200 per ton of CO2 sequestered (American University, 2020 (a).

In Latin America, the use of bioenergy is fairly widely researched, and there is an "incipient but rapidly increasing installed capacity of biomass and biogas power generation plants and biofuels production plants" (Samaniego et al., 2021: 5). However, there is not yet any research on the combination of bioenergy and carbon capture and storage.[7] The Brazilian biofuel company, FS, announced in 2021 that it

[7] Without the capture and storage component, biofuels alone are often but not always less greenhouse gas intensive than fossil fuels. Life-cycle assessments of the climate change and environmental impacts of biofuels produce different results depending principally on the type of crop used, environmental conditions, and whether production involves land-use change (i.e., whether forest is cleared for production, and whether the productive land has a high soil carbon content, such as peat land); results also differ as a result of different methodological choices and data sources. Biofuels are typically distinguished by three "generations": first generation biofuels are those produced from food or animal feed crops; second generation biofuels "are derived from non-food feedstocks, such as dedicated energy crops (e.g. Miscanthus, switchgrass, short rotation coppice (SRC) and other lignocellulosic plants), agricultural residues, forest residues and other waste materials (e.g. UCO and municipal solid waste)" (Jeswani et al 2020). Third generation biofuels are derived from algae but remain in the research and development phase. A recent review of available evidence found that among first generation biofuels, bioethanol from sugarcane has the lowest global warming potential because it produces higher yields with lower inputs of agrochemicals (Jeswani et al. 2020). In Brazil, the USA and Argentina, soya bean biodiesel has been shown to be considerably less GHG intensive than fossil fuels for the same reasons. Palm, rapeseed and sunflower biodiesel have different GHG intensity in different locations, but are generally less

would launch the first BECCS project in South America at its Lucas do Rio Verde plant. The "carbon injection site" had not been defined at the time of announcing this project, and it will be sometime before the success of this initiative can be evaluated (PR Newswire, 2021).

3. DACCS (Direct Air Capture with Carbon Storage)
DACCS is based on the same storage technologies as BECCS, but it captures emissions directly from the air:

> "Today, two technology approaches are being used to capture CO2 from the air: liquid and solid DAC (direct air capture). Liquid systems pass air through chemical solutions (e.g., a hydroxide solution), which removes the CO2. The system reintegrates the chemicals back into the process by applying high-temperature heat while returning the rest of the air to the environment. Solid DAC technology makes use of solid sorbent filters that chemically bind with CO2. When the filters are heated and placed under a vacuum, they release the concentrated CO2, which is then captured for storage or use" (IEA, 2021).

According to the International Energy Agency, there are nineteen DAC plants operating around the world capturing 0.01 Mt CO2 per year. Net zero emissions scenarios are based on the expectation that this can be scaled up to 85 Mt CO2 per year (IEA, 2021). Whether such expansion is viable within the necessary timeframes remains unknown but doubtful. This is an energy-intensive technology, and low-carbon energy will need to be used, thereby competing with other energy demands. An advantage that direct air capture has over bioenergy-based carbon, capture and storage is that it does not entail such large-scale demands for land (American University, 2020 (b). If the technology proves viable, the socio-environmental consequences of DACCS may be smaller than those of BECCS.

In Latin America, research capacity on carbon capture and storage is minimal, and limited almost exclusively to studies in Brazil on the geological storage of carbon in ultra-deep water salt caverns (Samaniego et al., 2021: 5).

4. Enhancing soil carbon content with biochar:
Enhancing soil carbon content is also known as "soil carbon sequestration" and "carbon farming" (American University, 2020 I. The amount of carbon stored in soils can be enhanced through various techniques, including the following:

- reducing soil disturbance by switching to low-till or no-till practices or planting perennial crops;
- changing planting schedules or rotations, such as by planting cover crops or double crops instead of leaving fields fallow;
- managed grazing of livestock;

intensive than fossil fuels. Irrespective of the type of crop used, when land clearing is implicated in biofuel production, the global warming potential is higher than that of fossil fuels. Second generation biofuels are less well established than first generation biofuels, as a result there is greater uncertainty in the technologies which in turn reduces certainty in scientific findings of greenhouse gas intensity. Nevertheless, most studies find that their comparative global warming potential is lower than that of fossil fuels. When second generation biofuels are derived from waste, their environmental costs are considered indirect costs and are typically attributed to the original production process, which lowers the reported global warming potential of the biofuel (ibid). It should be noted that biofuel production and burning can have additional environmental and social impacts beyond GHG emissions, including impacts on water availability and biodiversity, acidification, eutrophication, and local pollution.

- applying compost or crop residues to fields (American University, 2020 (c).

Biochar (sometimes called biocarbon) is produced by burning organic material in oxygen-free chambers (a process called pyrolysis); the resulting charcoal is then buried or mixed into soils and in this way resists decay and continues to sequester the carbon (American University, 2020 (d). An environmental co-benefit of biochar is that it improves soil quality and water retention, which in turn improve agricultural productivity (American University. 2020 (d). A social co-benefit is that burning biomass to produce biochar also produces energy, which can be used for heating and electricity (American University, 2020 (d). Nevertheless, biochar as a method of carbon sequestration is subject to the same concerns as tree planting, namely, it is difficult to guarantee permanent storage. If the soils are disturbed, the stored carbon can be released into the atmosphere. Its real contribution to meeting long-term emission targets is therefore uncertain and difficult to measure (American University, 2020 (d).

In Latin America there is still limited research on soil carbon sequestration as a negative emissions technology. Studies on enhancing soil carbon content exist, but so far only on a small scale and this has not been incorporated into policy and planning (Samaniego et al., 2021: 5). In Costa Rica, for example, researchers at the *Centro de Investigación en Contaminación Ambiental* (CICA) are studying the potential for biochar to improve soil nutrition and fertility in pineapple production. The pineapple stubble (stems) present environmental problems because it is not easy to discard; it is a durable waste that takes a long time to decompose. Chemicals are typically used to break down the material during burning. Biochar technology presents an opportunity to convert this organic waste into charcoal, which is then returned to the soil (Universidad de Costa Rica, 2018).

5. Enhanced weathering, ocean alkalinization and ocean fertilization

Enhanced weathering is also known as enhanced mineralization or accelerated weathering because it aims to accelerate the natural process by which minerals absorb CO2 from the atmosphere. It involves mining rock (typically, olivine or basalt), grinding it into a powder, and spreading it over soils (American University, 2020 (e). The viability of this technology for meeting climate targets is still unknown:

> "The basic chemistry of enhanced mineralization is well understood, and the technology to mine, grind, and disperse rock is widely available. Research on enhanced mineralization as a form of carbon removal, however, remains in comparatively early stages, with much more work to be done to evaluate its efficacy and social and environmental sustainability. The first major field trials, looking at on-site weathering of mining wastes, are under way in Canada" (American University, 2020 (e).

Ocean alkalinization is based on the same idea of using the absorptive capacity of minerals to store greater amounts of CO2. Adding minerals to the ocean enhances its capacity to act as a carbon sink. Researchers at the American University explain: "There are several ways to add alkalinity to the ocean. These include spreading finely ground alkaline substances over the open ocean, depositing alkaline sand or gravel on beaches or coastal seabeds, and reacting seawater with alkaline minerals inside specialized fuel cells before releasing it back into the ocean" (American University, 2020 (f). The potential environmental impacts of this process are still poorly understood because research is still nascent. A US-based organization, Project Vespa, is conducting a pilot study in the Dominican Republic:

> "Project Vesta obtained a Phase I permit from the Ministry of the Environment to conduct baseline research characterizing two pocket bays in Puerto Plata, Dominican Republic in order to assess the suitability for an olivine dissolution field pilot. In this first phase, the main objectives are to 1) collect baseline physical, chemical, biological, and ecological data, 2) establish mesocosm systems to study olivine dissolution in local conditions, and 3) develop a participatory governance approach to integrate community input into our process and explore ways to support local communities" (Project Vesta, No date).

In 2021, the Carnegie Climate Governance Initiative (C2G) and the Economic Commission for Latin America and the Caribbean (ECLAC) carried out a study of the implications of these carbon removal technologies for Latin America (Samaniego et al., 2021). The study found "a significant knowledge and empirical development gap of CDR (carbon dioxide removal)" in this region. "LAC countries efforts on climate change mitigation are primarily focused, as is appropriate, on emissions reductions and replacement of fossil fuels production and use, and only in a largely incipient manner carbon removal efforts are being considered" (Samaniego et al., 2021: 5). From the perspective of climate change campaigners critical of dependence on unproven negative emissions technologies, this focus on emissions *reduction* and energy transitions is a positive trend. But this focus should ideally be the result of analysis of the implications of CDR rather than a consequence of knowledge gaps. From a planning perspective, some technologies may be deemed appropriate if there is greater understanding of their "physical side-effects and socio-economic or governance implications" (Samaniego et al., 2021: 5). The study recommended that "A comprehensive research and technical development effort for each technology should be undertaken" (Samaniego et al., 2021: 5).

2.7 REDD+ in the UNFCCC negotiations[8]

In 2022, the World Bank estimated that the forest sector contributed about 12% to global emissions while providing up to 37% of emissions reductions (World Bank, 2022 (a): 4). Despite the significant contribution of deforestation to global warming, the climate regime was initially quite slow to take up the issue of forests. It has never been excluded from debates, but for many years its inclusion in agreements was considered too controversial mainly for methodological reasons. While some countries were keen to see forestry activities included in the Kyoto Protocol and its Clean Development Mechanism, the UNFCCC resolved to restrict this to afforestation (creating new forests) and reforestation (restoring destroyed or degraded forests). Methodologies for measuring the emissions associated with deforestation were considered too imprecise to allow for carbon credits and offsetting projects. In the jargon of UNFCCC negotiations, the concerns surrounding deforestation's inclusion relate to additionality, permanence, and leakage (Agrawal et al., 2011: 376-7).

- **Additionality** requires that actions only be rewarded if they generate emissions reduction beyond what would have occurred anyway. Establishing a financial mechanism to reward avoided deforestation risks transferring money for actions that were already planned. The payment incentive in such cases would be superfluous and inefficient. However, in practice it is very difficult to predict what might occur in the absence of a certain policy or financial incentive.
- **Permanence** concerns the risk of broken promises. Financial rewards may

[8] This section draws on Stevenson 2018, chapter 8.

be made on the basis of long-term conservation, but it can be difficult or impossible to guarantee that agreements will be upheld in the future. Rewarding avoided deforestation in the short-term only makes sense if that deforestation never takes place in the future, but without a strong system of monitoring and penalties, there is no way of ensuring this. Some risks of 'non-permanence' or 'reversals' are human induced (deliberately clearing protected forests), but others are natural (such as fires and natural disasters).

- **Leakage** concerns the risk that rewarding the avoidance of deforestation in one place will simply increase deforestation in another place. Unless the underlying drivers of deforestation are addressed, pressures on forests will simply shift rather than disappear. Indeed, deforestation might intensify in other areas as a result of the injection of capital provided by the reward. Leakage may occur within or across countries. The plausibility of this risk can be illustrated with evidence from narcotics production in Bolivia: the provision of incentives to reduce coca production in the Chapare region simply resulted in significant increases in production in the more weakly controlled Yungas region, as well as in Colombia (Müller 2011, p.180).

Concerns about the risks of additionality, permanence, and leakage prevented deforestation from being included in the offsetting mechanisms of the Kyoto Protocol. To deal with these uncertainties, governance experiments were implemented outside (but with reference to) the UNFCCC with the aim of generating lessons for a future 'REDD+' mechanism within the UNFCCC and building confidence in its viability. These experiments collectively became known as Reducing greenhouse gas Emissions from Deforestation and forest Degradation, forest stock conservation, sustainable forest management and the enhancement of forest stock (REDD+). REDD+ is essentially a reward-based system that aims to reduce GHG emissions by offering financial incentives to developing countries to better protect and manage their forests.

One important governance initiative is the UN Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries (UN-REDD). It was established in 2008 and is led by FAO, UNEP, and UNDP. The program works with individual countries in Africa, Asia-Pacific, and Latin America to develop their capacity in designing and implementing REDD+ projects. The program does not actually purchase credits from these countries. Instead, UN-REDD is working with them on issues of governance, stakeholder engagement, and financial management to prepare them to engage in forest-based carbon markets (UN-REDD, 2022 (a).

The other prominent REDD+ initiative is the World Bank Forest Carbon Partnership Facility (FCPF), which was also launched in 2008. Like UN-REDD it provides technical and financial assistance to strengthen the capacity of developing countries to participate in a future REDD+ mechanism under the UN climate regime. Among the 47 participating countries are 18 Latin American countries (World Bank, 2022 (a): 45). Unlike UN-REDD, this World Bank partnership also makes payments to a small number of pilot countries that are already avoiding GHG emissions through improved forest management. Its 'performance-based payment system' aims to make it more profitable for countries to keep their forests in place than clearing them. Rather than rewarding individual small-scale projects, the Forest Carbon Partnership Facility is targeting large-scale 'jurisdiction or eco-region' approaches that integrate REDD+ into national development strategies and entail significant policies and investments (FCPF, 2013). The 'performance' element ensures that rewards are only issued once emissions reductions or enhancement in forest carbon stocks have been verified. In 2021, Mozambique became the first country to receive a payment from the fund (receiving $6.4 million for reductions of almost 1.3 million tons of CO2e emissions. Other countries are expected to receive payments in 2022 (World Bank, 2022 (a): 6). Unlike UN-REDD, the World Bank partnership is financed by contributions from states and the private sector.

Building on the experience of UN-REDD and the World Bank Forest Carbon Partnership Facility, the UNFCCC adopted the Warsaw Framework for voluntary REDD+ project in 2013. The Framework allowed for results-based financing (i.e., payments are conditional on outcomes) to come from public, private, multilateral and/or bilateral sources subject to project compliance with social safeguards and measuring, reporting and verification (MRV) (IISD, 2013). These safeguards include that actions are consistent with national forest programs and international agreements; that they are governed transparently in such a way that take account of sovereignty and national legislation; that they respect the knowledge and rights of indigenous people and local communities; and that they are based on the full and effective participation of relevant stakeholders (UNFCCC, 2011: 26).

Despite the adoption of the Warsaw Framework, the place of REDD+ in post-2015 climate governance has been uncertain for several years given delays in finalizing the rules of the Paris Agreement, and in particular the rules of carbon offsetting. Article 5 of the Paris Agreement deals with forests in two paragraphs:

- "Parties should take action to conserve and enhance, as appropriate, sinks and reservoirs of greenhouse gases as referred to in Article 4, paragraph 1(d), of the Convention, including forests".
- "Parties are encouraged to take action to implement and support, including through results-based payments, the existing framework as set out in related guidance and decisions already agreed under the Convention for: policy approaches and positive incentives for activities relating to reducing emissions from deforestation and forest degradation, and the role of conservation, sustainable management of forests and enhancement of forest carbon stocks in developing countries; and alternative policy approaches, such as joint mitigation and adaptation approaches for the integral and sustainable management of forests, while reaffirming the importance of incentivizing, as appropriate, non-carbon benefits associated with such approaches" (UNFCCC, 2016).

The reference to results-based payments reflected doubts about whether REDD+ should function as a market-based mechanism or a fund-based mechanism. Section 5 includes a discussion of whether REDD+ is likely to be eligible for the Paris Agreement's offsetting scheme (so called Article 6 projects). There have long been concerns about turning REDD+ into an international market mechanism. A market-based scheme would involve fluctuating prices (depending on the international price of carbon); this creates a risk that the price would drop below the level necessary to incentivize conservation. So if the price of a unit of carbon that could be sequestered in a hectare of tropical forest dropped below the price of palm oil that could be obtained from that same hectare of forest, the rational outcome would be to abandon conservation in favor of palm oil production. If left entirely to market forces, there is no way of ensuring that the price of carbon is high enough to compete with alternative land uses; the price will simply be determined by supply and demand for REDD+ credits. Further complicating matters is the fact that sustainability concerns dictate that as much forest as possible should be included in the scheme, but market laws dictate that the price of carbon will fall as the scale of included forest expands (Humphreys, 2014: 500-1).

2.8 Climate finance in the UNFCCC negotiations

The topic of finance in the UNFCCC negotiations has been particularly sensitive and a key source of mistrust among parties. Parties have never reached agreement on the principles that ought to govern finance for climate change mitigation and adaptation, such as how responsibility should be distributed, and which countries should receive support. Although there are multiple funds for mitigation and adaptation, they are not governed on the basis of common accounting and reporting practices, which makes it difficult to evaluate progress (Weikmans and Timmons Roberts. 2019). The UNFCCC applies a flexible approach to accounting and reporting: developed country parties have to report on their contributions to climate finance for developing countries, but each developed country party can make their own individual judgment about what counts as climate finance, and why it can be considered "new and additional" (Weikmans and Timmons Roberts, 2019: 100).

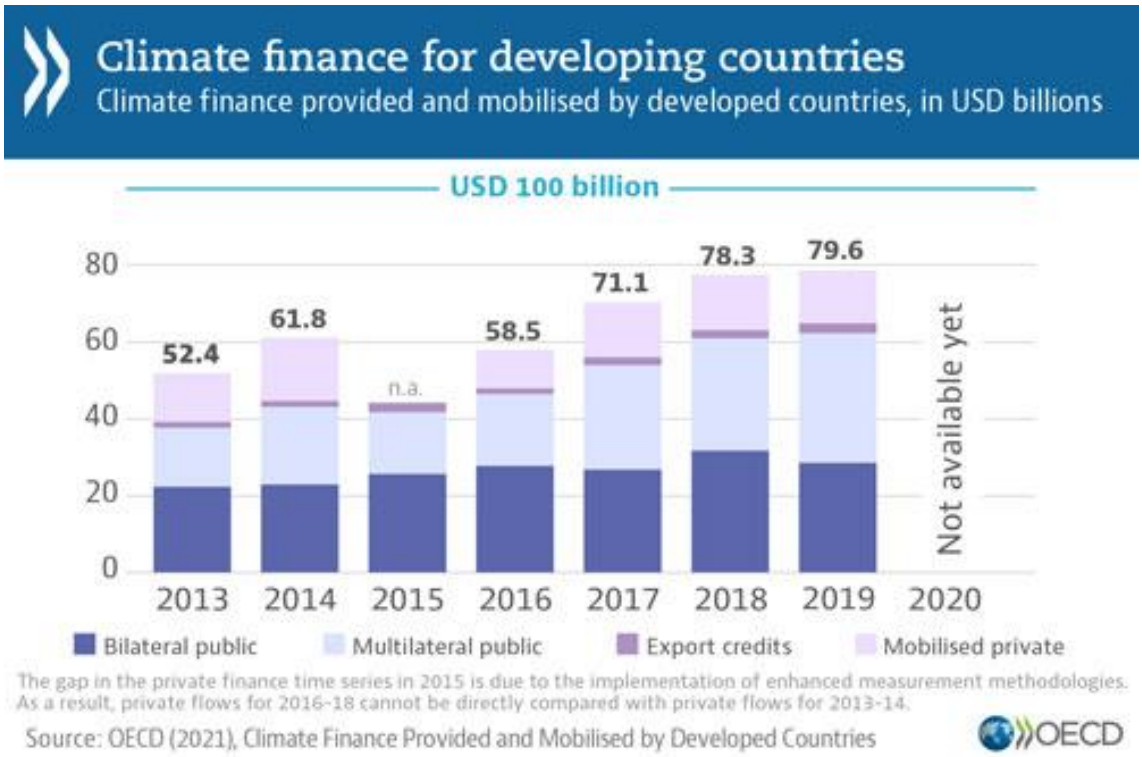
In accordance with the flexible approach now dominant in the UNFCCC, developed countries can also choose how to deliver their climate finance. In addition to private channels and bilateral channels, climate finance flows through multiple multilateral channels include the Global Environment Facility (GEF), as well as the GEF´s Least Developed Countries Fund (LDCF) and Special Climate Change Fund (SCCF); the UNFCCC's Adaptation Fund; the UNFCCC's Green Climate Fund; the World Bank's Climate Investment Funds; multilateral development banks (MDBs), and UN agencies (Climate Funds Update, 2020 (a): 4). This fragmentation of finance makes it difficult to evaluate its impact.

In 2009, at the Copenhagen climate summit, industrialized countries pledged to provide US$ 30 billion in additional climate finance by 2012 and deliver and mobilize $100 billion per year up to 2020 to support mitigation and adaptation in developing countries. This pledge is based on the principle of CBDR, which recognizes industrialized countries´ historical responsibility for accumulated emissions and their greater capacity to finance mitigation and adaptation. However, the emphasis on *mobilization* captures the position of developed countries that most climate finance will have to come from private sources, not public sources (Weikmans and Timmons Roberts, 2019: 104).

While there is disagreement over how to measure climate finance, it is clear that this promise was undelivered, irrespective of how it is measured. The OECD assesses climate finance progress on the basis of countries' self-reporting (which has found to consistently produce inflated figures[9]). Even according to this most favorable assessment, the amount "provided and mobilized" each year between 2013 and 2019 ranged between $52.4 billion and $79.6 billion (OECD, 2021). Once figures are adjusted to subtract concessional loans and non-grant instruments, estimates fall to between $18.5 billion and $22 billion per year (Oxfam, 2020: 2).

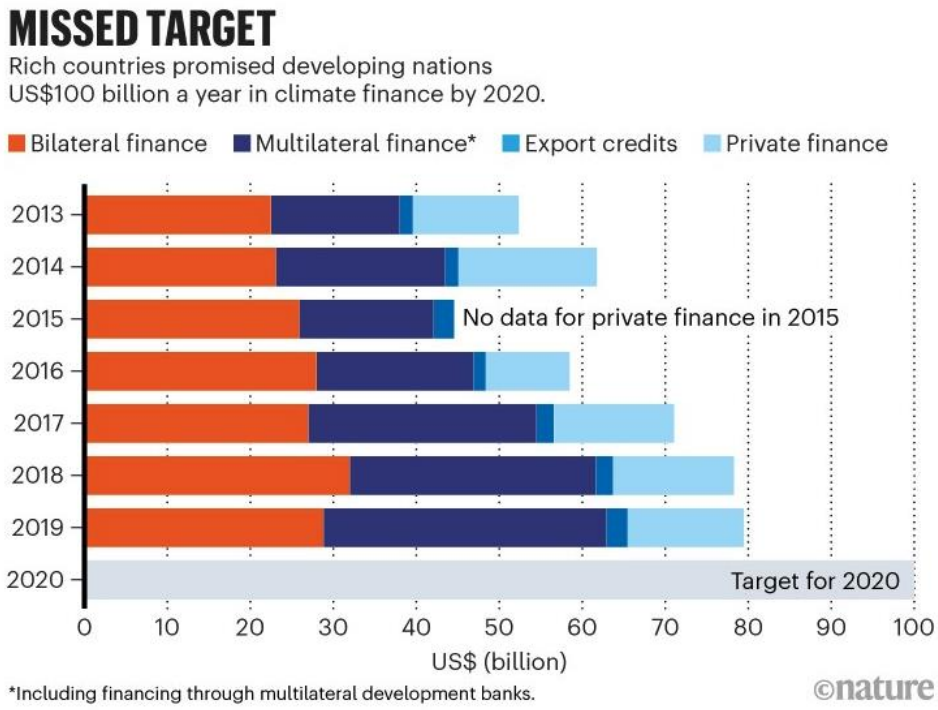
[9] Oxfam's "Climate Finance Shadow Report 2020" observes that donor reports "overstate climate finance by a huge margin. Most loans continue to be counted at their full face value, rather than as the amount of money given to a developing country once repayments, interest and other factors are accounted for (the grant equivalent)" (Oxfam, 2020: 2).

Graph 2.6: Climate finance for developing countries



Notes: Source: Graph 2.6: Climate finance for developing countries. OECD, 2021

Graph 2.7: Finance delivered to developing countries

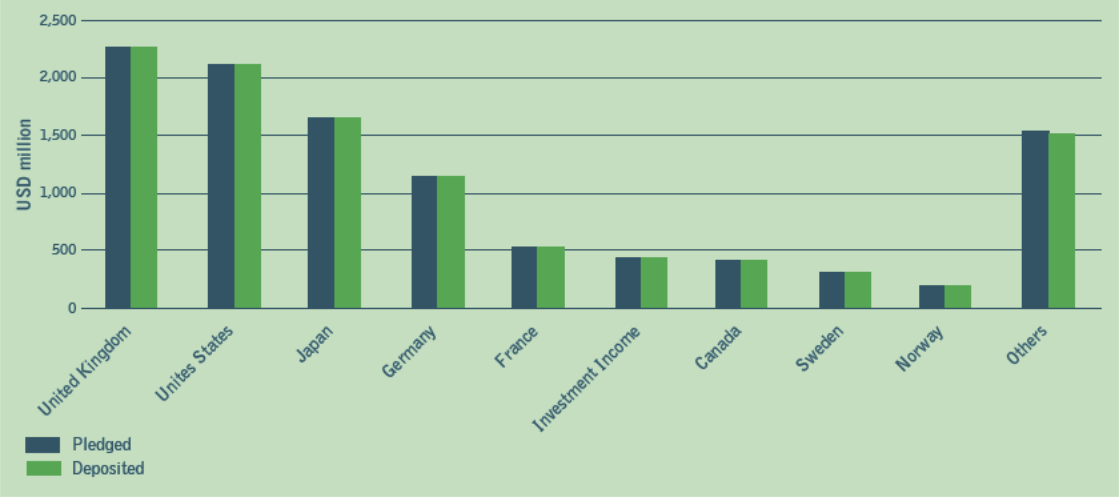


Notes: Graph 2.7: Finance delivered to developing countries. Source: Timperley, 2021.

The Washington-based Heinrich-Böll-Stiftung foundation is a key source of information on climate finance via the Climate Funds Update website. Their analysis

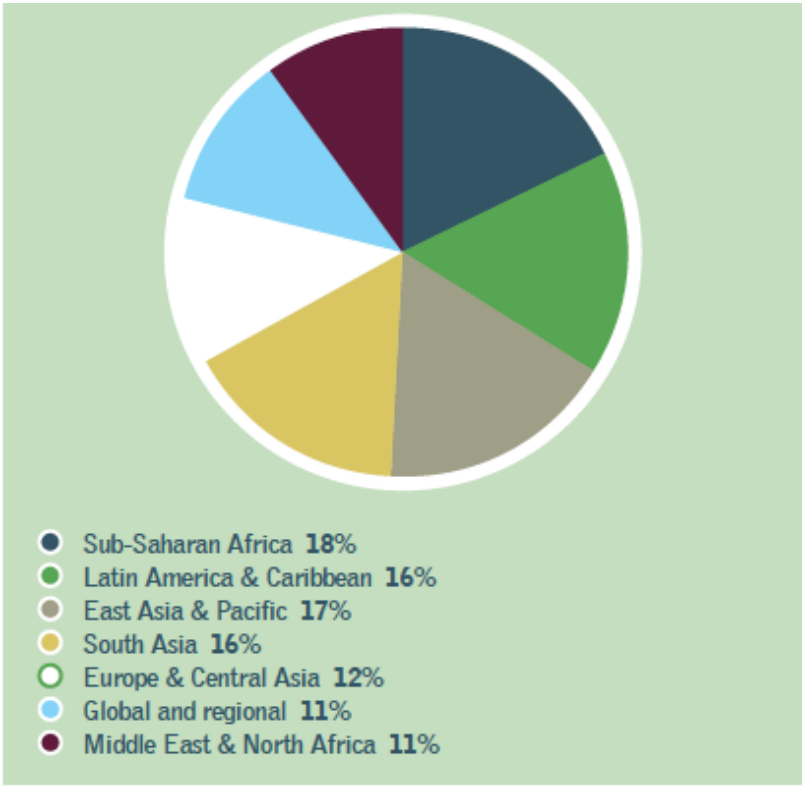
shows the following patterns of contributions and distributions of mitigation funds (graphs 2.8, 2.9. 2.10, 2.11):

Graph 2.8: Pledges and deposits to mitigation funds (2003-2020)



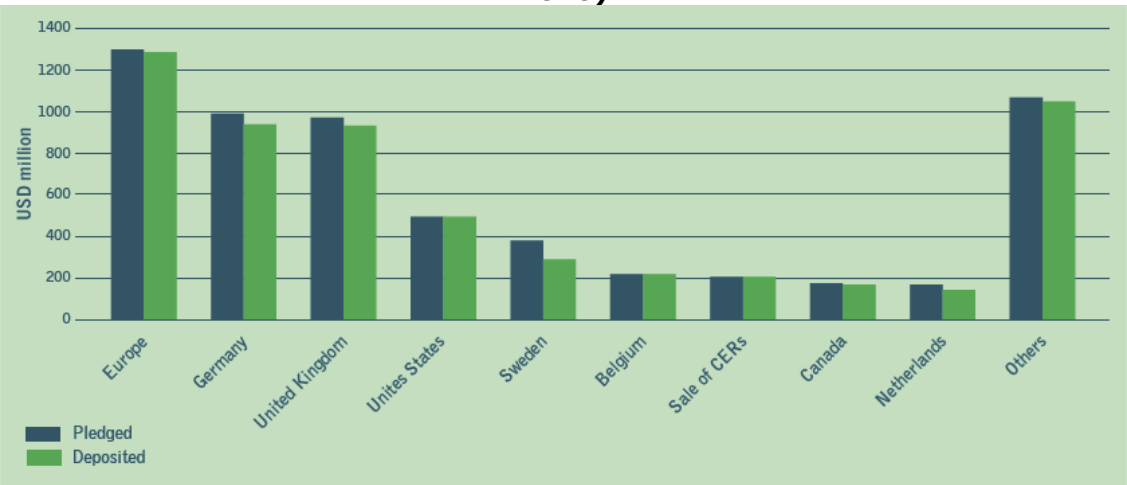
Notes: Graph 2.8: Pledges and deposits to mitigation funds (2003-2020). Source: Climate Funds Update, 2020 (b): 3

Graph 2.9: Regional distribution of mitigation finance (2003-2020)



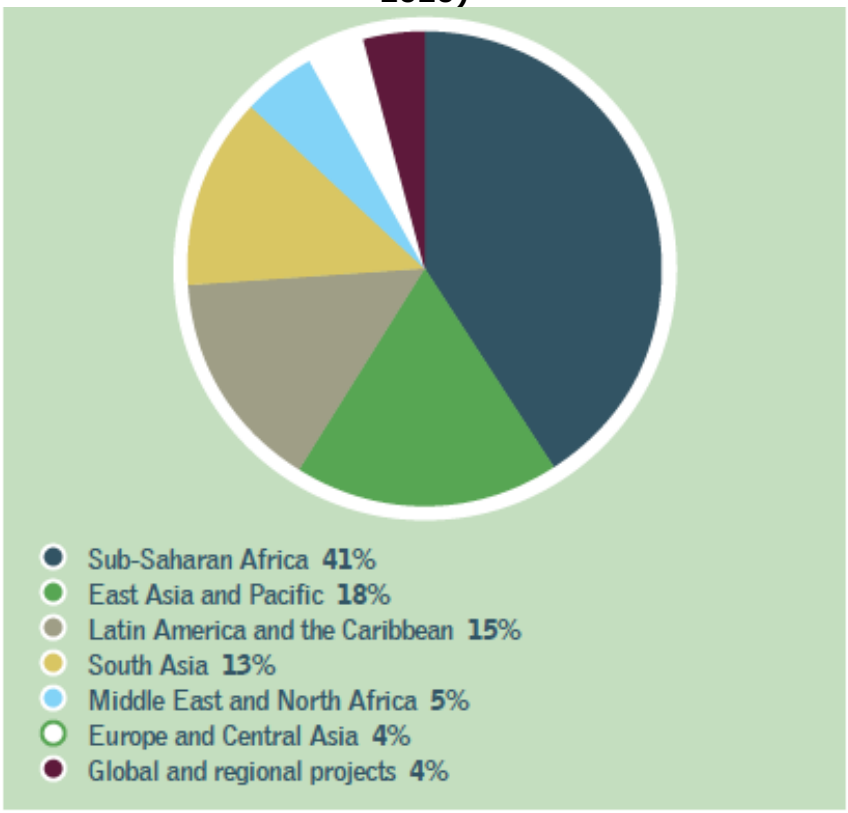
Notes: Graph 2.9: Regional distribution of mitigation finance (2003-2020). Source: Climate Funds Update, 2020 (b): 4.

Graph 2.10: Pledges and deposits to funds supporting adaptation (2003-2020)



Notes: Graph 2.10: Pledges and deposits to funds supporting adaptation (2003-2020) Source: Climate Funds Update, 2020 (c): 3

Graph 2.11: Regional distribution of approved adaptation finance (2003-2020)

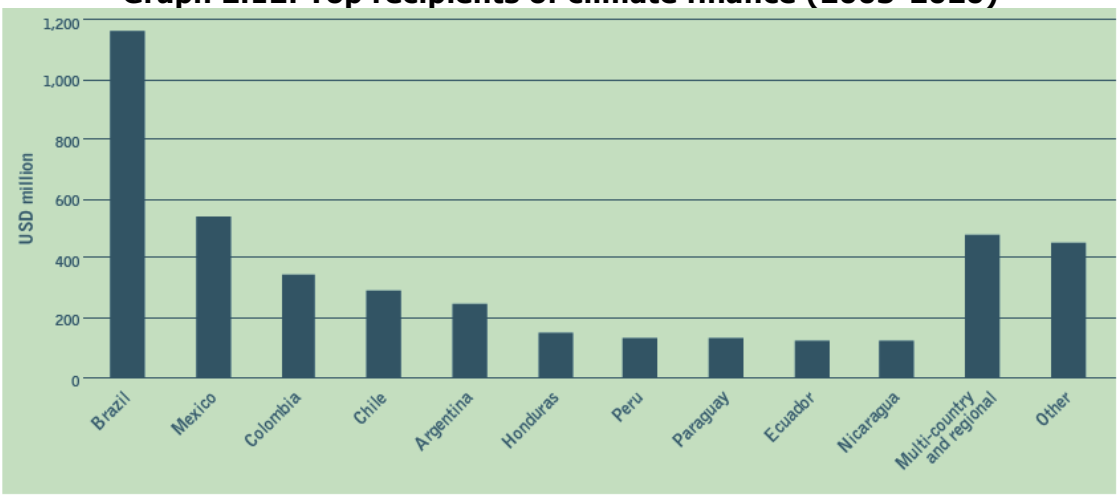


Notes: Graph 2.11: Regional distribution of approved adaptation finance (2003-2020). Source: Climate Funds Update, 2020 (c): 4.

According to this analysis, Latin America and the Caribbean receives approximately the same proportion of mitigation funds (16%) as adaptation funds (15%), as a percentage of total global distribution. However, the volume of finance allocated to mitigation is far greater than that allocated to adaptation. As a result, only 12% of climate finance in Latin American is spent on adaptation (Climate Funds Update, 2020 (d): 2).

The UNFCCC's Green Climate Fund is the largest source of climate finance in the region, having approved US$1,172 million for 25 projects in 12 countries by 2021. This is followed by the World Bank's Clean Technology Fund, which had approved US$724 million for 35 projects in eight countries by 2021 (Climate Funds Update, 2020 (d): 2). These funds are not evenly distributed throughout the region; Brazil and Mexico capture a combined total of 41% of climate finance in the region, and Colombia, Chile and Argentina capture a considerable proportion of the rest (Climate Funds Update, 2020 (d): 2), as shown in graph 2.12.

Graph 2.12: Top recipients of climate finance (2003-2020)



Notes: Graph 2.12: Top recipients of climate finance (2003-2020). Source: Climate Funds Update, 2020 (d).

3. Biodiversity agreements

Multilateral agreements on biodiversity conservation are also relevant for climate change mitigation and adaptation. Particularly relevant for Latin American countries is the 1992 Convention on Biological Diversity (CBD); as well as current negotiations on a new global biodiversity framework for the period up to 2030. Biodiversity (or biological diversity) is defined in the CBD as "the variability among living organisms from all sources including, *inter alia*, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part: this includes diversity within species, between species and of ecosystems" (CBD. 1992, Article 2). The most critical point to note about biodiversity governance is that it is completely failing to halt biodiversity loss. There are multiple reasons for this, which all come down to a lack of political will to take effective action. Specific factors highlighted to explain the governance failure include insufficient effort and resources from states; lack of understanding of objectives; lack of specificity in targets (i.e., lacking SMART characteristics: specific, measurable, ambitious, realistic, and time-bound); and diverse and conflicting stakeholder values and disputes over the distribution of costs and benefits, which lead negotiators to establish vague, ambiguous and unachievable targets (Burgass et al., 2020; Maxwell et al., 2015; Butchart et al., 2016).

This section provides an overview of the Convention on Biological Diversity (CBD) (3.1), and negotiations for a new Global Biodiversity Framework for the period up to 2030 (3.2). The implications of these agreements for climate change mitigation and adaptation are then highlighted.

3.1 Convention on Biological Diversity (CBD)

The Convention on Biological Diversity was adopted in 1992 and opened for signature alongside the UNFCCC at the Rio Earth Summit. It entered into force just a few months later and now has almost universal membership, including all countries in

Latin America and the Caribbean. Its objectives are the conservation of biodiversity, sustainable use of its components, and the fair and equitable sharing of benefits arising out of the use of genetic resources (CBD, 1992: Article 1). The CBD was not the first multilateral agreement on biodiversity; it was preceded by agreements including the 1972 Ramsar Convention on Wetlands, the 1973 Convention on International Trade in Endangered Species (CITES), and the 1979 Convention on the Conservation of Migratory Species of Wild Animals (CMS). But unlike these earlier conventions that focused on species or habitats, the CBD takes a holistic ecosystems perspective and is more encompassing than previous agreements. Parties to the Convention committed to develop "national strategies, plans or programs for the conservation and sustainable use of biological diversity" and to "integrate, as far as possible and as appropriate, the conservation and sustainable use of biological diversity into relevant sectoral or cross-sectoral plans, programs and policies" (CBD, 1992, Article 6). Just as parties have to submit NDCs to the UNFCCC, they are required to submit National Biodiversity Strategies and Action Plans (NBSAPs), as well as more frequent National Reports, to the CBD Secretariat. Most countries, including all LAC countries, have submitted at least one NBSAP, and the majority submitted a second NBSAP between approximately 2014 and 2016. A few parties, including Colombia, Cuba, and Brazil in the LAC region, have submitted three or more NBSAPs (reflecting a more frequent update to their plans) (CBD, 2021 (a).

UNEP carried out an assessment of the second NBSAPs submitted up to September 2016, with a particular focus on assessing "Parties' readiness to mainstream biodiversity concerns across sectoral and cross-sectoral plans and policies" (UNEP, 2018: 6). UNEP's assessment highlighted three countries for their best practice in involving stakeholders in the preparation of their NBSAP; two of these countries were from the LAC region (Antigua and Barbuda and Peru). Unlike most other countries (where stakeholder involvement was apparently brief and narrow), in Antigua and Barbuda and Peru, stakeholder involvement was broad and extensive (UNEP, 2018: 6). The generally poor quality of stakeholder involvement was also found in a study by the IUCN (International Union for Conservation of Nature) in 2015. Although this study included only ten countries (including three LAC countries), it found that "stakeholder workshops – the tool most often used to engage stakeholders in the process – were often not attended by people in a position to take decisions on behalf of the institutions they were representing. Those people would later "filter" the outputs of the workshops" (UNEP, 2018: 6). UNEP highlighted that most NBSAPs are technical reports rather than policy instruments, which is a problem because "Biodiversity planning should be first and foremost a political process driven by economic and social factors" (UNEP, 2018: 7). As technical reports, most lack the high-level political support and cross-sectoral buy-in which is necessary for implementation (UNEP, 2018: 8). UNEP warned that the horizontal integration (or "mainstreaming") of biodiversity considerations across sectors will not occur if those sectors have not been involved in biodiversity planning:

> "The call for mainstreaming reinforces the need for broad participatory NBSAP processes and for NBSAPs to be policy rather than technical instruments. This is because mainstreaming implies coherence of policies and actions across economic sectors and sectoral ministries that may have been quite incoherent before. Mainstreaming may and should lead to changes in values, decision-making and practices that can only be realized through political buy-in from those involved" (UNEP, 2018: 9-10).

There also tends to be a limited focus in NBSAPs on a few select sectors, rather than all those with implications for biodiversity loss. Forestry, agriculture, and fisheries

and typically included, but mining and energy are rarely included (UNEP, 2018: 10). Vertical mainstreaming is also important for implementation and UNEP's assessment highlighted Peru's NBSAP as reflecting best practice in this respect: "The Peru NBSAP has a particularly strong focus on this, guided by principles of subsidiarity and participatory governance and recognizing that governance (legislative, political or economic) achieves greater efficiency, effectiveness and citizen involvement when decentralized and as close as possible to the resources to be managed" (UNEP, 2018: 13, also p.22).

3.2 Global Biodiversity Framework negotiations

Conservationists hope that the "Global Biodiversity Framework can do for biodiversity and nature loss what the Paris Climate Agreement aims to do for global warming…" (Conservation International. 2022). This framework is being negotiated within the CBD and was due to be finalized in 2020, but negotiations have been beset by repeated delays. The first draft of the post-2020 Global Biodiversity Framework was published in July 2021 (CBD, 2021 (b). The Fifteenth Conference of the Parties to the CBD (COP-15) is expected to finalize negotiations, but it has been postponed several times. It is now scheduled to be held in December 2022, more than two years later than originally planned. The Covid-19 pandemic has been cited as the reason for the delays, but the validity of this justification is questionable given that a global climate change summit was held in 2021. Negotiators reconvened in person in March 2022 to make progress before the August conference (IISD, 2022).

Parties agree on the overall objective of the framework to halt and reverse biodiversity loss by 2030, but there remain disagreements over how to achieve this. Optimism is being kept in check by the experience of the previous Strategic Plan for Biodiversity 2011–2020 and its Aichi Targets, which failed to achieve goals on biodiversity loss. While the Aichi Targets were notoriously hard to measure, rendering evaluation of progress difficult, it is widely understood that no target was met (Buchanan et al., 2020). Target 1, for example, was "By 2020, at the latest, people are aware of the values of biodiversity and the steps they can take to conserve and use it sustainably" (CBD, 2010). Without a baseline of popular awareness, it is impossible to judge progress on this goal. Target 5 similarly stated: "By 2020, the rate of loss of all natural habitats, including forests, is at least halved and where feasible brought close to zero, and degradation and fragmentation is significantly reduced." Halving the rate of biodiversity loss requires a degree of data specificity that many parties lack, and "significantly reduce" is a qualitative assessment. On the whole, it is clear from trends on continued rapid biodiversity loss that the targets have not been met, irrespective of whether they can be specifically measured. This is clear, for example, in the case of Target 6: "By 2020 all fish and invertebrate stocks and aquatic plants are managed and harvested sustainably, legally and applying ecosystem based approaches, so that overfishing is avoided, recovery plans and measures are in place for all depleted species, fisheries have no significant adverse impacts on threatened species and vulnerable ecosystems and the impacts of fisheries on stocks, species and ecosystems are within safe ecological limits." And Target 14: "By 2020, ecosystems that provide essential services, including services related to water, and contribute to health, livelihoods and well-being, are restored and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable."

The Latin America and Caribbean Protected Planet Report 2020 was published in 2021 and was the result of a collaboration among 40 organizations including governments, universities, NGOs and international cooperation agencies (IUCN, 2021). The report analyzed progress in the region towards meeting Aichi Target 11: "By 2020, at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas, especially areas of particular importance for biodiversity and ecosystem services, are conserved through effectively and equitably managed, ecologically

representative and well connected systems of protected areas and other effective area-based conservation measures, and integrated into the wider landscapes and seascapes." The report noted that Latin America and the Caribbean is the most protected region in the world, apart from the polar region. On the regional level, 24% of terrestrial areas and 19% of marine and coastal areas are protected. But at the country-level, many LAC countries did not meet Aichi Target 11: "Of the 51 countries and territories in the region, only nine have at least 17% of their terrestrial surface protected" (Álvarez Malvido et al., 2021: 16). What's more, 43.8% of Key Biodiversity Areas (defined as "sites of global importance to the planet's overall health and the persistence of biodiversity" (KBA, No date) in the region are not protected at all. Protection is not determined on the basis of ecological criteria, which leaves large areas rich in biodiversity unprotected (Álvarez Malvido et al., 2021: 16).

The new Global Biodiversity Framework will set 21 targets and 10 milestones for governments to reach by 2030, with a view to living in harmony with nature by 2050 (CBD, 2021 (b). Among these targets are the following:

- "Ensure that at least 30 per cent globally of land areas and of sea areas, especially areas of particular importance for biodiversity and its contributions to people, are conserved through effectively and equitably managed, ecologically representative and well-connected systems of protected areas and other effective area based conservation measures, and integrated into the wider landscapes and seascapes."
- "Prevent or reduce the rate of introduction and establishment of invasive alien species by50%, and control or eradicate such species to eliminate or reduce their impacts."
- "Reduce nutrients lost to the environment by at least half, pesticides by at least two thirds, and eliminate discharge of plastic waste."
- "Use ecosystem-based approaches to contribute to mitigation and adaptation to climate change, contributing at least 10 GtCO2e per year to mitigation; and ensure that all mitigation and adaptation efforts avoid negative impacts on biodiversity."
- "Redirect, repurpose, reform or eliminate incentives harmful for biodiversity in a just and equitable way, reducing them by at least $500 billion per year."
- "Increase financial resources from all sources to at least US$ 200 billion per year, including new, additional and effective financial resources, increasing by at least US$ 10 billion per year international financial flows to developing countries, leveraging private finance, and increasing domestic resource mobilization, taking into account national biodiversity finance planning" (CBD, 2021 (b).

3.3 Implications for climate change

In 2001, the CBD Secretariat established an Ad Hoc Technical Expert Group (AHTEG) on Biodiversity and Climate Change "to consider the possible negative impacts of climate change related activities on biodiversity, identify the role of biodiversity in climate change mitigation and identify opportunities for achieving climate change and biodiversity co-benefits" (Secretariat of the CBD, 2009: 6). This group prepared a report and completed its work in 2003 but was given a new mandate in 2008 in response to considerable developments in science and tasked with providing scientific

advice to the UNFCCC on the connections between biodiversity and climate change (Secretariat of the CBD, 2009: 6). It published its report in 2009 in time for the Copenhagen climate summit.

The report highlights the multiple ways in which climate change and biodiversity are interconnected. Terrestrial, freshwater, and marine ecosystems sequester and store enormous amounts of carbon dioxide and therefore play an important role in the global carbon system. However, climate change is reducing their sequestration and storage capacity, which means that ecosystem damage will contribute to even greater climate change and make mitigation goals even harder to achieve (Secretariat of the CBD. 2009: 8). At the same time, effectively managing ecosystems presents a climate change mitigation option by maintaining and enhancing sinks that absorb greenhouse gas emissions (Secretariat of the CBD, 2009: 6).

Biodiversity is already threatened by human activities including overuse, pollution, and the introduction of non-native species. Climate change poses an additional threat to endangered species and entire ecosystems. Some species are showing a capacity to adapt, but others are already showing signs of negative impacts due to temperature increases, which are projected to increase (Secretariat of the CBD, 2009: 6). The working group recommended that states bolster their efforts to minimize other human-induced stressors on species and ecosystems, such as pollution, over-exploitation, habitat loss, and invasive non-native species. Conservation and sustainable use become increasingly important as climatic stressors grow (Secretariat of the CBD, 2009: 9).

The working group also highlighted options to integrate biodiversity and ecosystem services into adaptation plans, given that ecosystem-based adaptation presents opportunities for conserving biodiversity while delivering other social, economic and cultural co-benefits (Secretariat of the CBD, 2009: 9). Examples include "Coastal defence through the maintenance and/or restoration of mangroves and other coastal wetlands to reduce coastal flooding and coastal erosion; Sustainable management of upland wetlands and floodplains for maintenance of water flow and quality; Conservation and restoration of forests to stabilize land slopes and regulate water flows; Establishment of diverse agroforestry systems to cope with increased risk from changed climatic conditions; Conservation of agrobiodiversity to provide specific gene pools for crop and livestock adaptation to climate change" (Secretariat of the CBD, 2009: 10).

The working group highlighted the importance of land use management to reduce biodiversity loss and mitigate climate change. Protecting and restoring natural forests, peatlands, and wetlands, and shifting to sustainable agricultural practices are beneficial for limiting the accumulation of greenhouse gases in the atmosphere and reversing the rapid loss of biodiversity (Secretariat of the CBD, 2009: 10).

4. Domestic implementation and institutional challenges

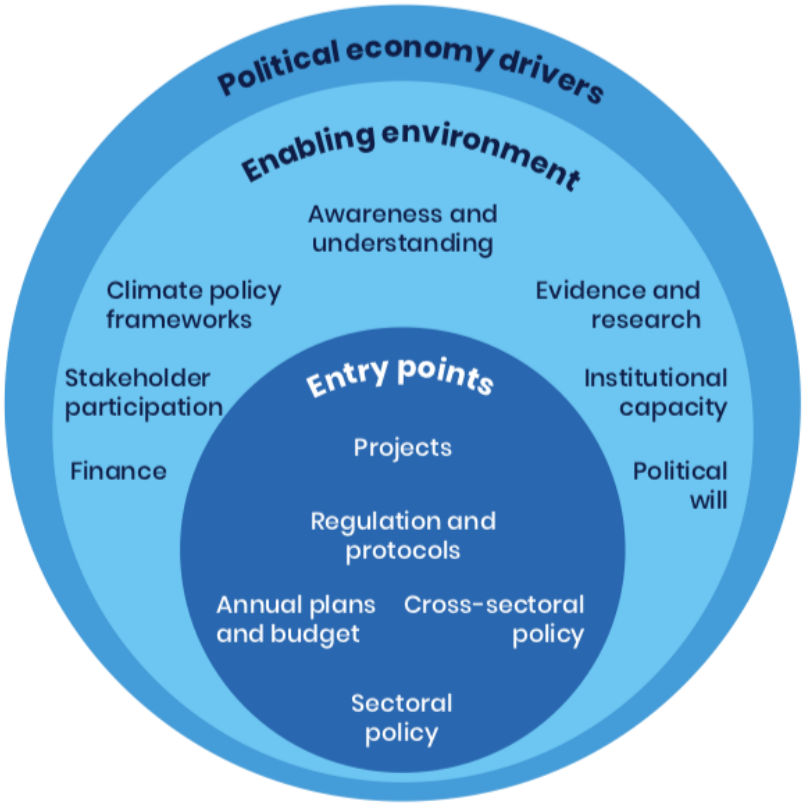
This section explains the challenges that parties face in implementing their commitments under the Paris Agreement. NDC governance frameworks highlight the processes by which these domestic plans can be effectively designed, enhanced, and implemented (3.1). These frameworks point to likely difficulties that will arise, including stakeholder, subnational, and inter-sectoral participation (often referred to as vertical and horizontal integration) (3.2). Given the comprehensive and cross-sectoral nature of NDCs, the effective design, enhancement, implementation, and monitoring of actions requires extensive data, which may be dispersed or unavailable; this challenge is highlighted in section 3.3. Section 3.4 then provides an

overview of the strengths and weaknesses highlighted in evaluations of NDCs in the LAC region.

4.1 Implementing NDCs

The challenges towards implementing effective mitigation and adaption actions in Latin America can be understood in the context of countries' Nationally Determined Contributions (NDCs). Oxford Policy Management promotes a framework for effective governance in implementing NDCs.

Figure 4.1: Governance framework for mainstreaming climate change

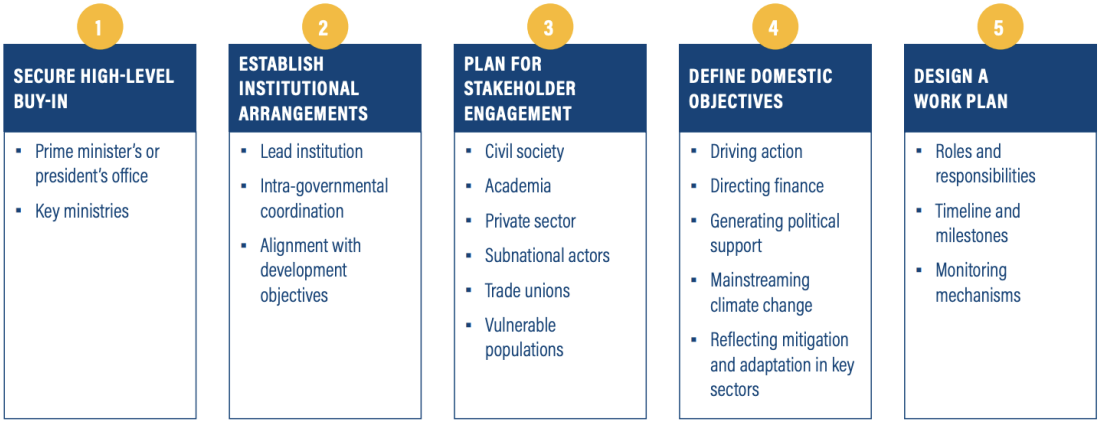


Notes: Figure 4.1: Governance framework for mainstreaming climate change. Source: Cooke, et al. 2018: 4.

The first level requires "identifying and addressing the political economy drivers that support implementation of the NDCs" (i.e., the interests and incentives of different groups and their influence on decision-making; political ideologies, etc.). The second level involves "strengthening the enabling environment" (i.e., institutional capacity and political will). The third level involves "using entry points for mainstreaming the NDC" (i.e., embedding targets and commitments in existing and new policy and planning processes) (Cooke, et al., 2018: 4).

An effective NDC should be developed on the basis of consultation with all relevant government ministries, the private sector, and civil society. Consultation with subnational actors will also usually be necessary, especially to develop adaptation strategies. The NDC should have high-level support, be coordinated by a lead institution, aligned with national development planning (including SDGs), and present a clear plan for implementation, including monitoring. WRI and UNDP (2019) recommend a five-step process for preparing NDCs that capture the elements of an effective strategy:

Figure 4.2: NDC preparation process



Notes: NDC preparation process. Source: UNDP and WRI, 2019: 6

The first step is to ensure the NDC drafting process or enhancement process is supported by the country's prime minister or president, and central ministries such as finance and planning. Although the content of the NDC is not legally binding, it presents a commitment to international cooperation efforts on the part of each country. Cooperation with relevant stakeholders will be more easily secured if the process has high-level support (UNDP and WRI, 2019: 23). High-level buy-in is more likely if the benefits of the NDC (especially in terms of development and poverty reduction) and wider international cooperation efforts are clearly defined and communicated (UNDP and WRI, 2019: 23). The second step is to nominate a lead high-level institution that can coordinate across all relevant ministries and government bodies, involving the parliament and judiciary as relevant; and consult with all relevant stakeholders (UNDP and WRI, 2019: 23-4). Step three entails ongoing stakeholder involvement throughout the NDC drafting and enhancement process, which is important for the legitimacy and durability of the strategy. Climate mitigation and adaptation actions will have costs and benefits for different groups in society, and this distribution of impacts (and the concerns it raises) needs to be anticipated and accounted for in the NDC (UNDP and WRI 2019: 23-4). Stakeholder engagement can be carried out through in-person meetings and online platforms (UNDP and WRI, 2019: 23-6). The fourth step involves assessing the extent to which climate change mitigation and adaptation objectives are aligned with different sectoral plans and policies, and how this alignment can be improved, including through directed funding (UNDP and WRI, 2019: 26-7). The final step is to design a work plan that defines roles and responsibilities, a timeline (taking into consideration national budgets and elections), milestones, and a monitoring mechanism (UNDP and WRI, 2019: 27).

4.2 The challenge of cross-sectoral policy integration

The cross-sectoral nature of NDCs presents a governance challenge. State and government institutions are typically organized along sectoral lines with limited communication between them. This is a problem at all scales of governance from the international to the local (Stevenson et al., 2021). Climate change mitigation and adaption require policy integration across multiple portfolios, including finance, energy, transport, health, forestry, and environment. Preparing and implementing NDCs will require institutional reforms to achieve such policy integration. Research on policy integration points to many factors that can facilitate or inhibit policy integration. Among the facilitators are **political** factors (convergent problem definitions, interests, ideologies, and approaches; equal institutional status; mutual understanding that integration may improve efficiency; high-level commitment to policy integration; understanding of cross-cutting issues); **institutional/ organizational** factors (standardized procedures; similar structures and capacities;

a coordinating mechanism); **economic/financial** factors (mutual understanding that integration saves resources; sharing costs and risks; perceived economies of scale; cross-cutting budget allocations; incentive structures for integration); **management** factors (opportunities for formal and informal communication; complementary roles; policy conflict resolution mechanisms; flexible implementation procedures to adjust policies); **behavioral/cultural/personal** factors (positive relations and attitude towards other organizations; willingness to cooperate and perceived benefits; recognized need for expertise; trust) (Stead and Meijers, 2019: 325). Among the inhibitors of policy integration are **political** factors (divergent priorities, interests, ideologies, goals; disagreement over problem definitions; fear of conflict); **institutional/organizational** factors (costly and fragmented communication; low levels of internal communication; fragmented levels of government with contradictory mandates and regulations; high staff turnover and inadequately trained staff; lack of overview capacity and clear hierarchy); **economic/financial** factors (unequal distribution of costs and benefits of integration; different planning and budget cycles; fear of resource loss; perception of time lost on cross-cutting arrangements; sectoral-based budgeting; lack of incentives); **management** factors (lack of inter-sectoral communication; coordination problems generating fear of delay; unclear or conflicting accountability structures; different procedures; lack of management mechanisms); **behavioral/cultural/personal** factors (negative experiences with cross-sectoral cooperation, or lack of experience; vested interests; diverging approaches and language; different working styles) (Stead and Meijers, 2019: 326).

4.3 Data challenges

Enhancing NDCs is a data-intensive exercise that crosses many sectors. Gathering this data will present an institutional challenge for some countries. UNDP identifies the following types of information as necessary (UNDP and WRI, 2019: 32):

- GHG indicators
    - National emissions inventories
    - Projected emissions
- Socioeconomic trends
    - GDP (actual and projected)
    - Income per capita
    - Employment
- Sectoral and technological indicators
    - Share of renewable energy in the energy mix
    - Cost and availability of renewable energy technologies
    - Transportation
    - Forest coverage
- National plans and policies
    - Climate change legislation and policy
    - National development plans and policy
    - Sector-specific plans and policy
    - Long-term climate strategies
    - SDG implementation plans
- Subnational and nonstate commitments, plans, policies, and actions
- Development synergies and trade-offs
    - Implementation plans for related international agreements (development, biodiversity)
- Finance
    - Finance requirements for NDC implementation
    - Finance availability
    - Policy action to align finance flows with mitigation goals

4.4 NDCs in Latin America and the Caribbean: strengths and weaknesses

The Inter-American Development Bank (IDB) analyzed the first and second iterations of NDCs prepared by Latin American and Caribbean countries and found important weaknesses. Most "were drafted quickly, and with minimal consultation"; consultations with the private sector were notably absent (Cárdenas et al., 2021: 56) (it should be noted that this experience is not unique to the region) (Cooke et al., 2018: 3). More than half were drafted without the involvement of relevant ministries in the definition of sectoral targets, resulting in a lack of "policy coherence and effective multi-stakeholder ownership of the agenda" (Cárdenas et al., 2021: 56). This problem was partly corrected in the majority of cases (85%) when countries revised their NDCs for 2020; cross-ministerial consultation was more common but the depth of consultations varied. IDB highlighted the challenge of promoting the participation of the private sector and civil society (unions, environmental NGOs, youth) and suggested that it remains to be determined which coordinating mechanisms work best for effective climate policy (Cárdenas et al., 2021: 56-57).

The IDB identified best practices in the cases of Argentina, Costa Rica, Chile, and Uruguay:

> "Before the design of its first NDC, Uruguay developed a whole-of-government approach through a multi-sector coordinating mechanism, the National Climate Change Response System (*Sistema Nacional de Respuesta al Cambio Climático*). In its 2020 five-year budgetary law (Law 19.924), Uruguay also highlighted its intent to align public expenditures and economic planning with mitigation and adaptation measures to accomplish its LTS and NDC objectives while also prioritizing a green and sustainable economic recovery. Argentina, Costa Rica, and Chile have adopted a national climate change cabinet strategy to coordinate efforts2 (Cárdenas et al., 2021: 56).

Chile and Columbia also stood out for their subnational adaptation plan, which, unlike in other countries in the region, were developed in collaboration with states, regions, and municipalities (Cárdenas et al., 2021: 56).

Other analyses of best practice have highlighted the stakeholder engagement processes in the Dominican Republic, Ecuador, Colombia, Paraguay, and Peru. In each of these countries, efforts were made to include civil society and private sector actors in participatory dialogues to prepare the NDC (UNDP and WRI, 2019: 25; GIZ & GmbH, 2019; NDC Partnership, 2019).

> "In Ecuador, a participatory process consisting of 30 workshops with the participation of 1,000 actors from the public and private sector, civil society, and academia, was used for its first, newly developed NDC, which incorporates gender equality aspects, particularly in the energy sector. The National Council for Gender Equality and women's organizations were among the engaged actors, and gender balance throughout the consultation process was taken into account, showcasing an example of whole-of-society stakeholder engagement that can be replicated during the cyclical NDC revision process" (UNDP and WRI, 2019: 25).

Peru used a cross-sectoral coordination approach to prepare roadmaps for implementing the NDC. The NDC Multi-Sectoral Working Group (GTM-NDC: *Grupo de Trabajo Multisectorial*) was established in 2017, and its membership compromised

the National Centre for Strategic Planning and 13 ministries (environment, foreign affairs, agriculture and irrigation, economy and finance, energy and mining, transport and communications, production, housing, construction and sanitation, health, education, development and social inclusion, culture, and women and vulnerable populations) (GTM-NDC, 2018: 27-28). It completed its work at the end of 2018 (GTM-NDC, 2018). In addition to preparing implementation roadmaps, the working group was responsible for identifying social and environmental co-benefits and evaluating and calculating the direct and indirect costs of the NDC (GTM-NDC, 2018: 27). The working group's final report explained that the approach was multi-sectoral and multi-level because it was necessary to involve and secure the commitment of many different management units, affiliated organizations, and vice-ministries, as well as all areas of the state, and regional and local governments (GTM-NDC, 2018: 29). They collaborated through monthly meetings.

In the Dominican Republic, the President leads the "National Council on Climate Change and the Clean Development Mechanism" (NCCC-CDM), which was responsible for preparing the country's NDC. This high-level commitment is identified as best practice and a key factor for securing buy-in from the public and private sector, and civil society (International Partnership on Mitigation and MRV, 2015; European Commission, 2020: 13). The council has a board of representatives from fifteen national ministries.

A key weakness identified in Latin American countries' NDCs was the supporting financial documentation. Only four countries included a financial strategy document in their NDC, and the content of these documents varied, as well as the extent of involvement by finance ministries in preparing them (Cárdenas et al. 2021: 57). The EUROCLIMA+ evaluation reached a similar judgment noting that financial coordination "is still in the embryonic stage". The Paris Agreement requires parties to make "financial flows consistent with a pathway towards low greenhouse gas emissions and climate-resilient development", but "this remains unfulfilled in Latin America" (European Commission, 2020: 13). Although parties are not obligated to include financial information in their NDCs, there are clear benefits to doing so, including demonstrating credibility, and, in turn, attracting support and investment (UNDP and WRI, 2019: 55). UNDP recommends that, where appropriate, parties consider using their NDCs to communicate the need for capacity building to undertake a comprehensive financial needs estimation (Cárdenas et al., 2021: 57). An evaluation of NDC implementation by Oxford Policy Management was less ambiguous and claimed that NDCs will fail unless they have clear financing plans (Cooke et al., 2018: 2).

As part of the EUROCLIMA+ program, the European Commission funded a review of NDC implementation in 18 Latin American countries (Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay & Venezuela). The study is based on data available in March 2019. The evaluation found that most countries had designed their NDCs on the basis of rigorous technical standards, and with involvement from state and non-state actors. Most countries had established a permanent inter-sectoral coordinating mechanism but there remains "a fundamental need in the region … to promote the development and strengthening of the skills required for establishing information systems that allow for the design, implementation and monitoring of sectoral climate management plans". These plans should include emissions goals or limits compatible with the NDC (Cooke et al., 2018: 2). Just over half the countries had created a multi-level coordination mechanism, and the evaluation noted that a key challenge is to coordinate work with subnational governments and strengthen subnational climate governance and monitoring (European Commission, 2020: 15). At this time, 8 countries had created *ad hoc* coordinating mechanisms to develop NDC implementation plans, which should,

according to this evaluation, be formalized and institutionalized (European Commission, 2020: 14). Only five countries were found to have a framework climate change law, with two more countries developing one. The lack of financial coordination was identified as a key weakness in NDC implementation. Chile and Honduras were the only countries referencing a financial strategy in their NDCs. Such strategies should include "mechanisms for optimizing the use of public resources as well as international cooperation funds, which could act as a catalyst for private investment on a larger scale" (European Commission, 2020: 17). Based on the experience to date of implementing NDCs in Latin America, the study identified nine fundamental challenges moving forward:

1. Raising ambition while simultaneously making progress on implementation.
2. Defining the relevance of NDCs and the expected impacts of their implementation.
3. Establishing and achieving sectoral targets.
4. Aligning territorial priorities and making them compatible with national climate action priorities.
5. Identifying development priorities and measurement strategies.
6. Determining how to use domestic and international resources effectively.
7. Identifying, promoting, and accounting for the contributions of non-state actors.
8. Determining whether it is necessary to create new financial instruments to mobilize finance or modify existing instruments.
9. Determining how to manage and share knowledge systematically and identifying what can be achieved by doing so (European Commission, 2020: 18).

5. Commercial aspects of climate change agreements

The agreements that states adopt to mitigate climate change have considerable commercial implications. Markets have long been recognized as presenting both challenges and opportunities for improving the effectiveness of climate change commitments. This section begins with an overview of international trends in carbon pricing, which is constituted by carbon taxes and carbon trading (5.1), and trends and ambitions in the LAC region are highlighted (5.2). The question of introducing trade levies to protect the competitiveness of regulated industries has long been debated but the past couple of years have seen moves to turn this idea into practice via what is called border carbon adjustment (BCA). Section 5.3 provides an overview of the rationale for BCA; recent proposals from the US and EU; challenges and controversies surrounding this practice (including its compatibility with WTO rules); the implications for GHG accounting; and the anticipated impact on LAC countries. Carbon clubs are increasingly seen as an option for coordinating carbon pricing and trade conditionalities. Section 5.4 reviews the theory of carbon clubs; existing proposals; challenges and criticisms; and the implications for LAC countries. The rest of section 5 reviews additional commercial aspects of climate change agreements: low-carbon product requirements (5.5), green bonds (5.6), and carbon offset markets (5.7).

5.1 Carbon pricing: international trends

As of 2021, 21.5% of global greenhouse gas emissions are covered by a carbon price, which is established by either a carbon tax or an emissions trading scheme (World Bank 2022 (b). This trend has been motivated by an interest in reducing greenhouse gas emissions at the lowest economic cost for society. The flexibility of carbon taxes and trading (collectively known as carbon pricing instruments) has generally been perceived as preferable to traditional "command and control" regulations (such as prohibitions and fines). These instruments send a price signal to producers and consumers, which lets them choose to reduce emissions (or consumption), pay for

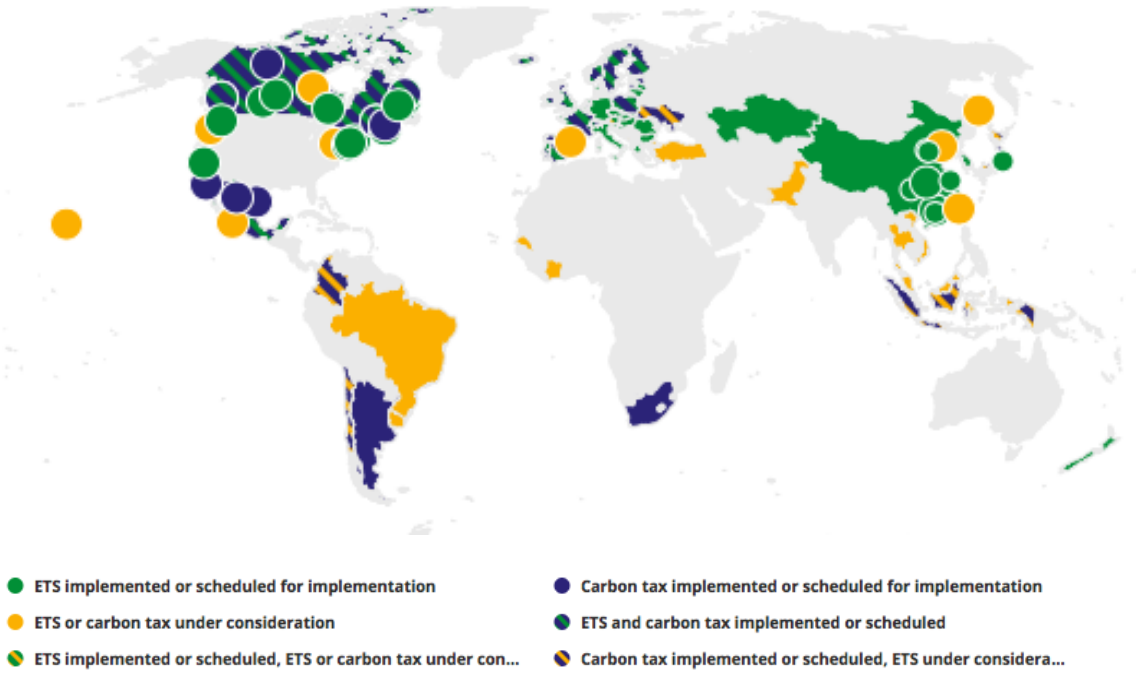
the emissions, or compensate them if a complementary offset scheme has been established. Both instruments are designed to correct a market failure by pricing a "social bad" that has previously been free, uncontrolled, and unsanctioned. Both instruments are designed to incentivize technological development by motivating producers to adopt more efficient production processes that would allow them to avoid paying for carbon emissions. A key difference between carbon taxes and emissions trading schemes is that the former controls the *price*, and the latter (if designed appropriately) controls the *outcome*. Neither of these instruments can control both the price and the outcome. By establishing a "cap" on total emissions permitted within a jurisdiction (or among certain sectors within a jurisdiction), an emissions trading scheme can guarantee the size of emissions reduction, but the cost of carbon will vary according to market conditions (whether producers choose to innovate and sell permits or emit and buy permits). A carbon tax, on the other hand, guarantees a price but it cannot guarantee the size of emissions reduction within a given jurisdiction; again, this will depend on whether producers and consumers decide to accept the additional cost of emissions, or reduce emissions through innovation or reduced consumption.

5.2 Existing carbon pricing in Latin America and the Caribbean

In December 2017, the Heads of States and Governments of Canada, Colombia, Costa Rica, Chile and Mexico; together with the Governors of California, Washington and the Premiers of Alberta, British Columbia, Nova Scotia, Ontario and Quebec signed the Paris Declaration on Carbon Pricing in the Americas. This declaration recognizes the importance of carbon pricing mechanisms for reducing GHG emissions at a lower cost and in ways that promote innovation and technological transfer. It also affirms "a shared vision of regional cooperation on carbon pricing in the Americas" and commits to creating a "platform for cooperation … to increase alignment of carbon pricing systems and promote carbon markets" (Paris Declaration on Carbon Pricing in the Americas, 2017).

In practice there are still considerable differences in carbon pricing across the region. Nearly every jurisdiction in Latin America has some form of fuel tax, however this is generally not measured in terms of the carbon dioxide content of fuels and therefore does not constitute a carbon price (Pizarro, 2021: 12). As shown in figure 5.1, most countries in Latin America have yet to implement a carbon price. Exceptions are Argentina, Chile, Colombia, and Mexico. Uruguay has also recently introduced a new carbon tax. Costa Rica does not have an explicit carbon tax, but since 1997 it has collected a tax on energy (OECD, 2019). Brazil, Chile and Colombia are considering emissions trading schemes. Those countries that have introduced a carbon tax have done so in the context of broader tax reforms; this means they do not necessarily change the cost of production or provide new sources of revenue, but they allow governments to align their tax systems with international climate change expectations and introduce a price signal for future changes in consumption (UN, 2021: 117, 172).

Figure 5.1: Map of carbon pricing around the world



Notes: Figure 5.1: Map of carbon pricing around the world. Source: World Bank 2022 (b)

Argentina implemented a carbon tax on liquid fuels in 2018. It covers "all major fossil fuels used as motor fuels or for heating purposes with the exemption of natural gas and LPG used for heating purposes" (UN, 2021: 86) and covers 20% of Argentina's GHG emissions. The tax is priced in the local currency (ARS555/tCO2e), which means that although it was intended to be a progressively increasing tax, its value in dollars has been declining each year since it was introduced. The tax is not adjusted for inflation and the current value applied to most liquid fuels is approximately US$5/tCO2e (down from the original price of US$10/tCO2e). However, the tax is being introduced gradually, initially at 10% of the full tax rate and increasing by 10% each year to reach the full tax rate in 2028 (World Bank, 2022 (b); UN, 2021: 73). Mineral coal, petroleum coke, and fuel oil attract a tax of only ARS0.3/tCO2e (US$0/tCO2e).[10] In 2021, the government collected approximately US$272 million in revenue, which was distributed according to the Federal Revenue Distribution System, as well as across multiple social spending programs, including the National Housing Fund, the Transport Infrastructure Trust, and the social security system. Chile implemented a carbon tax for the power and industry sectors in 2017. Since 2020 it has applied to installations annually emitting 25,000 tCO2 or more, and/or more than 100 tons of particulate matter (World Bank, 2022 (b). The tax covers approximately 39% of all GHG emissions in Chile. It has a value of US$5/tCO2e, generating an annual revenue of US$165 million. In 2017 Colombia also implemented a carbon tax, which applies to all sectors and fuels (with some minor exemptions). It covers 24% of Colombia's GHG emissions. With a price of US$5/tCO2e the tax generates US$29 million in government revenue each year. Mexico introduced its carbon tax in 2014. The intention was this would be the first step towards integrating the country into the Western Climate Initiative, a cap-and-trade scheme that links carbon markets in the US states of California and Washington, and the Canadian provinces of Nova Scotia and Quebec (WCI Inc, No date). Mexico's tax covers all fossil fuels except natural gas, and the value is calculated on the addition CO2 content

[10] At the time of writing, the official USD exchange rate was 127 ARS / 1 USD, which explains the USD value of 0.

of fuels compared to natural gas rather than on the full carbon content of fuels (World Bank, 2022 (b). It applies to most sectors: power, industry, road transport, aviation, shipping, buildings, waste, forestry, waste, agriculture sectors, and covers 23% of Mexico's emissions. The price varies between MXN65/tCO2e (US$3/tCO2e) and MXN7/tCO2e (US$0.4/tCO2e) and generates government revenues of US$230 million. The relatively low price of carbon in Mexico is a key barrier to integrating this jurisdiction into the Western Climate Initiative, which has a floor price of $17.71 but in 2022 permits are trading at $28.26 per ton (Storrow, 2022). Mexico also began piloting an emissions trading scheme in 2020 which then became operational in 2023 (free permits are initially being allocated to participating companies and will be phased out over time) (ICAP 2023). This presents an additional possibility for eventually integrating Mexico's carbon prices into regional schemes like the Western Climate Initiative. In 2021, Uruguay reformed its fuel taxes, resulting in a 12% increase in fuel prices (El País 2021). Since January 2022, fuels have been subjected to a carbon tax of UY5645/tCO2e (US$137/tCO2e) (Ferrere, 2021).

Introducing a carbon tax is much more straightforward than establishing an emissions trading scheme. The regulatory institutions for a tax are already in place; the concept is well understood; and it can easily be applied to all emitting entities, large and small. Of course, a carbon tax does face certain challenges and has certain disadvantages: the level of resulting emissions reduction is uncertain; taxes are politically unpopular; and it is not the most flexible way to reduce emissions (Pizarro, 2021: 18). An emissions trading scheme has the advantage of guaranteeing (in theory) a decided level of emissions reduction; it promises reduction at the least social cost (again, in theory); and it can be linked with other jurisdictions to ensure even greater cost efficiency. However, emissions trading schemes are very complex to set up; they often suffer from transparency deficits especially in the assignation of permits, which undermines trust and accountability; it requires new institutional architecture to administer and regulate; and these schemes introduce volatility in carbon prices (Pizarro, 2021: 18). Given the complexities involved in establishing emissions trading schemes, it is unsurprising that there are few such markets in the world, and there is relatively little interest in establishing markets in Latin American countries (Pizarro, 2021: 15).

An emissions trading scheme has been under consideration in Brazil since 2009 but is not expected to be implemented in the foreseeable future. In Chile a draft law to establish an emissions trading scheme was introduced to Congress in 2020. In Colombia, the government is considering an emissions trading pilot scheme to commence in 2024 (World Bank, 2022 (b). In the Americas region, there are only two emissions trading schemes: the Western Climate Initiative (WCI) and the Regional Greenhouse Gas Initiative (RGGI). As noted above, the WCI integrates the emissions markets of California, Washington, Nova Scotia and Quebec. The RGGI enables trading among the power sectors of various US states: Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, Vermont, and Virginia (RGGI, 2022).

Beyond the region, the principal emissions trading scheme is the EU's market. National markets have also been set up in China, Korea, New Zealand, and Kazakhstan. Indonesia, Malaysia, Thailand, Turkey, Pakistan, and Ukraine are also considering national markets. Subnational markets have been set up in multiple US and Canadian jurisdictions, and piloted in various cities and provinces in East Asia (World Bank, 2022 (b).

In recent years there has been considerable debate about linking emissions trading schemes.

> "Linking occurs when two or more ETSs mutually recognize common units or compliance instruments with their respective targets, thus raising both the number of participants and the size of the carbon market. When two systems are linked, companies or other participants in the linked systems (non-regulated entities such as banks, insurance companies and other financial institutions) may trade across the two markets; the compliance instruments they trade in may be used by participating entities in at least one of the systems towards fulfilling their emission targets" (Borghesi and Zhu, 2018: 2).

However, linking emissions markets across jurisdictions remains a largely academic debate given the technical complexities and political barriers involved. The likelihood of a global market in emissions remains very low for the foreseeable future. But possibilities for building such a market through incremental steps are being theorized (Rose et al., 2018; Kachi et al., 2015).

5.3 Border carbon adjustment

Given the uneven introduction of carbon pricing across the world, and the varying degrees of ambition, border carbon adjustment (BCA) instruments have been proposed in recent years as a means to protect the competitiveness of energy-intensive trade-exposed sectors in countries that face a carbon price. Border adjustment has also been seen as a means to promote more stringent standards in countries that have a low carbon price, or none at all. Border carbon adjustment aims to harmonize domestic environmental policies with international trading systems in ways that avoid creating new trade advantages and disadvantages, while also allowing for increasingly ambitious environmental standards. BCA instruments, also known as carbon border adjustment mechanisms (CBAM), entail imposing a tax or levy on goods imported from countries without an equivalent carbon price into countries that have already introduced a domestic carbon price. The value of the carbon tariff should, in theory, be equivalent to the cost incurred during domestic production of the same good (Cosbey, 2021).

Border adjustment has long been debated as a potential measure to respond to the risk of "carbon leakage", which occurs when efforts to reduce greenhouse gas emissions in one country cause an emissions increase in another country. More specifically, leakage occurs when production of energy-intensive goods like steel, cement, aluminum, and chemicals is scaled down in a regulating country and scaled up in a non-regulating country. The US-based research institution, Resources for the Future explains the logic as follows:

> "By discouraging production from moving abroad to less regulated jurisdictions and then exporting back to the more regulated jurisdiction, a BCA protects the climate mitigation ambition and the domestic industry of the country enacting it. The core idea behind a BCA is to prevent emission "leakage" related to competitiveness effects. In this context, this includes the potential for increased emissions in countries without (or with less ambitious) carbon mitigation policy compared to other countries that put forth more ambitious mitigation plans. These incentive misalignments between trading partners reduce the net effect of an ambitious country's policies and could even end up increasing overall emissions" (RFF, 2021).

Some industrialized countries (or industry groups within these countries) have long argued that differentiated environmental policies will place them at a disadvantage

in international markets, while producing no environmental improvements. In the absence of comparable environmental standards in all countries, so the argument goes, investments will be redirected to those countries with the lowest standards. Such arguments began to emerge in the 1980s. They became more salient in the 1990s as industrialized countries faced greater pressure to show leadership in global environmental governance by adopting more stringent environmental standards and pollution reduction goals. Early empirical research appeared to support the "pollution haven hypothesis", which holds that the weaker environmental regulation of developing countries makes them an attractive investment option for dirty industries. Barry Castleman was the first to document a trend in polluting and hazardous industry shifted to less developed countries following the introduction of environmental regulations in the 1970s the US, Canada, Europe, and Japan (Castleman, 1979). However, the argument that environmental regulations *cause* such industry migration was disputed. Follow-up studies in the 1980s and 1990s often reached the same conclusion, arguing that industrial decisions about location and relocation of plants are informed by multiple factors, and "the costs and logistics of complying with environmental regulations are not a decisive factor" (Leonard, 1988: 231. Cited in Mol ,2001: 159). One reason for this is that the benefits of shifting polluting practices to non-regulating countries were expected to be short-lived. The globalization of environmental pressure and regulations reduces the expected profits to be gained by shifting investment locations. Gains were expected to be short-lived and curtailed by the introduction of environmental regulations in non-regulating countries (Mol, 2001: 158-161). The *modernization* of existing plants was typically considered to be a more profitable option than the *migration* of production (Mol ,2001: 160-1). This is known as ecological modernization strategy: the introduction of environmental regulations in OECD countries has sometimes prompted companies to improve practices through the more efficient use of resources (Mol, 2001: 160-1). This is related to what is known amongst economists as the *Porter hypothesis*, which asserts that:

> "Strict environmental regulations do not inevitably hinder competitive advantage against foreign rivals; indeed, they often enhance it. Tough standards trigger innovation and upgrading… Properly constructed regulatory standards, which aim at outcomes and not methods, will encourage companies to re-engineer their technology. The result in many cases is a process that not only pollutes less but lowers costs or improves quality" (Porter, 1991: 168).

This of course does not mean that North American and European investors avoid profitable opportunities in pollution-intensive sectors in developing countries, but rather that such investment decisions are not informed primarily by changes in environmental regulation in industrialized countries. Investments in polluting practices in developing countries need to be understood independently from the introduction of environmental regulations in industrialized economies. What this does mean is that arguments about the risk of industry migration should be treated with caution. However, it should also be noted that empirical evidence for the Porter hypothesis is mixed and there is no consensus among economists about its validity (Van Leeuwen and Mohnen, 2017).

The Kyoto Protocol prompted renewed interest in the risk of pollution leakage. Concerns in the 1980s and 1990s focused on the displacement of local pollutants. Pollutants such as asbestos, arsenic, zinc, and benzidine dyes have a localized effect. In cases where the pollution haven hypothesis does hold, the regulating country enjoys improved environmental conditions following a reduction in industrial production. The global effect of greenhouse gas emissions means that any production migration that does occur will undermine mitigation efforts because no local

improvements can be secured in exchange for the loss of industrial production (Naegele and Zaklan, 2019). The Kyoto Protocol prompted concern that restricting greenhouse gas emissions *only* in Annex I countries would simply shift emissions from one place to another rather than reduce global emissions, a phenomenon labelled "carbon leakage". Carbon leakage would occur if a company subject to GHG regulations relocated to a non-regulating country, or if they lose competitiveness and market share to unregulated companies (Naegele and Zaklan, 2019). In practice, however, this phenomenon is generally not observed (but see Aichele and Felbermayr, 2015). One study of the impact of the EU Emissions Trading System on European manufacturing sectors found no evidence of carbon leakage between 2004 and 2011 (Naegele and Zaklan, 2019). Another study, financed by the European Commission, found no evidence of carbon leakage during the first and second phases of the EU ETS (2005-2012) (Bolscher, et al. 2013). This may be because of the Porter hypothesis: the emission price signal incentivized innovation in lower-carbon products and processes because this is more profitable than shifting the location of production. But it is also probably because the carbon cost imposed by the emissions trading scheme has so far been small. The researchers found that "the emission cost imposed by the EU ETS is below 0.65% of total material cost for 95 percent of European manufacturing". While this is higher than the zero-cost found in most parts of the world, it is not sufficient to prompt either a reconsideration of industry location or a loss of market share (Naegele and Zaklan ,2019). Despite weak empirical support for pollution leakage and industry migration, arguments about the risk of carbon leakage retain a powerful resonance and have been used to justify public support for energy-intensive, trade-exposed sectors in the European Union. European industry groups convinced the European Commission to design the emissions trading scheme with anti-leakage instruments in the form of free permits for emissions-intensive sectors and compensation for sectors vulnerable to carbon leakage. The EU Commission defines a sector or sub-sector as at significant risk of carbon leakage if:

- direct and indirect costs induced by the implementation of the directive would increase production cost, calculated as a proportion of the gross value added, by at least 5%; and
- the sector's trade intensity with non-EU countries (imports and exports) is above 10% (European Commission, no date (1).

Whether or not the provision of anti-leakage subsidies helped to avoid carbon leakage is unclear but European industry groups continue to insist that any increase in ambition (and consequent increase in the cost of carbon) must be accompanied by additional anti-leakage instruments. It is in this context that the idea of border carbon adjustment has moved beyond debate and edged closer towards implementation.

So far, the only place where border carbon adjustment has been introduced is in California, and it only applies domestically. So far, no country has implemented an international border carbon adjustment. In 2006, California adopted the Global Warming Solutions Act with a goal of reducing GHG emissions to 1990 levels by 2020. This was followed in 2013 by the introduction of an economy-wide emissions trading system. The potential for carbon leakage was high because California is connected to an integrated electricity system that spans various jurisdictions that did not regulate greenhouse gas emissions. Such a system facilitates what is known as "resource shuffling" whereby power companies reorganize their electricity contracts to allocate high-emitting contracts to entities in unregulated jurisdictions and low-emitting contracts to entities in regulated jurisdictions (Cullenward, 2015). Without anti-leakage regulation, it is difficult to avoid this practice because it is a cheap and easy option for power companies looking to comply with emissions regulations without investing in infrastructure reforms. The Porter hypothesis does not apply to this kind of leakage because resource shuffling does not entail any cost associated with shifting

production. There is evidence to suggest that resource shuffling significantly undermined California's climate policies prior to 2013 (Cullenward, 2014; Caron et al., 2015; Green, 2021).[11] Given that a significant amount of the electricity consumed in California was generated in states without a carbon price, regulators decided to impose a border carbon adjustment on electricity imports by taxing them on the basis of their greenhouse gas emissions intensity. This came into effect in 2013 (Fowlie et al., 2021: 402). By 2018, California had achieved its original emissions reduction goal, and over half of the emissions reduction has been "attributed to reduced emissions from electricity imports" (Fowlie et al., 2021: 402). Although this is the only case of BCA in practice, there are now firm plans to introduce border adjustment instruments in the European Union as early as 2023. Different proposals to introduce BCA nationally in the United States have been submitted since the 2000s (Mehling et al., 2017: 29-35), with the most recent bill introduced in 2021.

5.3.1 US Proposals

Proposals for a carbon border adjustment in the United States date back to 2008. Import taxes have been part of several emissions trading bills presented to Congress since this time, however so far none of these has gained sufficient support from both Democrats and Republicans to move forward.[12] While significant challenges remain, the likelihood of carbon border adjustment being adopted in the United States has never been higher. President Biden's Plan for a Clean Energy Revolution and Environmental Justice (released during his presidential campaign) includes a carbon border adjustment proposal to "stop other countries from cheating on their climate commitments" (Biden, 2020):

> "As the U.S. takes steps to make domestic polluters bear the full cost of their carbon pollution, the Biden Administration will impose carbon adjustment fees or quotas on carbon-intensive goods from countries that are failing to meet their climate and environmental obligations. This will ensure that American workers and their employers are not at a competitive disadvantage and simultaneously encourage other nations to raise their climate ambitions" (Biden, 2020).

The most recent bill (the Fair, Affordable, Innovative, and Resilient Transition and Competition Act or the FAIR Transition and Competition Act) was introduced in the US Senate by Democrats on 19 July 2021 and was referred to the Senate Finance committee, where (at the time of writing) it is currently being discussed (US Senate 2021). This bill would impose an import tax on carbon-intensive goods that are exposed to trade competition. The FAIR bill, if adopted, would require the US Treasury to begin calculating the domestic cost incurred by selected sectors in complying with federal, state, regional, or local laws, regulations, policies, and programs designed to reduce greenhouse gas emissions. Treasury would begin calculating this cost no later than July 2023, with coverage extended to the steel, aluminum, cement, iron, and fossil fuel (gas, petroleum, coal) sectors (Coons, 2021a). A fee on imports of steel, aluminum, cement, iron, and fossil fuels (or any product that is composed of over 50% of these products) would be introduced in January 2024. According to one estimate, about 12% of US imports would initially be subject to the import tax (Mintz, 2021), but "The list of goods covered by the tariff will expand as the United States improves processes for determining the carbon intensity of different types of goods" (Coons, 2021b).

[11] There is also evidence that resource shuffling has undermined the Regional Greenhouse Gas Initiative (RGGI) (Fell and Maniloff, 2018; Green, 2021)
[12] For further details on earlier bills see Mehling et al., 2017: 29-35.

The bill does enjoy some support. Although Joe Biden supported a carbon border adjustment during his presidential campaign, his administration has not yet formally supported the bill presented to the Senate. In August 2021, a White House official stated: "We believe that carbon border adjustments in relation to carbon-intensive goods represent a potential, useful tool. We do not have a comment on any specific proposals at this time (Mintz 2021)." Some industry groups also see the proposal as a way to give the US a competitive advantage in international markets because production is more efficient in the US than in many competitor countries (Mintz 2021). The CEO Climate Dialogue, a cross-sectoral coalition representing oil and gas, utilities, agriculture and food, automotive, chemicals, manufacturing, financial services, and environmental advocacy, was supportive of efforts to advance border adjustment as part of a carbon pricing framework (CEO Climate Dialogue, 2021). The American Sustainable Business Council is also supportive of the bill, arguing that it protect US businesses against polluting industries in other countries (American Sustainable Business Council, 2022).

However, it remains unclear whether the bill will successfully make its way through the legislative process. The fate of previous bills gives reason to be doubtful. Republicans and Democrats rarely agree on climate and environmental proposals. Some moderate Republican senators are cautiously open to the idea of border adjustments, particularly because it presents an opportunity to improve competitiveness vis a vis China (Waldman, 2021). Imposing a cost on other countries also resonates with the long-touted Republican narrative that other countries are not doing as much as the US in addressing climate change. One Republican senator who is open to a border tax said: "Well, we are trying to move the world to a cleaner environment, and China, India and other countries are not doing as much, and they need to pay a price (Siegel, 2022)." Republicans have long been hostile to a domestic carbon price but the introduction of border adjustment in Europe is forcing them to recognize that avoiding a domestic carbon price will not protect US industry from climate regulations (Waldman, 2021). However, other Republicans remain unconvinced, with one senator (the lead Republican on the Senate's energy committee) arguing that "They're proposing a border tax because they know punishing regulations and taxes will drive U.S. businesses overseas" (Friedman, 2021). Many Republicans are wary that a border adjustment will be paired with a domestic carbon price, or at least open the door to one in the future, and this is something they broadly reject. The present bill in the Senate would introduce a border adjustment without new domestic regulations on greenhouse gas emissions. For Democrats and climate action advocates generally, "the trade element and domestic carbon price go hand in hand," but they also recognize that binding these two instruments together will make it very hard to get legislative approval (Siegel, 2022).

5.3.2 EU Proposal

As part of its plans to reduce GHG emissions by 55% in 2030 (relative to 1990 levels) and completely decarbonize its economy by 2050, the EU Commission proposed a border carbon adjustment in 2021 (European Commission, 2021b). They argued:

> "As long as significant numbers of the EU's international partners have policy approaches that do not result in the same level of climate ambition as the Union, and differences in the price applied to GHG emissions remain, there is a risk of carbon leakage. Carbon leakage occurs if, for reasons of differing ambitions related to climate policies, businesses in certain industry sectors or subsectors were to transfer production to other countries with less stringent emission constraints or imports from these countries would replace equivalent but less GHG emissions intensive products due to

> the difference in climate policy" (European Commission, 2021b: 1).

The European Council of the EU Commission reached an agreement on this proposal in March 2022 (European Council, 2022). Various issues are still to be resolved but the border adjustment is expected to transitionally enter into force in January 2023 and become fully operational in 2026. The transitional phase will involve introduction of a registration and reporting system, as well as dialogue with non-EU countries that export goods into the EU. Importers will then begin paying the border tax in 2026 (European Commission, 2021a).

This policy is justified with reference to the steeply increasing carbon price in the EU (as determined by the regional emissions trading system) and the growing asymmetry between the EU's ambition (as reflected in its internal carbon price) and the ambition of other countries, in particular the EU's trading partners (ERCST, 2021: 3-4). It has the aims of allowing increasingly ambitious climate action within the EU, protecting internal industry from countries with less ambitious polices, and encouraging other countries to increase the level of their own policies so that overall greenhouse gas emissions can be reduced (European Council, 2022). Since the EU emissions trading system was introduced in 2005, the price of a ton of carbon dioxide has fluctuated significantly, often sitting around 5 Euros but rising in 2022 to a record high of nearly 100 Euros in February (Fjellheim, 2022). This increase has heightened European concerns about impacts on the competitiveness of energy-intensive trade-exposed sectors.

Under the proposed border carbon adjustment, goods imported into the EU will be subject to a tax equivalent to the carbon price they would have incurred had they been produced within the EU. As with all carbon regulation in the EU, the border adjustment will initially be applied selectively to allow affected parties to "learn" the new processes and adapt their operations accordingly. During the phase-in period beginning in 2022, the tax will apply only to a few emissions-intensive sectors: iron, steel, cement, fertilizers, aluminum, and electricity generation. At the end of this period, in 2026, the European Commission will consider expanding the tax to additional sectors.

The instrument will work in combination with the EU's Emissions Trading Scheme, eventually replacing existing anti-leakage mechanisms so that local industry is not compensated twice. Free allowances will be gradually phased out beginning in 2026 (European Commission, 2021a). The combination of free permits for local firms and import taxes would provoke greater concerns among the EU's trading partners that border adjustment represents a form of protectionism. It would also be unacceptable to advocates of climate action within the EU who insist that policies must be designed to incentivize transformation of local industry.

In theory, methodologies for calculating the cost of emissions embedded in imported goods are complex, and in practice it is widely recognized that border adjustment calculations will be imperfect. There is a trade-off between technical precision and administrative feasibility. Experts have proposed different administrative tools for calculating the emissions intensity of goods and the corresponding tax value, for example, RFF's Greenhouse Gas Index, the "social cost of carbon" (SC-CO_2) and and the Greenhouse Gas Protocol designed by the World Resources Institute and the World Business Council for Sustainable Development (Flannery, 2020; EPA, 2016; WRI, no date). Calculations are imperfect because calculating the emissions embedded in imported products would require access to firm-level data along the manufacturing chain. Even if such data were both available and reliable, it would be administratively burdensome to collect and combine in order to precisely calculate the emissions embedded in individual products. In the case of the EU, border

adjustment will be implemented in conjunction with the existing Emissions Trade Scheme. Importers will have to buy carbon certificates at the value set by the ETS (based on the weekly average auction price of EU permits). This value will generally not reflect the actual cost of the carbon embedded in imported goods. EU importers will be required to request this data from firms in third countries, but if it is unavailable a default value will apply (European Commission, 2021a). The default value will be calculated on the assumption that exporting countries are relatively inefficient compared to EU producers:

> "When actual emissions cannot be adequately determined by the authorized declarant, default values shall be used. These values shall be set at the average emission intensity of each exporting country and for each of the goods listed in Annex I other than electricity, increased by a mark-up, the latter to be determined in the implementing acts of this Regulation. When reliable data for the exporting country cannot be applied for a type of goods, the default values shall be based on the average emission intensity of the 10 per cent worst performing EU installations for that type of goods" (European Commission, 2021b: Annex III, article 4.1).

If a company can prove that an equivalent carbon price was already imposed during the production process, an exemption may be granted to avoid double-taxation (i.e., the EU importer can deduct the carbon cost once a non-EU producer demonstrates that they have already paid a price for the carbon emitted during production) (European Commission, 2021a). An equivalent price may result from the application of a direct carbon tax, or as a result of some other greenhouse gas regulation, including a domestic emissions market which forced producers to purchase polluting permits.

5.3.3 Challenges and controversies

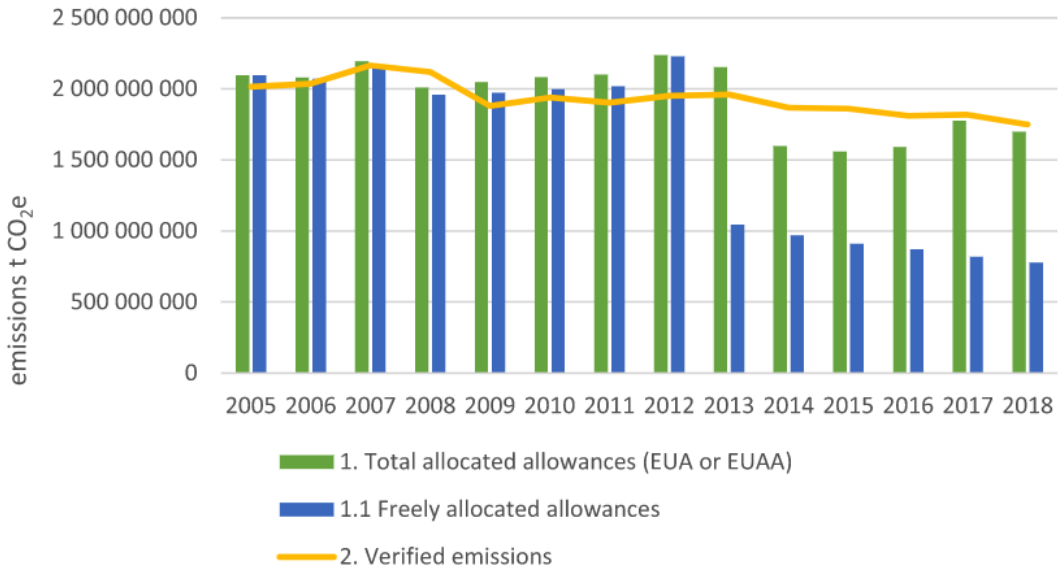
While advocates of border carbon adjustment insist that its ultimate aim is to reduce greenhouse gas emissions, it often invokes fears that it will be used as a form of protectionism. Developing countries in particular have expressed concern that new tariffs will introduce further barriers to trade and make it even harder to access markets in wealthy countries. Fears of protectionism will be heightened – and perhaps justifiably so – if border adjustment is introduced without phasing out existing support for carbon-intensive sectors in the US and Europe. The current EU proposal includes a phase-out of free allowances for European firms participating in the EU emissions trading scheme, by 10% a year. But this process will not be completed until 2036, by which time exporting countries will have already faced a decade's worth of taxes at European borders. There are some calls from within Europe to phase out these free allowances more rapidly by 2030, which was the plan envisaged in 2018 during the last phase of EU ETS reform (IEEP, 2021; Cornago, 2022; van Renssen and Ferris, 2021). The Centre for European Reform, for example, has argued that:

> "… giving industry free permits is neither efficient nor just, and it translates into unfair extra profit for certain plants. Between 2008 and 2019, energy-intensive industries reaped an estimated €30 to 50 billion in windfall profits. In some cases, firms received more free allowances than they needed, which they sold at a profit. In other cases, firms passed on their purported carbon costs to consumers, according to their exposure to competition and other features of the market. Charging consumers for the carbon costs of a product, despite receiving the carbon permit for free, is rational for firms as

long as consumers still pay for their products, yet it undermines the fairness of the ETS if it goes beyond preserving production at risk of offshoring" (Cornago, 2022).

Gains and losses have been unevenly distributed throughout the European economy, and some carbon-intensive companies and sectors have made considerable profits. The ETS is a "cap-and-trade" system. The cap imposes a ceiling on the number of permits available, and this cap has been lowered in successive phases of the initiative. Permits can either be distributed at no cost to companies (called "free allocation") or auctioned, and the EU ETS combined both methods with the aim of minimizing the burden on industry. Companies that receive free permits are required to submit one permit for each ton of CO2 emitted; permits that are not used can be sold to other companies whose pollution exceeds their free permit allocation. In the first phase of the EU ETS (2005-2007), almost all permits were distributed for free on the basis of companies' historic emissions (a practice known as "grandfathering") (see Graph 5.1). The over-supply of permits resulted in a negligible price. In the second phase (2008-2012), the cap was lowered by 6.5%; although some companies still received an over-allocation of permits, many others received an under-allocation which forced them to purchase additional permits. However, during this phase, companies had the additional (and often cheaper) option of purchasing permits through the Clean Development Mechanism (CDM, see section 5.7). Combined with the drop of emissions that accompanied the global financial crisis of 2008 (which pushed down production and emissions), the market continued to be oversupplied with permits and the price fell to historically low levels. In the third phase (2013-20), the cap was reduced by 1.74% per year and free allocation was replaced with auctioning as the principal method of distribution. However, large numbers of permits were still distributed for free (see graph 5.1), and industries deemed at risk of carbon leakage continued to receive 100% of their permits at no cost; these were precisely the sectors that have profited most from the system.[13]

Graph 5.1: Free allocation under the EU emissions trading scheme



Source: ECA, based on data from the EU ETS data viewer of the European Environment Agency.

Notes: Graph 5.1: Free allocation under the EU emissions trading scheme. Source: European Court of Auditors, 2020.

[13] The actual number of permits received by each company was calculated on the basis of their most efficient operation levels in previous years of the ETS.

Researchers in the Netherlands (CE Delft) have calculated that the fifteen most carbon-intensive sectors in the EU have managed to maximize profits from the emissions trading scheme by using free permits as well as using cheaper international offsets (such as the CDM, see section 5.7). The permits they received free of charge had a higher value than the permits they purchase in international offset schemes (De Bruyn et al., 2021). Such gaming of the system makes it difficult to justify additional carbon leakage instruments. CE Delft revealed that:

> "On average, the CO2-intensive sectors in those countries did not need to pay for any emission allowances to cover their carbon emissions under the EU ETS. Instead, they could earn from selling their freely obtained allowances in excess of demand at the spot market resulting in additional profits worth an estimated € 1.6 billion. Especially the cement sector and other building materials (bricks and lime) have profited from this, resulting in around € 4 billion additional profits from simply taking part in European climate policies" (De Bruyn et al., 2021).

Steel manufacturers in the EU, for example, only have to pay for about 20% of the permits they use to emit greenhouse gas emissions (Cornago, 2022). The iron and steel sector has been the greatest beneficiary of climate policy in the EU, making an additional profit of € 11.9 to € 16.1 billion between 2008 and 2019. The cement and refineries sectors have also made large gains of € 7.1 to € 10.3 billion (cement) and € 5.9-11.3 billion (refineries) (De Bruyn et al., 2021: 4). Overallocation of free permits allowed some companies and sectors to profit from the EU ETS. But many of those companies that were under-allocated permits and forced to purchase permits still managed to profit from the system by passing on the cost of purchased permits to customers (a practice known as cost pass-through) (Marcantonini et al., 2017). One study revealed that utility companies did not receive excess free permits and were required to purchase permits, but these same companies had the highest windfall profits because they were able to impose a higher carbon cost on consumers than they had actually incurred. Cludius explains how this works:

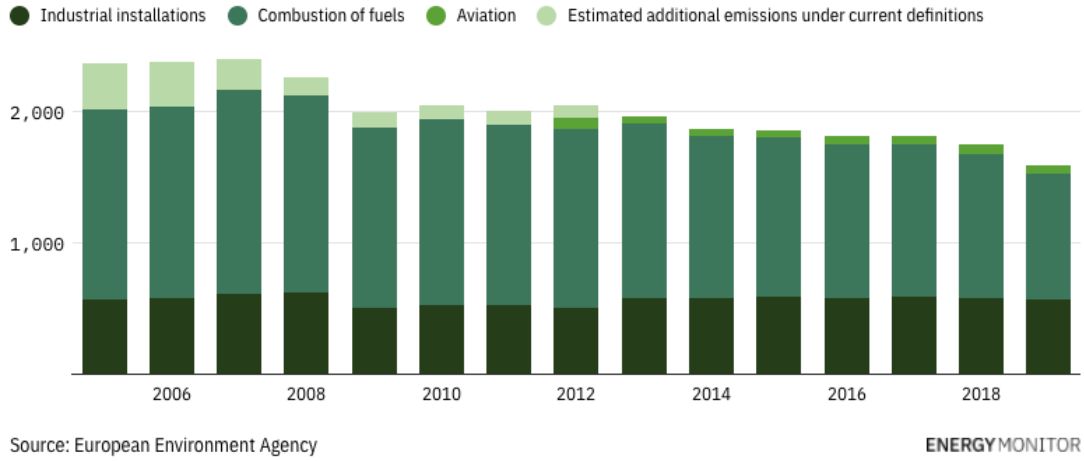
> "It is mostly utilities that were identified as having had to buy additional permits on the market for EUAs (EU emission allowances). However, it is exactly for those companies that other studies have estimated the highest windfall profits due to pass-through of carbon costs over and above the level these companies actually faced. This mechanism works in two ways: i) Companies can pass through the (opportunity) cost of freely allocated allowances, and ii) due to the way in which electricity prices are set in a competitive wholesale market, windfall profits may arise even for the share of allowances that has to be purchased on the market. This happens if an emissions-intensive producer, for example a coal plant, sets the price according to its marginal costs including high CO2 costs. In this case, all less emissions-intensive plants that are generating power during the same time, for example nuclear power and renewables, also are also given this price, although their CO2 costs are much lower than those of the coal plant" (Cludius, 2015: 16).

In successive phases of the EU ETS, the European Commission gradually reduced the number of permits available in the market (i.e., lowered the "cap" in the cap-and-trade system), and this pushed the price of each permit upwards. But this did not necessarily increase production costs for EU industry and electricity providers

because many were able to pass the cost on to consumers to protect profits, and many others continued to receive 100% free allocation.

Climate campaigners point to evidence that the free permit system has failed to decarbonize industrial processes in Europe, thus undermining the fundamental goal of the Emissions Trading System. Data from the European Environment Agency supports this criticism, showing that emissions from industrial installations have remained flat between 2005 and 2019 (Graph 5.2). An audit conducted by the European Court of Auditors in 2020 also found that "free allocation to the power sector did not promote decarbonisation in phase 3" (European Court of Auditors, 2020). The audit highlighted that contrary to the initial intention to use free allocation as an exceptional method, it continued to "represent more than 40 % of the total number of available allowances" during phase 3 and early phase 4 (European Court of Auditors, 2020).

Graph 5.2: ETS emissions by activity type (2005-2019)



Notes: Graph 5.2: ETS emissions by activity type (2005-2019). Source: Nichols, 2021.

The combination of flat emissions patterns together with significant profits makes it hard for the EU to morally justify the introduction of a carbon border adjustment. It makes the charge of protectionism all the more justified because introducing carbon border adjustment into such a system will simply increase the profits (and subsidies) of European industry and make it even harder for producers in non-EU countries to compete. The EU cannot coherently insist that carbon border adjustment is a GHG reduction measure rather than a form of trade protectionism while it maintains such high subsidies for European producers.

The current bill being debated in the US Senate is vulnerable to the same charge that it is a form of green protectionism. Unlike the EU scheme which will link the import tax value to the market value of carbon in the ETS, the import tax value in the US will be calculated on the basis of the estimated domestic cost of diverse regulations at multiple levels of jurisdiction. The US does not have a carbon market so there is no transparent and objective carbon price. There is therefore an incentive for the US Treasury to exaggerate the domestic cost of greenhouse gas regulations in order to inflate the import tax value.

Some trade partners have already raised strong concerns about unilateral proposals to impose a carbon tax at US and EU borders. For example, China's vice environment minister, Zhao Yingmin, has criticized what he calls climate protectionism: "We need to prevent unilateralism and protectionism from hurting global growth expectations and the will of countries to combat climate change together" (Cadell, 2019). Brazil, South Africa, India, and China coordinated a statement on the EU proposal in April

2021, expressing "grave concern regarding the proposal for introducing trade barriers, such as unilateral carbon border adjustment, that are discriminatory and against the principles of Equity and principles of Equity and CBDR-RC (Common but Differentiated Responsibilities and Respective Capabilities)" (Republic of South Africa, 2021). Later that year the BRICS coalition (Brazil, Russia, India, China and South Africa) repeated their criticism citing its potential incompatibility with WTO rules: "We underline that all measures taken to tackle climate change must be designed, adopted, and implemented in full conformity with WTO agreements and must not constitute a means of arbitrary or unjustifiable discrimination or a disguised restriction on international trade" (BRICS, 2021).

Criticisms from these trading partners point to two controversies that merit further explanation: compatibility with WTO rules and compatibility with equity norms embedded in UNFCCC agreements. These will be examined in turn in the following paragraphs.

During the years that it has been debated – hypothetically and now in practice - the principal objection levelled against carbon border adjustment is its incompatibility with WTO rules. The WTO regulates trade between nearly every country in the world and aims to ensure that all member countries have fair access to international markets (RFF, 2021: 4). The spirit of WTO rules is to ensure that domestic and foreign-produced goods compete equally in the market. Any public support which artificially reduces the cost of domestic production is prohibited unless it conforms to strict criteria. Just as member countries cannot treat their domestic products more favorably than foreign-produced goods, neither can they discriminate between foreign-produced goods on the basis of country of origin. For example, the EU must treat steel produced in Brazil in the same way as steel produced in Turkey, and any rebates or taxes must not alter the cost of purchasing steel produced in either the EU, Brazil, or Turkey. ""WTO rules allow nations to provide rebates for indirect taxes on products that are exported (not to exceed the domestic tax paid on products that are consumed domestically) and to apply a charge to imported products (not in excess of the indirect tax on like domestic products)" (Flannery et al., 2021). The US think tank, Resources for the Future explains that: "Among the criteria to comply with the WTO, a BCA must have objective methodology, the import charge cannot exceed charges on a similar domestic product, and an export rebate cannot exceed the domestic tax paid on the product. Additionally, importing nations cannot credit foreign companies that face more stringent regulations than others" (RFF, 2021: 5). This raises challenges for the introduction of carbon border adjustment because there are plausible concerns about the proposed methodologies for calculating import taxes in both the EU and US, and the continued direct support for carbon-emission sectors means that the import charge will ultimately exceed the cost faced by domestic producers. In the case of the EU such support is plain to see: continuation of free permits is anticipated until 2036. In the case of the US, a country could point to the large subsidies that still exist for the coal and gas sectors, which ultimately reduce the domestic cost of production (IMF, 2021). But a country that raises a dispute in the WTO on the basis of fossil fuel subsidies will come under scrutiny for its own subsidies, so it is not clear whether such disputes would even be raised, or if they would be resolved in favor of the country imposing border adjustments or the country facing border adjustments.

The objectivity of proposed methodologies will also be vulnerable to challenge because it is recognized that calculating the actual *de facto* cost of carbon in different countries is technically complex and administratively implausible. Any calculated cost will be vulnerable to challenge. Experts in climate and trade issues point out that:

> "Most nations, including the United States, utilize a portfolio of policies that include a variety of mandates, subsidies, and

> end-use efficiency regulations, as well as some price-based approaches. Cap-and-trade systems result in a variable, volatile, unpredictable GHG price for facilities in some sectors. Evaluating the cost of the ensemble of these policies for specific products gives rise to a quagmire of challenges. It would be exceedingly difficult, for example, to determine the amount of a cap-and-trade credit appropriate to reduce the US import charge on products exported from a country with a cap-and-trade system that includes substantial free allowances for facilities of various industries" (Flannery et al., 2021).

Exemptions to WTO rules are permitted under criteria defined in Article XX of the GATT. Ten exemptions are stipulated, which define the conditions under which non-application of WTO rules is permitted. They include measures "necessary to protect public morals"; "necessary to protect human, animal or plant life or health"; and "relating to the conservation of exhaustible natural resources if such measures are made effective in conjunction with restrictions on domestic production or consumption" (WTO, 1994). A member country could conceivably defend carbon border adjustment on the basis of any of these three conditions. However, there is considerable uncertainty about the likely outcome of such a dispute, especially given that affected countries could argue that the continuation of domestic support (such as free permits) creates a trade barrier beyond what is necessary to ensure the exemption-based conditions outlined above. Trade experts conclude that "There may be no clear answer on WTO compatibility and how risky this measure is until a trade dispute actually happens (Lehne and Sartor, 2020: 14)."

Some analysts and commentators have suggested that countries may – or even should – proceed to impose carbon border adjustments without concern for WTO rules. Resources for the Future points out that it is unclear whether any country would raise a dispute in the WTO, and if they did so, it is likely to take years to resolve, so countries may opt for the immediate benefits of carbon adjustment even at the risk of being forced to roll back or modify these adjustments in the future (RFF, 2021). The director of the US-based environmentalist organization, Sierra Club, argued that "The WTO track record on climate and environmental protections hardly inspires confidence that this body should be issuing pronouncements on countries' efforts to tackle the climate crisis" (New Zealand Foreign Affairs and Trade, 2021). A New York Times op-ed mocked the idea that the US should take into account possible interpretations of international trade law given the domestic impacts of climate change that are already being experienced in that country (New Zealand Foreign Affairs and Trade, 2021).

From the perspective of firms in Europe and North America it may seem intuitively reasonable to impose taxes on imports originating in countries with a lower carbon price. However, critics argue that this goes against the equity principles built into the international climate regime since the early 1990s. Border carbon adjustments are frequently justified as a means of pressuring other countries to "up their game" and increase the ambition of their own domestic policies (RFF, 2021: 4). But if developing countries are forced to accept an increased cost *equivalent* to the domestic carbon cost established in the US and EU, the measure clashes with the principle of Common but Differentiated Responsibilities and Respective Capabilities (CBDR). As explained in Section 2, the norm of CBDR demands more ambitious mitigation actions from industrialized countries on the basis of their historical contribution to pollution and/or capacity to bear the costs incurred. While there has been extensive debate over how this principle should be applied in the 21st century, the essence of differentiation cannot be ignored without violating this equity principle. Aligning the measure with CBDR would require capacity building and substantive support (including technology transfer) for affected developing countries (Lehne and Sartor, 2020: 6). The fact that

carbon-intensive firms in the EU have profited significantly from the EU ETS undermines the argument that border adjustment is necessary for equity. Under such conditions, the imposition of a border tax may serve to widen international inequalities under the guise of environmental protection. This risk is evident in an assessment of the EU's proposal by the United Nations Commission on Trade and Development (UNCTAD). UNCTAD modeled several scenarios in which a carbon price of $44 and $88 was imposed in the EU with and without a corresponding border adjustment. This price is considerably higher than the actual carbon price seen in the EU between 2005 and 2021, and it produces an expected leakage of 13.3% of EU emissions. The assessment found that if the EU provided 50% free allocation of permits to European companies alongside application of border adjustment of $44, production in Europe would increase.[14] This would reduce global emissions by 27 million $MtCO_2$, which represents 0.1% of global emissions. But this overall reduction would actually constitute a redistribution of emissions: under this scenario, "Emissions by all countries outside of the European Union decrease by 36 million $MtCO_2$ and emissions in the European Union increase by 9 million $MtCO_2$. The emissions in the European Union increase because the production of energy intensive products is partly shifting back to the European Union (compared to a scenario without carbon adjustment and 13.3% leakage)" (UNCTAD, 2021: 17).

Arvind Ravikumar of the University of Texas has argued that "Although reasonable at face value, unilateral carbon border adjustments merely represent the latest form of economic imperialism and are antithetical to the principles of equity enshrined in the Paris Agreement… Without buy-in from countries like India and China, carbon border adjustments risk becoming a climate-based sanctions regime" (Ravikumar, 2020). This argument resonates with that advanced by the BRICS and BASIC groupings of countries. As explained in Section 1, the Paris Agreement is based on a bottom-up logic whereby each state determines the scale and style of their commitment on the basis of their self-assessed capacity. Unilateral punitive mechanisms arguably violate the spirit of this agreement (Lehne and Sartor, 2020: 6).

Developing countries' objections to a border tax are further justified when considered in light of the promises of financial and technological support that have gone unfulfilled for many years (as explained in Section 2).

There are various proposals for making border adjustments compatible with principles of equity. Both the EU proposal and the bill currently under consideration in the US exempt least developed countries (LDCs), and countries that can demonstrate an equivalent domestic carbon price. Other analysts suggest more far-reaching measures to align border adjustment with international equity principles, including by redistributing the revenue generated by this measure. Estimates of precisely how much revenue will be generated vary: the EU is expected to generate between €2 billion and €14 billion in revenue each year (RFF, 2021: 3-4; IEEP, 2021), while the US proposal currently under consideration would generate approximately $16 billion each year (Volmer, 2021). Observing that the EU's proposal imposes additional costs on imports from lower income and climate vulnerable countries, the Institute for European Environmental Policy (a non-government think tank) argues that "Much of the €2.1bn the EU will collect should be used to support climate vulnerable countries to modernize their supply chains. A just transition should not stop at the EU's borders" (IEEP, 2021). They further argue that such a measure should be coupled with a phasing out of free emissions permits for European industry in 2030. UNCTAD also advocates border adjustment "flanking policies" to mitigate the punitive consequences of the EU's proposed measure, and to narrow and

[14] Note that 50% is a lower level of support than has been in place for most of the EU ETS, but is consistent with declared intentions to reduce this form of support.

eventually eliminate the emissions gap between developed and developing countries that this measure will produce (see above). Exempting the very poorest countries is not sufficient to avoid deepening inequalities between developed and developing countries. UNCTAD argues that "A potential aim of the European Union could include utilizing some of the revenue generated by the CBAM to accelerate the diffusion and uptake of cleaner production technologies in developing countries in the CBAM's targeted sectors" (UNCTAD, 2021: 24). This proposal also finds support in the academic literature:

> "Economic analyses show that when countries that implement BCA retain the revenues, more of the burden of the climate policy package shifts toward developing countries; alternatively, dedicating the revenues to benefit the exporting countries can avoid this shift or even make exporting countries better off… For example, revenues could be refunded to the exporting country directly or via clean technology transfer. The implementing country could earmark the revenues to internationally administered funds for climate change mitigation and/or adaptation or disburse them for mitigation and adaptation projects" (Cosbey et al., 2019).

Development economist, Aaron Cosbey, and colleagues argue that using the revenue in this way would have the triple benefit of (a) bringing the measure into alignment with the principles of CBDR, (b) demonstrating that the measure is indeed a carbon leakage measure and not a form of protectionism, and (c) disincentivizing implementing countries from inflating calculations of the domestic cost of carbon (Cosbey et al., 2019).

5.3.4 Implications for GHG accounting

Border carbon adjustment is a mechanism that modifies existing practices of production-based accounting, discussed in section 2.3. The methodologies used to prepare national emissions inventories do not change, but the way in which responsibility for emissions is assigned does partly change. As explained in Section 2, countries are responsible for the emissions produced within their jurisdiction. Border carbon adjustment has the effect of making consumers responsible for the emissions embedded in the imported goods they consume but this does not imply a shift towards consumption-based accounting. Consumption-based accounting would require countries to calculate the emissions embedded in *all* the goods consumed and activities performed within their jurisdictions. Border carbon adjustment only imposes a cost on imported goods that are also produced within the importing country. If a country imports goods that are not produced domestically, no tariff is imposed to reflect the embedded emissions.

5.3.5 Implications for LAC countries

Determining the comparative impacts of border adjustment requires analysis not only of the economic profiles of the US' and EU's trading partners, but also the relative efficiency of their production and their domestic climate policies. The amount of CO_2 embedded in an imported good will depend on the energy efficiency of the exporting country, which will also vary from sector to sector. The tax value imposed on a product will also depend on the domestic carbon price incurred in its production. Comparative impact analysis is a data-intensive exercise, and there are, unsurprisingly, few studies published from which to draw conclusions about the impact on Latin American countries (the available studies are Brandi, 2013; UNCTAD, 2021). The studies that do exist almost exclusively analyze country groupings rather than individual countries and sectors within individual countries (McKibbin and Wilcoxen, 2008); Matoo et al., 2009). In general, the countries expected to be most affected by the EU's carbon adjustment are those whose economies lack diversity

and are concentrated in energy-intensive, trade-exposed sectors such as oil and gas, chemicals, steel, aluminum, cement, plastics and paper.

Research from the German Development Institute assesses comparative exposure to carbon border adjustment in the EU and US on the basis of trade flows in energy intensive industries (iron and steel, aluminum, cement, glass, paper, clay and certain chemicals) (Brandi, 2013). The study ranks vulnerability not in terms of trade volumes, but rather in terms of the average share of energy intensive exports to the US and the EU relative to the country's total exports to these countries. For the US, the most vulnerable countries were Tajikistan, Ukraine, Zimbabwe, Georgia, India, Indonesia, China and Thailand (tables 5.1 and 5.2). For the EU, the most vulnerable countries were Mozambique, Tajikistan, Armenia, Ukraine, Moldova, Zimbabwe, Egypt, and Jordan. No Latin American country was among the top 21 most vulnerable countries to an EU border adjustment, or among the top 8 most vulnerable countries for the US.

Table 5.1: Energy intensive exports: Absolute and relative trade flows to the US

Country	Economic classification	Average energy intensive trade flows (2004–2008) ($ million)	Average % energy intensive exports
Tajikistan	LIC[a]	51	74
Ukraine	LMIC[b]	973	62.9
Zimbabwe	LIC	48	50.3
Georgia	LMIC	85	49.8
India	LMIC	1569	7.0
Indonesia	LMIC	458	3.2
China	LMIC	8488	2.9
Thailand	LMIC	437	2.0

Notes:
a. LIC = Low-income country
b. LMIC = lower-middle income country.

Notes: Table 5.1: Energy intensive exports: Absolute and relative trade flows to the US. Source: Brandi, 2013: 83.

Table 5.2: Energy intensive exports: Absolute and relative trade flows to the EU

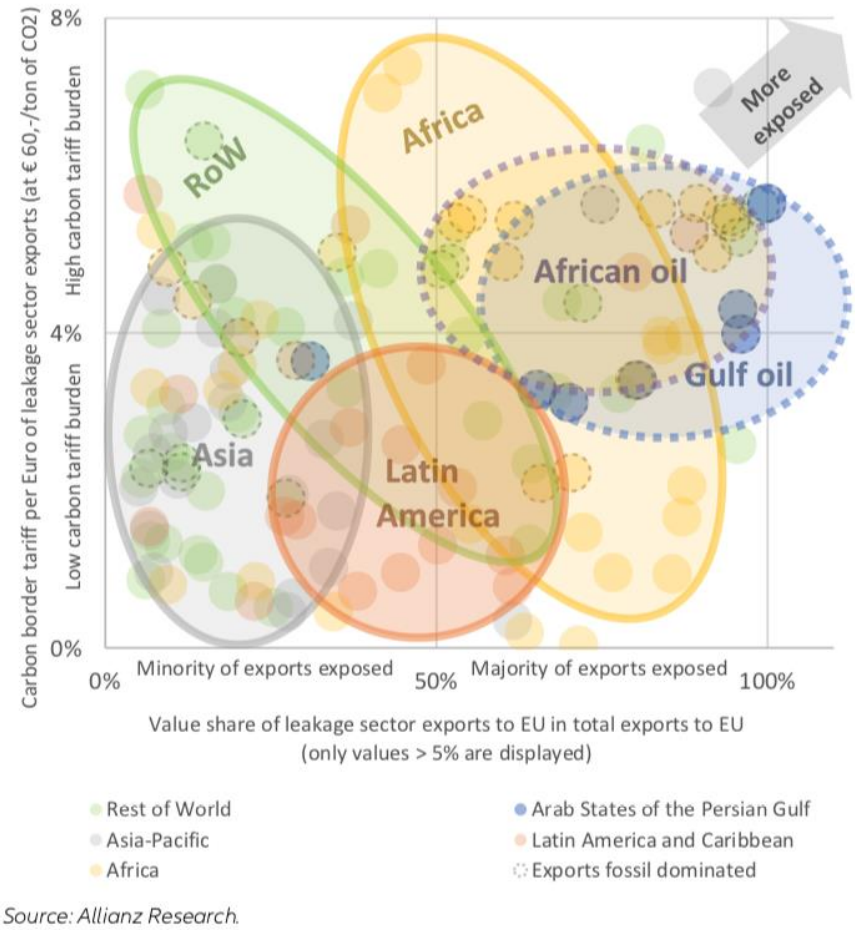
Country	Economic classification	Average energy intensive trade flows (2004–2008) ($ million)	Average share of energy intensive exports (2004–2008) (%)
Mozambique	LIC[a] and LDC[b]	1203	84.5
Tajikistan	LIC	184	71.4
Armenia	LMIC[c]	1862	39.7
Ukraine	LMIC	782	32.5
Moldova	LMIC	180	22.9
Zimbabwe	LIC	115	22.8
Egypt	LMIC	1426	16.6
Jordan	LMIC	53	14.0
Georgia	LMIC	76	12.1
India	LMIC	2494	8.2
Albania	LMIC	47	6.7
Iran	LMIC	879	5.3
Cameroon	LMIC	157	5.2
Tunisia	LMIC	447	4.2
Ghana	LIC	403	4.2
China	LMIC	10387	4.0
Indonesia	LMIC	570	3.6
Uzbekistan	LIC	32	3.0
Morocco	LMIC	312	3.0
Kyrgyzstan	LIC	0.8	2.5
Thailand	LMIC	444	2.2

Notes:
a. LIC = Low-income country
b. LDC = least developed country
c. LMIC = lower-middle income country.

Notes: Table 5.2: Energy intensive exports: Absolute and relative trade flows to the EU. Source: Brandi, 2013: 84.

A more recent study of the impact of the EU's border adjustment on low-income countries found that Russia is the most exposed country, while the most vulnerable regions are Africa and the Persian Gulf countries. Many African countries will be exempted from the proposed mechanism on the basis of their LDC status. But the large fuel-exporting countries of Nigeria, Egypt and Cameroon will not be exempt (Zimmer and Holzhausen, 2020: 1). This is shown in figure 5.2. This study analyzed *relative* exposure by combining the percentage of each country's exports exposed to carbon adjustment and the likely value of that adjustment. The most vulnerable countries are those with a majority of exports exposed and a high tax value (i.e., countries that export inefficiently produced carbon-intensive products). This modelling shows that Latin America is less vulnerable than other regions.

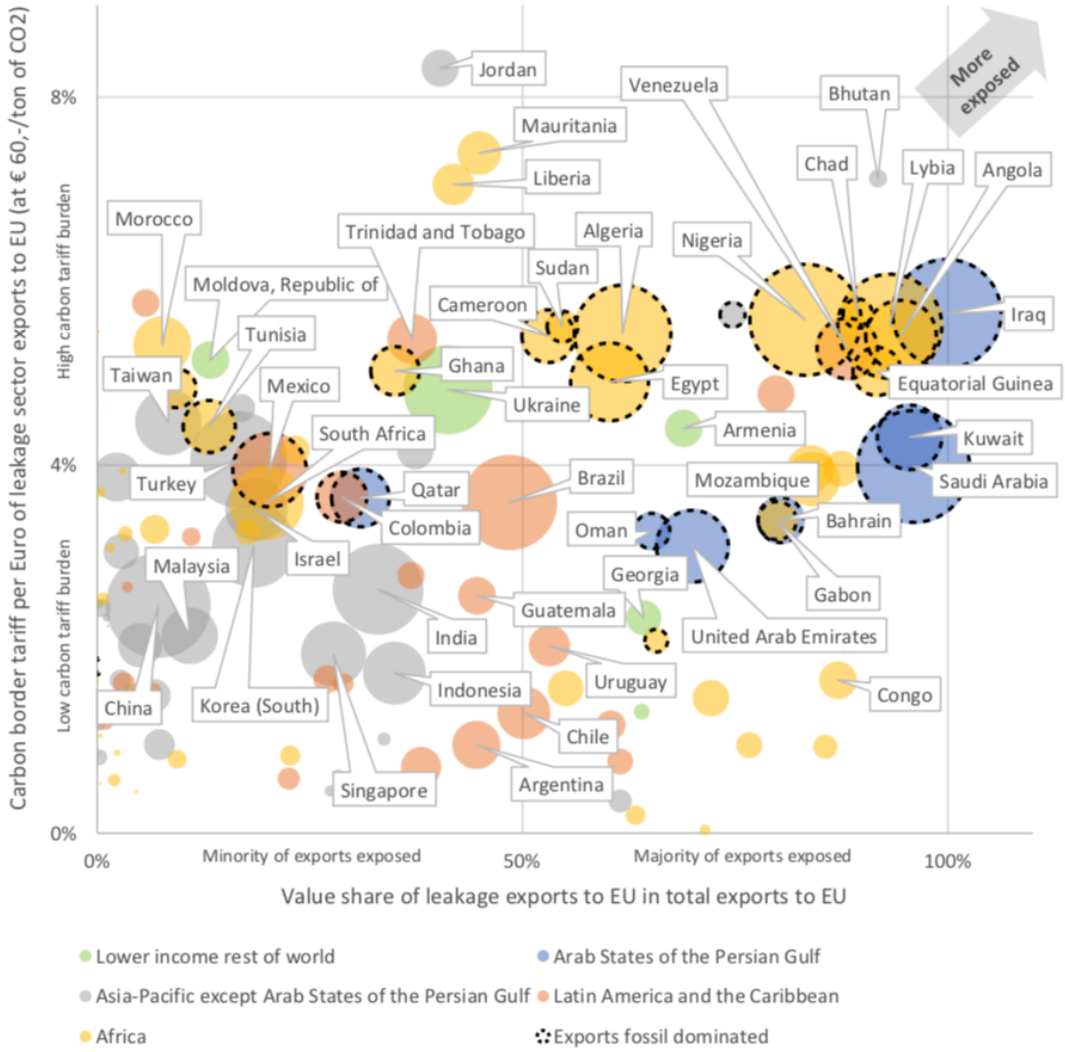
Figure 5.2: Relative vulnerability of regions



Notes: Figure 5.2: Relative vulnerability of regions. Source: Zimmer and Holzhausen, 2020: 1.

When this analysis is broken down to the country level (as shown in figure 5.3 below), we can see that Mexico, Colombia, Argentina, and Guatemala (and to a lesser extent Chile) are comparatively less vulnerable because they have a minority of their exports exposed to the carbon tax, and this tax has a low value. Trinidad and Tobago is slightly more vulnerable because although it has a minority of its exports exposed (namely, fertilizers exported to the EU), it faces a higher tax value. Uruguay, similarly, has a majority of its exports exposed, but a low tax value. In the most vulnerable category is Venezuela, with a majority of exports exposed and a high tax value. Brazil is placed slightly closer towards the vulnerable category. Other Latin American countries, although not individually labelled, are mostly scattered within the least vulnerable category (Zimmer and Holzhausen, 2020: 6).

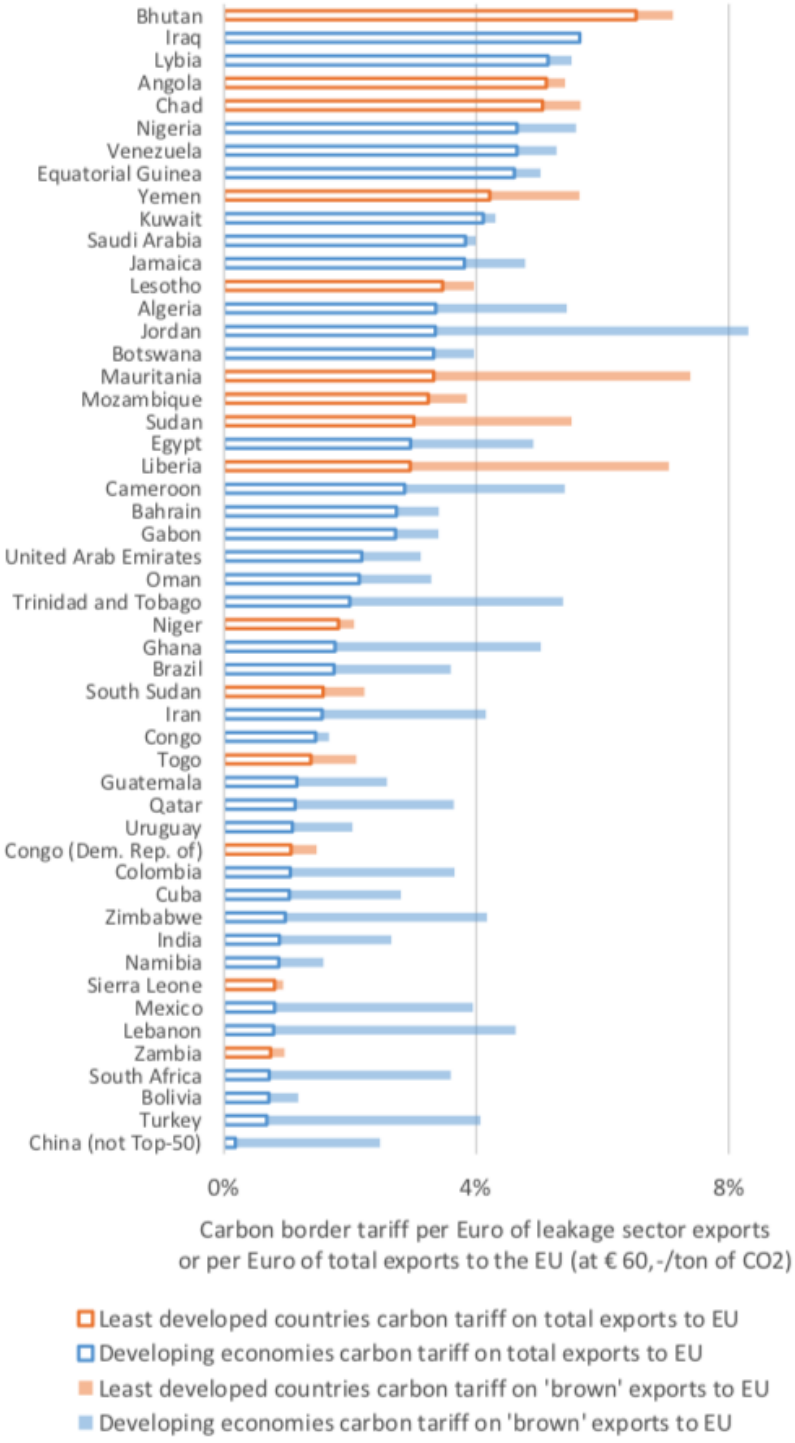
Figure 5.3: Relative vulnerability of countries



Notes: Figure 5.3: Relative vulnerability of countries. Source: Zimmer and Holzhausen, 2020: 6.

When developing countries are ranked in terms of their exposure to the EU's border adjustment, we can see that Latin America is relatively protected, with the exception of Venezuela (ranked 7). Trinidad and Tobago is ranked 27, followed by Brazil (30), Guatemala (35), Uruguay (37), Colombia (39), Mexico (45), and Bolivia (49) (graph 5.3).

Graph 5.3: Least developed and developing countries most exposed to EU border carbon adjustment

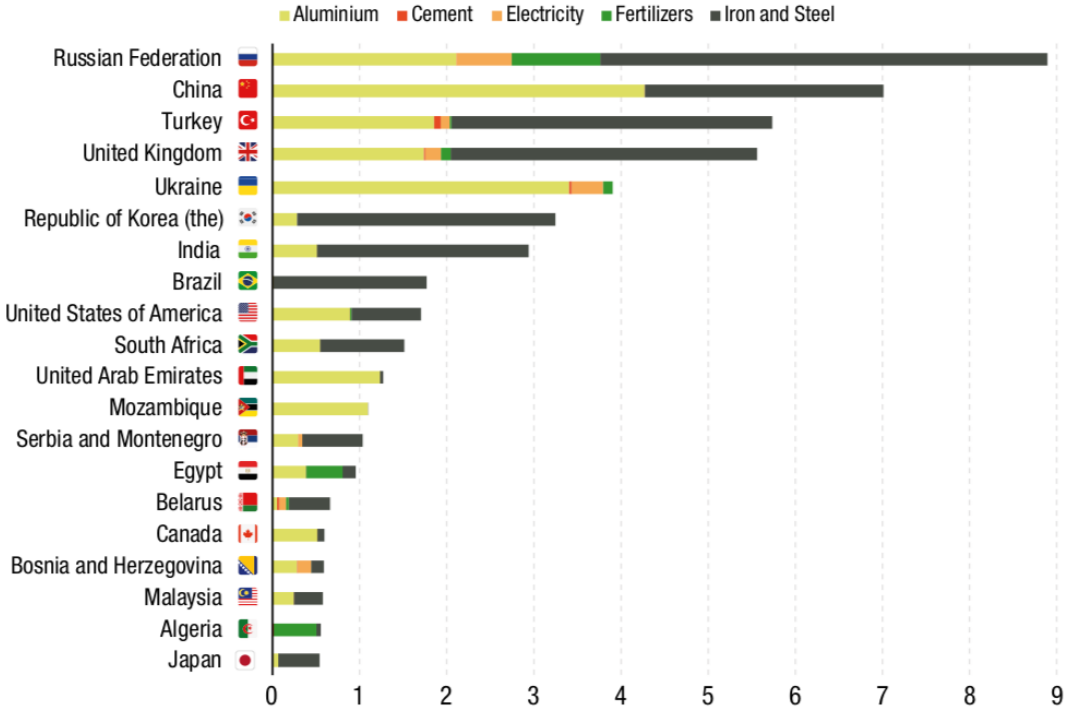


Notes: Graph 5.3: Least developed and developing countries most exposed to EU border carbon adjustment. Source: Zimmer and Holzhausen, 2020: 3.

The most comprehensive study of the impact of the EU's border adjustment was published by UNCTAD in 2021. The results support those presented above showing the comparatively low vulnerability of Latin American countries. On the basis of trade volumes, UNCTAD modelling shows that the top five countries most exposed to the carbon border tax would be Russia, China, Turkey, the United Kingdom and Ukraine.

As Figure 5.4 shows, the only Latin American country among the 20 most exposed countries is Brazil, due to its heavy exports of iron and steel.

Graph 5.4: Countries most exposed to EU border carbon adjustment



Source: UNCTAD based on UN COMTRADE. The list does not include Iceland, Norway and Switzerland because they participate in, or are linked to, the ETS. Therefore, it is likely that these countries are exempt from the mechanism.

Notes: Source: Graph 5.4: Countries most exposed to EU border carbon adjustment. UNCTAD, 2021: 10.

However, the UNCTAD modelling goes beyond trade volumes to assess the impact on trade, CO_2 emissions, income and employment, focusing in particular on developing countries. It should be noted, however, that the analysis covers only seven Latin American countries: Argentina, Brazil, Chile, Colombia, Mexico, Peru and Uruguay. The UNCTAD modelling was carried out before the EU decided to exclude the paper and pulp sector from its carbon border adjustment (this is discussed in more detail below). As a result, the modelling over-estimates the impact on Latin American countries, where this is a relevant sector. Graph 5.5 shows the impact in each sector in terms of ad valorem equivalent (i.e., as a percentage of the total price of each product). In the case of Argentina, for example, we see that the price of cement and glass products imported by the EU would increase by 8.2% with a border adjustment of $44 per ton of CO_2.

Graph 5.5: CBA ad valorem equivalent, at $44/CO2 ton, by economy

Country	Paper Products	Aluminium	Steel, ferrous metals	Petroleum, Coal Prod.	Cement, Glass	Chemicals, Fertilizers	Electricity
Argentina	0.8	2.6	6.3	1.4	8.2	2.6	
Belarus	1.7	0.7	2.9	1.4	30.3	4.4	11.3
Brazil	0.8	4.4	3.3	0.9	7.0	0.8	
Canada	1.3	1.3	2.2	1.3	4.1	2.2	
China	1.7	2.4	3.7	2.3	10.3	3.0	
Chile	1.9	0.1	2.5	1.0	4.5	1.1	
Colombia	0.9	0.1	3.4	1.7	3.6	0.9	
Egypt	2.3	2.4	5.9	0.7	10.6	5.4	
India	4.0	5.6	12.6	0.9	22.1	4.6	
Indonesia	1.7	3.1	4.3	1.9	8.5	2.0	
Israel	0.3	1.5	2.5	1.3	4.0	0.6	
Japan	1.0	0.4	1.0	0.8	5.0	1.4	
Kazakstan	5.1	3.5	17.1	1.7	13.6	4.9	
Republic of Korea	1.0	0.6	1.5	0.8	4.8	1.2	
Malaysia	1.4	2.6	3.3	4.6	6.4	2.6	
Mexico	1.2	1.2	2.5	2.3	10.9	1.8	
Morocco	0.6	3.1	0.1	1.4	7.2	0.4	17.1
Peru	0.3	0.3	11.0	0.5	3.4	0.3	
Russian Federation	5.1	3.0	5.3	1.3	10.5	7.0	20.8
Saudi Arabia	6.1	4.9	2.7	1.0	6.9	6.9	
South Africa	1.7	6.4	6.2	10.4	11.7	4.2	
Singapore	0.3	1.4	3.5	0.6	1.6	1.3	
Thailand	2.8	0.4	2.2	0.2	13.5	1.5	
Turkey	1.1	1.2	2.9	1.2	12.3	2.0	16.6
Taiwan (Province of China)	1.8	0.4	1.1	0.7	3.5	2.0	
United Arab Emirates	3.1	0.8	1.9	0.7	7.6	3.7	
Ukraine	1.6	5.3	9.2	3.1	18.7	10.8	15.6
Uruguay	1.5	0.2	0.1	1.2	2.3	0.2	
United States of America	0.7	1.2	1.5	1.3	3.2	1.2	
Australia/New Zealand	1.4	5.5	2.2	2.0	3.2	2.2	
Serbia/Bosnia and Herzegovina	1.6	5.5	6.6	1.8	9.9	2.4	19.3

Note: The size of the bars is normalised by sector (column) and not for the whole table.
Source: UNCTAD based on GTAP emissions database.

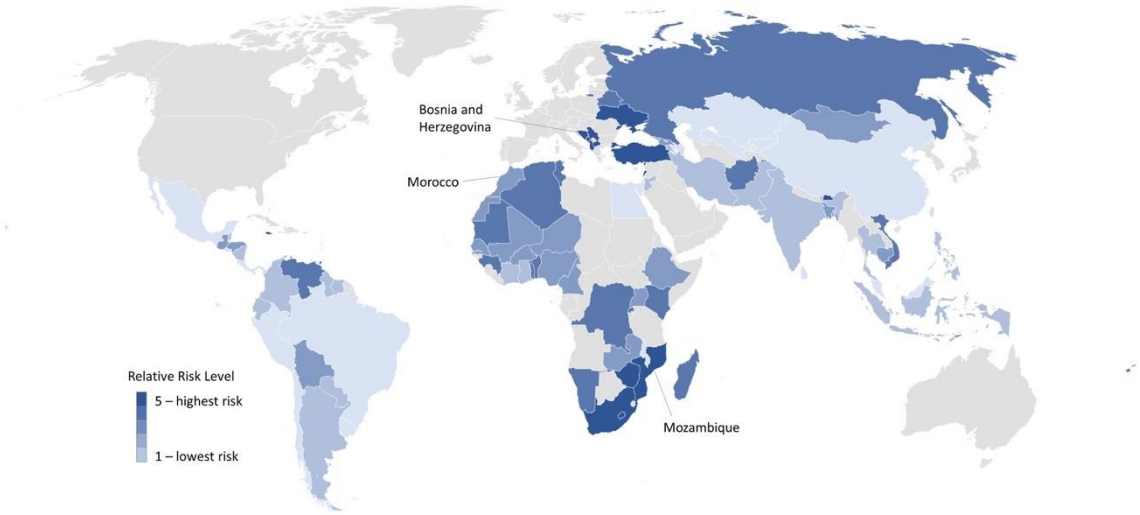
Notes: Graph 5.5: CBA ad valorem equivalent, at $44/CO2 ton, by economy. Source: UNCTAD, 2021: 15

The impact on each sector in each country will be determined by its relative efficiency vis a vis other trading partners. Taking the example of the cement and glass sector, we can see that products from Argentina will be much less affected than products from Belarus, where production is much less efficient in terms of CO_2 emissions. The imposition of a carbon border tax may, in theory, allow more efficient countries to increase their market share and to some degree mitigate the tax's impact. To assess the *relative* impact of the carbon tax in each sector in each country, we would have to calculate whether the ad valorem equivalent is less than or greater than the average across all countries. This level of analysis is beyond the scope of this background paper, but a few tentative observations can be made. Argentina's aluminum and steel/ferrous metals sectors are relatively vulnerable; Mexico's petroleum and coal sectors, as well as cement and glass sectors are relatively vulnerable; and Peru's steel sector is relatively vulnerable. But on the basis of this modelling, other sectors in these countries, and sectors in the other Latin American

countries face a carbon border adjustment that is average or below average, compared to other trading partners. The UNCTAD modelling does show, however, that a carbon border tax will produce more favorable conditions for European producers (as it is designed to do). As a result, Latin American exporters may gain more market share vis a vis Europe's other trading partners but may lose market share to European domestic products. Of course, each country's cost of production is determined by factors beyond carbon-intensity, and these will need to be considered to evaluate the precise comparative impact of introducing carbon border adjustment.

A 2020 study from the Institute for Advanced Sustainability Studies (IASS, Germany) identified Latin America on the whole as one the regions least "at risk" to the EU's carbon border adjustment. "Two factors determine whether countries are at risk from an EU CBAM: exposure and vulnerability. Exposure describes how important trade with the EU is for the national economy. Vulnerability constitutes an inability to adapt to an EU CBAM by changing export structures, decarbonizing, or certifying the carbon content of products" (Weko et al., 2020: 4). Although emerging economies like Brazil, China and India have been the most vocal in the concerns about the potential impact of border adjustment, this study showed that they have "a lower relative risk compared to other countries, particularly a number of countries in Africa" (Weko et al., 2020: 5). On a relative risk scale of 1-5 (with 5 being the highest risk), most Latin American countries were ranked 1 or 2, with the exceptions of Bolivia (3), Guatemala (3), Nicaragua (3), Venezuela (4), Trinidad and Tobago (5), and Jamaica (5). This is shown in figure 5.6.

Figure 5.6: Level of risk, EU carbon border adjustment



Notes: Figure 5.6: Level of risk, EU carbon border adjustment. Source: Eike et al, 2021

The analysis above shows that from an international perspective, Latin America is not a particularly vulnerable region in terms of proposed carbon border adjustments in the US and the UK. This is also evident in figure 5.7. Overall, the countries and regions that are expected to experience significant reductions in energy intensive exports are Russia, Serbia and Bosnia Herzegovina, Ukraine, Central Asia, Egypt, South Africa, and the regions Rest of East Asia and Rest of South Asia (UNCTAD, 2021: 20). These countries can be expected to experience income losses and employment losses as a result of the EU's carbon border adjustment (UNCTAD, 2021: 22). The main reason for this is these countries' power sectors are much more carbon-intensive than those in Latin America (Binstead et al, 2020).

Figure 5.8: CBA ad valorem equivalent, at $44/ CO2 ton, by region

Country	Paper Products	Aluminium	Steel, ferrous metals	Petroleum, Coal Prod.	Cement, Glass	Chemicals, Fertilizers
Rest of Central Asia	4.6	2.3	3.8	2.0	10.2	14.4
Rest of Central America	0.6	1.0	3.6	1.0	9.4	1.4
CES Africa	0.5	0.4	2.2	1.9	8.2	1.8
Rest of East Asia	5.5	8.3	37.7	3.9	35.4	12.1
Rest of Latin America	0.6	2.1	2.7	2.1	4.3	3.9
Rest of MENA	3.1	5.6	2.9	2.0	12.0	9.3
Rest of North Africa	1.8	2.6	6.7	2.9	5.7	6.0
Rest of South East Asia	3.5	1.0	4.9	1.3	18.5	2.0
Rest of South Asia	1.0	6.1	4.9	0.5	14.5	5.0
Rest of West Africa	1.0	1.0	7.1	7.9	33.4	3.4
Rest of the World	0.3	4.6	11.3	1.0	1.8	0.8

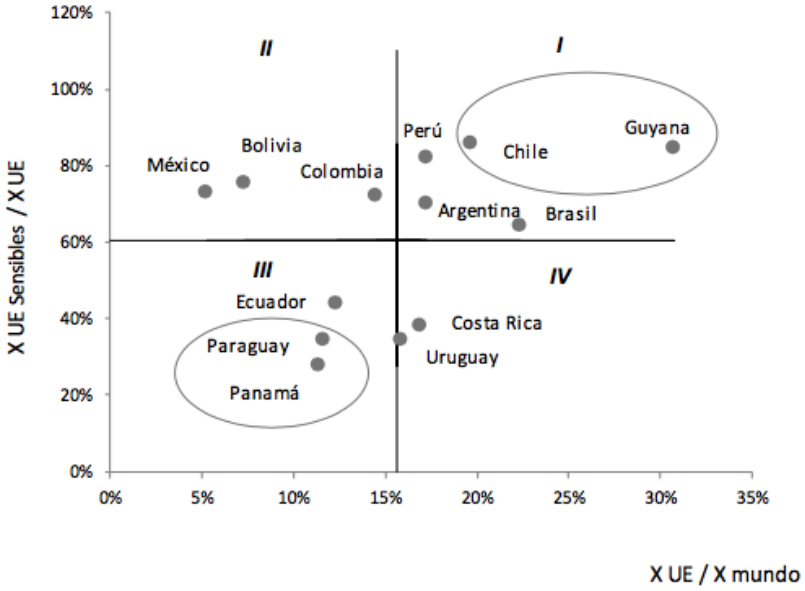
Note: The size of the bars is normalised by sector (column) and not for the whole table.
Source: UNCTAD based on GTAP emissions database.

Notes: Figure 5.8: CBA ad valorem equivalent, at $44/ CO2 ton, by region. Source: UNCTAD, 2021: 16

In 2017, the Inter-American Development Bank in 2013 published a study of the potential impact of anti-leakage instruments on thirteen Latin American countries: Argentina, Bolivia, Brazil, Chile, Costa Rica, Colombia, Ecuador, Guyana, Mexico, Panama, Paraguay, Peru, Surinam, and Uruguay (IADB, 2017). Vulnerability to carbon adjustment instruments was assessed in terms of the percentage of each country's exports that are sent to the EU, and percentage of these exports potentially affected by carbon adjustment in the EU (i.e., carbon-intensive goods that are also produced in the EU). The study showed that Chile and Guyana are the most vulnerable countries, with Peru, Argentina, and Brazil also emerging as relatively vulnerable. These countries are those which have a non-negligible percentage of exports to the EU (relative to their overall exports). More than 30% of Guyana's exports would be affected, followed by Brazil (20%), Chile (20%), Argentina (17%), and Peru (17%). The particular vulnerability of Chile and Guyana is explained by the fact that more than 80% of their EU exports consist of goods that are likely to attract a carbon border adjustment (IADB, 2017: 15).

The impact of each country is showed in figure 5.8. The horizontal axis measures each country's EU exports as a proportion of their total exports; the vertical axis measures the proportion of each country's EU exports that are likely to be taxed. Countries in the bottom left-hand corner are those least vulnerable to the EU's carbon border adjustment, while those in the top right-hand corner are most vulnerable.

Figure 5.8: Vulnerability to EU carbon border adjustment (average 2005-2013)



Notes: Figure 5.8: Vulnerability to EU carbon border adjustment (average 2005-2013). Source: IADB, 2017: 16

This study is useful for considering the potential vulnerability of Latin American countries in the future. However, the study over-estimates the present vulnerability of these countries because it included products that will not be included in the EU's carbon border adjustment in the foreseeable future (animals & animal products, vegetable products, other foods, wood and wood products). The study found that the most vulnerable sectors are those producing minerals, rawhide, furs and leather, wood and wood products, footwear and headwear, chemicals, and metals (IADB, 2017: 18). The study would need to be replicated on the basis of those goods that we now know will be included in the EU's scheme.

The impact of Europe's carbon border adjustment on the LAC region is minimized by the exclusion of two key sectors: agriculture and paper and pulp. It remains uncertain whether these sectors will be included when the European Commission revises the scheme's coverage at the end of 2025. There were some expectations that the paper and pulp sector would be included in the initial phase from 2023-2026 because it had been identified as a sector vulnerable to carbon leakage (European Parliament, 2021). However, it was excluded due to the technical complexities of calculating embedded emissions (European Parliament, 2021), and perhaps also because the European paper and pulp sector argued strongly against its inclusion (CEPI, 2022). The sector perceives itself as vulnerable to carbon leakage but argues that a border adjustment would further disadvantage the competitiveness of this sector because European firms would be subject to higher electricity prices. Companies in the Baltic region and Finland depend on electricity imports from Russia, which would become unprofitable under the proposed border adjustment plans, and industry bodies argue that the impact would not be compensated by carbon adjustments for third countries. The sector argues that carbon border adjustment should complement rather than replace existing anti-leakage instruments, and opposes proposals to phase out ETS free allowances. The sector insists that as an export-oriented industry its competitiveness would be better protected not via carbon border adjustment but rather via continued public support in the form of free allowances in the Emissions Trading Scheme, a special electricity price for industry, and/or export rebates ("export adjustments") (CEPI, 2022; Archynetys, 2021).

Unlike the paper and pulp sector, agriculture is not included in the European Emissions Trading scheme and therefore does not directly face a carbon price. Although it is an emissions-intensive and trade-exposed sector, it does not face the same risk of carbon leakage given its exclusion from the ETS. Its inclusion in the carbon border adjustment would raise additional methodological complexity given that import taxes will be calculated on the basis of ETS carbon prices, which do not currently apply to agriculture. The actual cost of climate change regulation for European agriculture is difficult to calculate because farms in different member countries are subject to different regulations. The sector is not subject to a single European greenhouse gas price (Beattie, 2020). It would be even more difficult to calculate or estimate the greenhouse gases embedded in agricultural imports because many of these goods are processed, passing through a long production chain involving multiple countries (Beattie, 2020).

While the sector does not face a significant risk of carbon leakage, some groups in Europe are pushing for a carbon border adjustment to protect the sector's competitiveness, which they argue is indirectly affected by the EU's carbon price, including the increased cost of electricity, fertilizer, transport, aluminum and steel (European Parliament, 2022b). The German agricultural ministry, for example, argues that international competition affects the capacity of German farmers to decarbonize. Investments in new techniques and carbon storage raises the prices of agricultural products, which undermines the sector's competitiveness unless there is either a change in consumption habits (towards favoring climate friendly agricultural products) or carbon border adjustment (Appunn, 2021). The German position has wider support in the EU, as reflected in an Opinion adopted in the European Parliament's agriculture committee (AGRI) in January 2022, in which the committee proposes amendments for a future expanded carbon border adjustment.[15] The Opinion claims that the asymmetrical ambition in international climate policy generates a risk of "carbon leakage" and "carbon dumping", which potentially affect European agricultural products. It calls for the carbon border adjustment to be "extended to agricultural products after the phasing-in period", and "by 2030 at the latest" (European Parliament, 2022b). The committee called on the Commission to "monitor the stability of the Union agricultural markets" during the phase-in period, and take "strong remedial actions, including through financial compensation to farmers, if the profitability and viability of agricultural production is seriously affected by the implementation of the new mechanism" (European Parliament, 2022b). The current gas crisis provoked by war in Ukraine will likely increase pressure to protect the European agricultural sector, because gas prices have a particularly strong impact on the cost of nitrogen-based fertilizers. According to the EU Commission Directorate-General for Climate Action, pilot projects are currently underway to evaluate the feasibility of including agriculture in carbon pricing mechanisms from 2030 onwards (Appunn, 2021).

It is possible that the European Commission would face pressure from climate advocacy groups to eliminate support for the agricultural sector given its failure to reduce emissions. According the Financial Times, agricultural emissions in the EU have fallen by only about 1% since 2005 (Beattie, 2020). Given that farmers are not making costly efforts to reduce emissions, they have a weak case to demand public support to protect their competitiveness.

5.4 Carbon clubs

The seeming inability of the UNFCCC to motivate action of the scale and speed necessary to avert climate disaster has led to a growing interest in alternative institutions, including carbon clubs.

[15] The Opinion, submitted by Polish MEP Zbigniew Kuzmiuk, was as adopted on 10 January 2022, with 27 votes in favour, 3 against and 18 abstentions (European Parliament, 2022b).

5.4.1 The theory of carbon clubs

The idea of "carbon clubs" have been proposed as a solution to what is commonly understood as the fundamental flaw in global climate governance: freeriding. Collective action theory holds that actors are self-regarding and short-sighted; it predicts that an actor will seek to benefit from the cooperative actions of others without contributing to these efforts. The higher the number of actors that make this individual decision, the higher the likelihood that the cooperative arrangements will collapse. Observers often point to Garrett Hardin's account of the "tragedy of the commons" to explain this phenomenon. From this perspective, all countries want a stable climate and will benefit from a reduction in global greenhouse gas emissions, but each country also has an incentive to minimize their own ambition and freeride on the efforts of others. Given that there is no central actor that can force every country to take the appropriate level of action, all countries continue to exploit the global atmosphere, and everyone is worse off. The governance challenge, from this perspective, is to establish mechanisms that prevent freeriding. For some this requires greater central control (which is difficult to establish in the international system), and for others it requires transforming the public good of the atmosphere into a private good governed by market mechanisms (See Stevenson, 2018, chapter 2).

In 2015, economist and Nobel laureate, William Nordhaus, proposed climate clubs as a model for international cooperation on climate change. He argued that "… it has up to now proven difficult to induce countries to join in an international agreement with significant reductions in emissions. The fundamental reason is the strong incentives for free riding in current international climate agreements" (Nordhaus, 2015, p.1339). Unlike the universal participation of the UNFCCC, a club model would restrict membership to those parties who commit to action of comparable ambition, and sanction non-participants with trade penalties (Nordhaus, 2015). Based on the economic theory of clubs, he identified four conditions for an ideal and successful club (in practice different types of clubs will vary in the extent to which they reflect these conditions):

> (i) that there is a public-good-type resource that can be shared;
> (ii) that the cooperative arrangement, including the dues, is beneficial for each of the members;
> (iii) that nonmembers can be excluded or penalized at relatively low cost to members; and
> (iv) that the membership is stable in the sense that no one wants to leave (Nordhaus, 2015: 1340).

Nordhaus proposed building a climate club around an international target carbon price, with members having the freedom to meet this requirement with whichever instrument or combination of instruments they choose (carbon tax, emissions trading, other regulation). The atmospheric benefits of the resulting emissions reduction could obviously not be reserved for club members, hence sanctions would have to be tied to the international trading system. Non-participants would be forced to join the club or pay import tariffs (Nordhaus, 2015: 1341).

Critics of the club model point out that it misdiagnoses the fundamental flaw of international cooperation on climate change. Political scientists, Michaël Aklin and Matto Mildenberger (2020: 4) review empirical support for the assumption that climate change policy is "a global collective action problem structured by free-riding concerns". They find no evidence that climate policies are dominated by free-riding concerns. Instead, climate policy is better understood as a distributive conflict in which governments are sensitive to the preferences of key domestic constituencies, and the economic winners and losers of measures to reduce greenhouse gas emissions (Aklin and Mildenberger, 2020: 5-6). Free-riding concerns may be present,

but they certainly do not dominate climate policymaking. Governments that adopt ambitious climate policies are those that are able to do so without losing the support of key constituencies, and they tend to do so irrespective of what other countries are doing (Aklin and Mildenberger, 2020: 4).

5.4.2 Climate club proposals

Despite theoretical weaknesses in the climate club model, multiple proposals for climate clubs have been made in recent years. Proposals differ in terms of size, purpose, and ambition. To understand how proposals differ, political scientists Robert Falkner, Naghmeh Nasiritousi and Gunilla Reischl identify three ideal types of climate clubs: normative clubs, bargaining clubs, and transformational clubs (Falkner et al., 2022).

Normative clubs consist of "countries that share a normative commitment to achieving certain objectives". Parties may join the club if they pledge support for a climate policy commitment such as phasing out fossil fuels, shifting to renewable energy, or transitioning to carbon neutrality. Commitments are not legally binding but rather based on moral ambition (Falkner et al., 2022). Bargaining clubs seek to "facilitate more effective negotiation of climate mitigation targets, measures and rules among significant powers". They assume that negotiating in a "minilateral" forum involving only the most relevant states (e.g., the largest polluters) is more efficient than negotiating in a "multilateral" forum with all states (Falkner et al., 2022). Transformational clubs seek to restructure incentives to enable greater ambition by reserving certain tangible benefits for members (such as access to markets, finance, and technology) and penalizing non-members (through, for example, tariffs). This ideal type of club resembles Nordhaus's 2015 proposal.

Normative clubs have long had a presence in global climate change governance. For example, the Asia Pacific Partnership on Clean Development and Climate (APP) was created in 2005 by the US, Australia, Republic of Korea, China, India, Japan, and Canada. While it began with some ambition to create benchmarks and performance indicators (e.g., for the energy intensity and recycling of construction materials), by the time it ceased in 2012 the APP had generally only served to promote discussion between the public and private sector about cleaner technologies. Another example is the C40 Climate Leadership Group, which was established in 2005 to promote climate change mitigation and adaptation within cities. The city was seen as an important focus for action because our societies are increasingly urbanized, and many of these are coastal, making them vulnerable to sea level rise. Cities account for 70% of global GHG emissions. The C40 has nearly 100 city members in over 50 countries, accounting for 20% of global GDP (C40 2021: 5). It provides a network for mayors and city officials to share knowledge and ideas about decarbonizing city economies and infrastructure. But, importantly, city members are also expected to set "actionable" and "measurable" goals on energy, transportation, waste management, and adaptation planning.

While some might see the G20 as a type of climate club given that this has become a constant theme on the annual agenda, this is better understood as "an economic club with a climate governance work stream" (Unger and Thielges, 2021). What prevents this grouping from becoming a climate club is the heterogeneity of its members' interests. There is no interest among members in using this forum to negotiate stronger action (which would denote a bargaining club), nor even to pledge commitment to a specific goal (which would denote a normative club). On the issue of climate change, the G20 is not a club of like-minded actors and includes members who have long resisted ambitious climate policy, including the US, Saudi Arabia, and Russia (Unger and Thielges, 2021).

What is new in recent years is the growing call for transformational clubs, especially now that the EU is set to move forward with carbon border adjustments. Some observers suggest that the international climate is ripe for a climate club between the US, EU, and China because the level of ambition among these countries (at least at the executive level) has never been so closely aligned (precisely how the Ukraine war will affect this climate remains uncertain) (Tagliapietra and Wolff, 2021). The EU and US have committed to carbon neutrality by 2050, and China by 2060. If these three countries were to establish a trade-linked climate club (imposing tariffs on imports from countries without comparable commitments) there would be strong incentive for other countries to join because the US, EU and China account for 43% of global imports (Tagliapietra and Wolff, 2021). Establishing such a club trade-linked climate club would require more than a normative commitment to carbon neutrality; instead, it would require strengthened domestic policies that are aligned with this commitment; agreement on how to compare the ambition of different policy tools (to calculate the actual carbon cost in each country); agreement on how to measure emissions embedded in trade (including for goods with complex production chains); and finally an arbitration system for resolving disputes among members (Tagliapietra and Wolff, 2021).

In 2021, the new German chancellor, Olaf Scholz, announced plans for its leadership of the G7, commencing in 2022. The climate club concept was central to these plans. Speaking at the World Economic Forum in Davos, Scholtz said, "We will use our Presidency of the G7 to turn that group into the nucleus of an International Climate Club" (Kurmayer, 2022). Germany aims to align such a club with its own border adjustment proposals by linking membership to minimum carbon prices and carbon leakage mechanisms. Three members of the G7 are already EU members; the proposal is therefore directed firstly and primarily at the other four members of the G7: the US, Canada, Japan, and the UK, but with aspirations to open the club to other countries that share its goals (Kurmayer, 2022). The German proposal is to create an ambitious, bold, and cooperative club, and defines these characteristics in specific terms:

> A) AMBITIOUS: "The alliance will be a partnership of the countries of the world with the highest ambitions for climate policy. Participation is open in principle to all countries that commit themselves to corresponding targets and measures within the scope of their possibilities. Members will be committed to the 1.5 degree target of the Paris Agreement and accordingly to climate neutrality by 2050 at the latest (as a rule). They will set themselves ambitious interim targets and define reduction paths in line with their targets.
>
> B) BOLD: The goal of the initiative is for as many countries as possible to support joint climate policy ambitions by means of coordinated and ambitious climate policy measures. To this end, they will work on a roadmap towards measuring CO2 and determining (minimum) carbon prices and will coordinate their measures to prevent carbon leakage with each other. In addition, the members will also cooperate on the transformation of their industrial sectors, in order to establish a reliable framework and an international lead market for climate-friendly materials and products.
>
> C) COOPERATIVE: The core of the initiative is the cooperation between the participating economies that are pressing ahead with the transformation, while wanting to prevent competitive disadvantages to their own economies as a result of the

> transformation. At the same time, these economies will invite all countries that share these goals, and the measures that are necessary to achieve them, to participate. The primary basis for the club is the arrangements made under the Paris Agreement on climate targets and climate financing, as well as technology cooperation and market mechanisms. Trade policy plays a supporting role as part of the WTO processes" (BMF et al., 2021).

5.4.3 Challenges and criticisms

A recent study of the climate club perceptions of researchers and practitioners of international climate policy found concerns about political feasibility, effectiveness, trade impacts (i.e., protectionism), and legitimacy (Falkner et al., 2022). Political feasibility concerns are grounded in the existing experience of voluntary groupings, which have had a questionable impact on reducing emissions and have struggled to maintain buy-in among members. Also relevant is the fact that despite growing expressions of interest in carbon border adjustments and more robust domestic carbon prices, no country is yet matching the EU's level of ambition and is probably unlikely to do so in the near future (Mathieu, 2021). If common carbon pricing was a central feature of a climate club, its membership would necessarily be very small, thus calling into question whether it could have any real impact. Canada and the US, as well as major emerging economies such as China, South Korea, Mexico and Chile, only have partial carbon pricing systems (Martini and Görlach, 2022: 5). A study carried out at the French Institute of International Relations concluded that "Despite Brussels' repeated calls for a transatlantic agenda on climate change, the recent launch of a "Green Alliance" with Japan, and years of cooperation with China on the technicalities of ETS, there is little chance that an international alliance on carbon pricing can be set up within a timeframe compatible with the climate emergency" (Mathieu, 2021: 5).

Concerns about the potential effectiveness of the club model also relate to how the proliferation of climate clubs would impact the UNFCCC, potentially displacing this institution as the primary forum for negotiating global action on climate change. Such a shift would have implications for the fairness of climate change cooperation, not only because large numbers of countries would be excluded but also because key issues on the UNFCCC agenda (such as adaptation, climate finance, loss and damage, and technology transfer) may be subordinated to the overarching issue of carbon prices. UNFCCC negotiations are based on the principle of "single undertaking", which requires that nothing is agreed until everything is agreed. Shifting to a predominantly club-based model may result in a sidelining of the interests of some members, particularly developing countries and less powerful countries that cannot exert their interests in a club.

5.4.4 Implications for LAC countries

The key barrier to participating in any new climate club will be matching the national carbon prices (real, projected, or intended) in other countries. As shown in section 5.2, few Latin American countries have introduced a price on carbon. In those countries where a carbon tax is in place, the value is relatively low. Given that the EU is the main actor pursuing a climate club, its own carbon price is likely to be a benchmark. It is difficult to imagine that any country in Latin America (with the recent exception of Uruguay) will raise its carbon price to a comparable level that would allow membership of a carbon club, or to convince the EU to waive carbon border adjustments for Latin American imports. As a result, LAC countries can expect to be locked out of any carbon club that is created in the foreseeable future.

5.5 Low-carbon product requirements

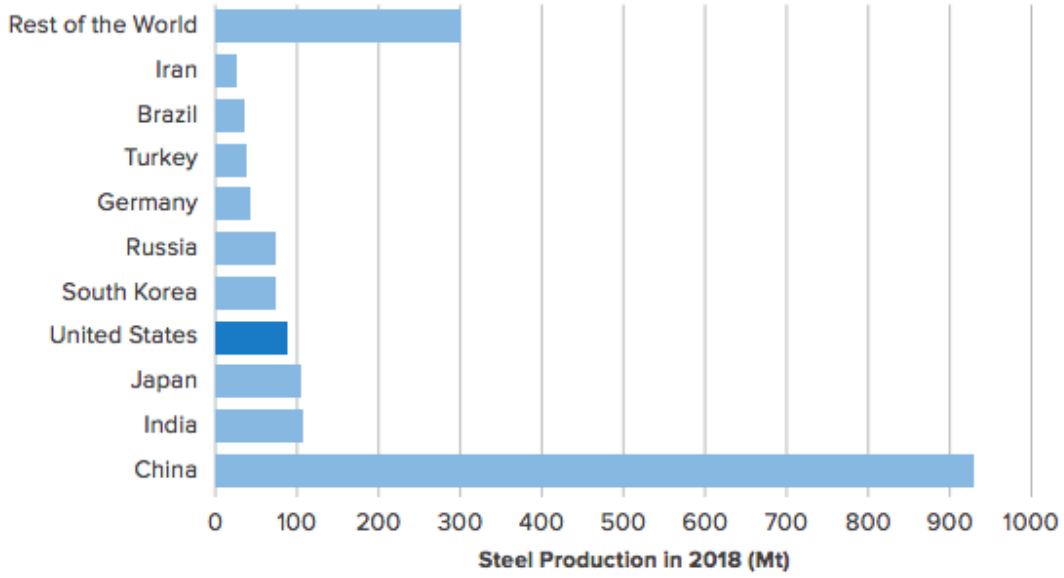
One option that has been proposed as an alternative to a price-based carbon club is product carbon requirements (PCRs) (Martini and Görlach, 2022). Product requirements would introduce common standards for emissions-intensive sectors with the aim of ensuring that goods produced in different countries have the same "carbon footprint". PCRs can be implemented individually at the national level in pursuit of a country's own climate change commitments. Countries may also seek to align their requirements to promote greater international cooperation on climate change and/or to address concerns about carbon leakage. Cooperation would require countries to agree on methodologies for measuring emissions produced during a good's life cycle, agree on a minimum standard, and agree on labelling to mutual recognize compliance with an agreed standard. Various methodologies already exist for measuring life cycle emissions, including ISO 14044 (life cycle assessment), ISO 14067 (carbon footprint of products), and the Greenhouse Gas Protocol Product Standard.

In practice there is very little international cooperation on product carbon requirements. An important recent exception is the deal announced by the US and EU on 31 October 2021, which has been dubbed the "World's First Carbon-Based Sectoral Arrangement on Steel and Aluminum Trade" (The White House. 2021). The main motive of this deal was to reverse tariffs imposed on the EU by the Trump administration, and the EU's own retaliatory tariffs. The Joint EU-US Statement revealed that the two countries would "create a technical working group charged with developing a common methodology and share relevant data for assessing the embedded emissions of traded steel and aluminum" (European Commission, 2021 (c). The intention is to make this a "global arrangement" which would be open tariff-free trade to countries that commit to reducing the carbon-intensity of steel and aluminum products and undertaking the following actions:

(i) restrict market access for non-participants that do not meet conditions of market orientation and that contribute to non-market excess capacity, through application of appropriate measures including trade defense instruments;
(ii) restrict market access for non-participants that do not meet standards for low-carbon intensity;
(iii) ensure that domestic policies support the objectives of the arrangements and support lowering carbon intensity across all modes of production;
(iv) refrain from non-market practices that contribute to carbon-intensive, non-market oriented capacity;
(v) consult on government investment in decarbonization; and
(vi) screen inward investments from non-market-oriented actors in accordance with their respective domestic legal frameworks (European Commission, 2021 (c).

A negotiation period of two years is anticipated (European Commission, 2021 (c), meaning that a common standard may be adopted as early as 2024. Given that China accounts for over 50% of global steel production, it stands to be the country most affected by this measure (Hasanbeigi and Springer, 2019: 8). Brazil is also amongst the top ten steel producing countries (2018) (graph 5.9).

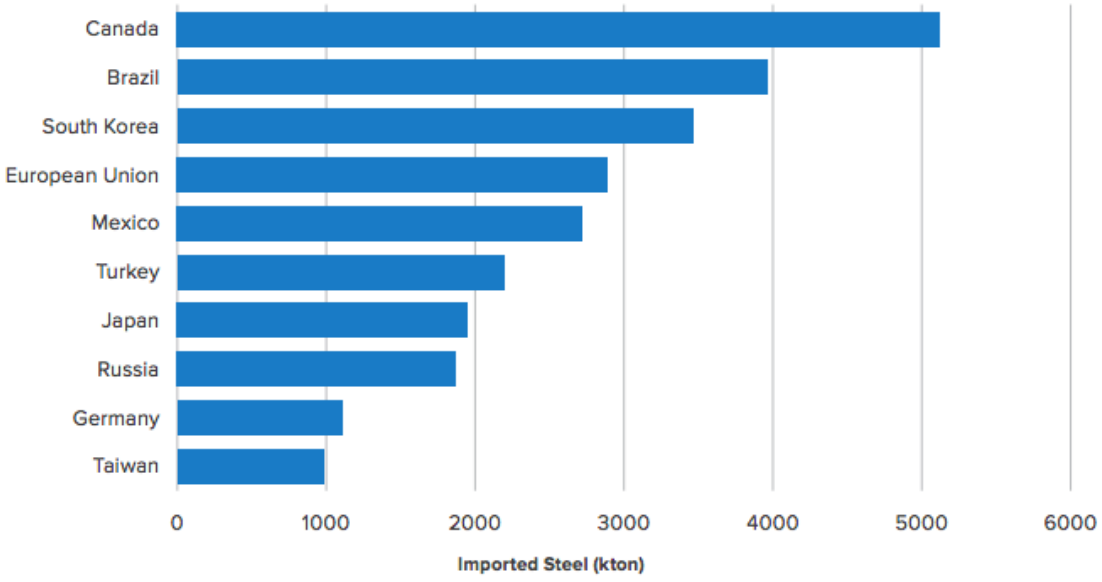
Graph 5.9: top steel producing countries



Notes: Graph 5.9: top steel producing countries. Source: Hasanbeigi and Springer, 2019: 9.

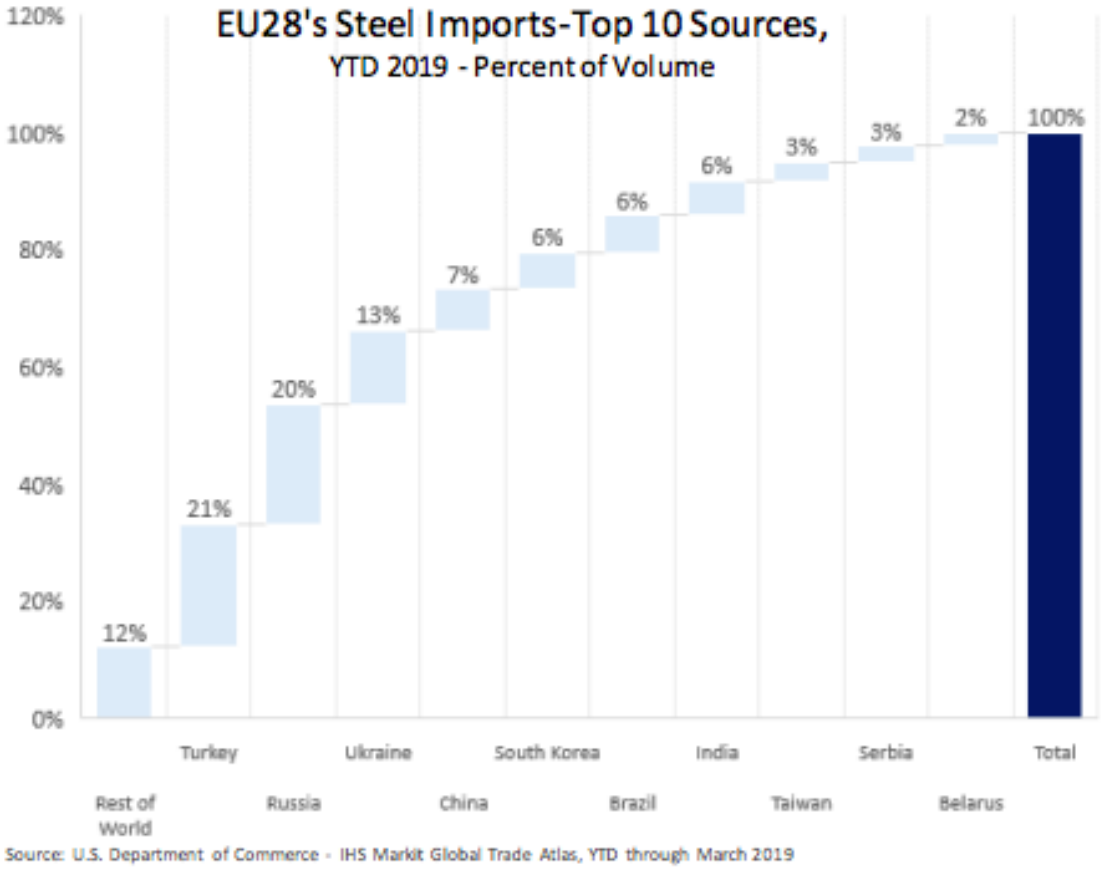
Brazil and Mexico are among the top five countries from which the US imported steel in 2016 (see graph 5.10). Brazil is also one of the top ten suppliers of steel to the EU (see graph 5.11).

Graph 5.10: Top countries from which the US imported steel in 2016



Notes: Graph 5.10: Top countries from which the US imported steel in 2016. Source: Hasanbeigi and Springer, 2019: 15.

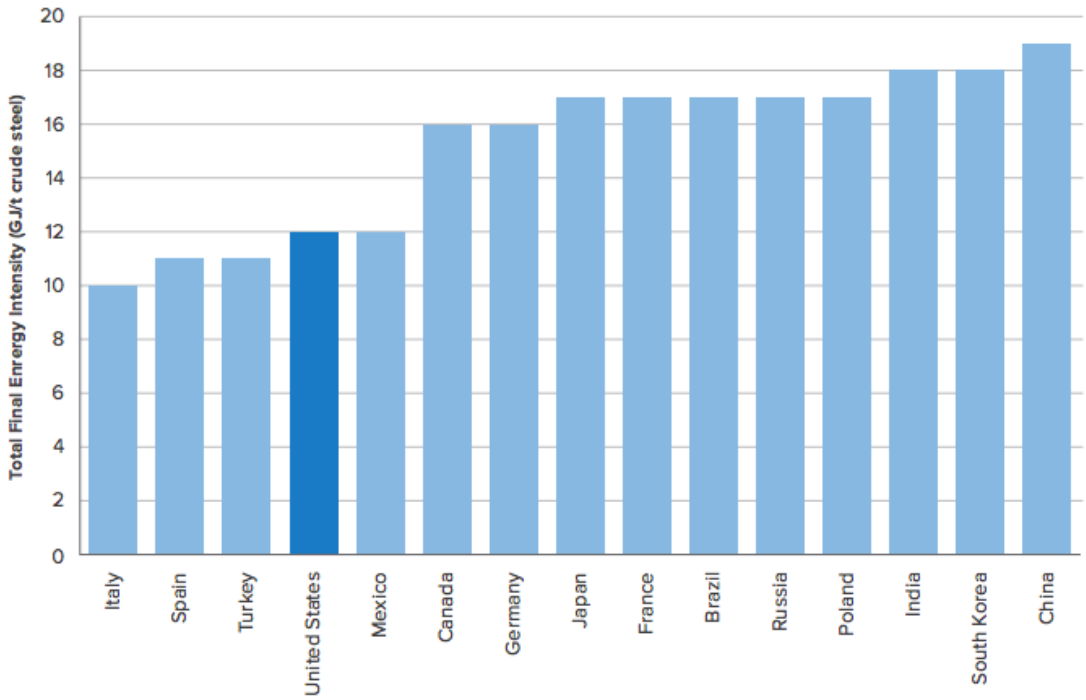
Graph 5.11 top suppliers of steel to the EU, 2019



Notes: Graph 5.11 top suppliers of steel to the EU, 2019. Source: International Trade Administration, 2019: 3.

Plans for cooperation on the emissions intensity of this product will affect Brazil and Mexico because steel produced in these two countries has a higher energy-intensity compared to the US. The energy-intensity of Brazilian and Mexican steel is higher than some European countries and lower than others (see graph 5.12).

Graph 5.12: Emissions intensity of steel producing countries (2016)



Notes: Graph 5.12: Emissions intensity of steel producing countries (2016). Source Hasanbeigi and Springer, 2019: 18.

5.6 Green bonds

Investors are showing increasing interest in sustainable development, as well as increasing awareness of the risks that climate change poses for their portfolios. This has led to the rise of "green bonds" as a new instrument for financing climate-friendly projects (including infrastructure) (World Bank, 2021). The OECD explains the key characteristics of a green bond as follows:

> "Like any other bond, a green bond is a fixed-income financial instrument for raising capital from investors through the debt capital market. Typically, the bond issuer raises a fixed amount of capital from investors over a set period of time (the "maturity"), repaying the capital (the "principal") when the bond matures and paying an agreed amount of interest ("coupons") along the way. A green bond is differentiated from a regular bond by being "labelled", i.e., designated as "green" by the issuer or another entity, whereby a commitment is made to use the proceeds of green bonds (i.e., the principal) in a transparent manner, and exclusively to finance or re-finance "green" projects, assets or business activities with an environmental benefit" (OECD, 2015: 5).

There are multiple types of green bonds, as the table 5.3 shows.

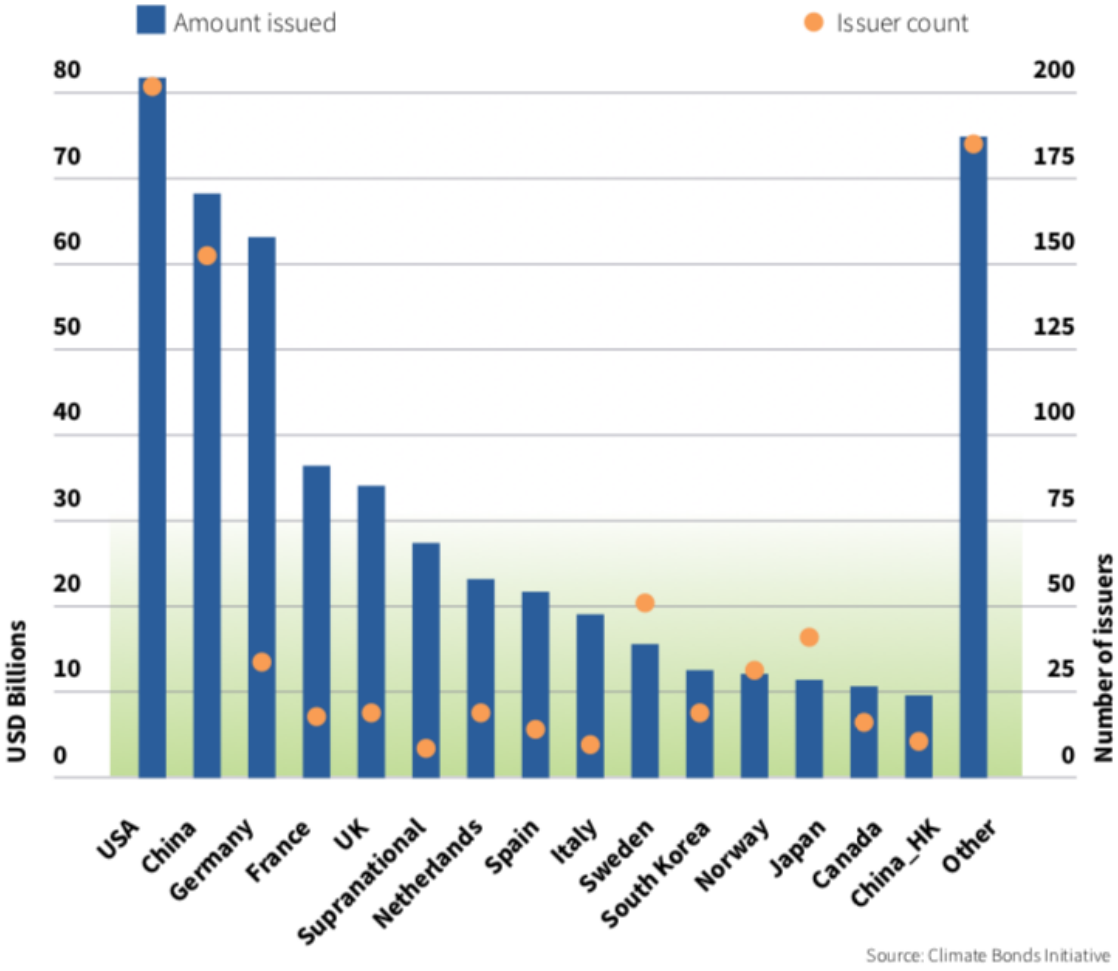
Table 5.3: Types of green bonds

Type	Proceeds raised by bond sale are	Debt recourse	Example
"Use of Proceeds" Bond	Earmarked for green projects	Recourse to the issuer: same credit rating applies as issuer's other bonds	EIB "Climate Awareness Bond" (backed by EIB); Barclays Green Bond
"Use of Proceeds" Revenue Bond or ABS	Earmarked for or refinances green projects	Revenue streams from the issuers though fees, taxes etc are collateral for the debt	Hawaii State (backed by fee on electricity bills of the state utilities)
Project Bond	Ring-fenced for the specific underlying green project(s)	Recourse is only to the project's assets and balance sheet	Invenergy Wind Farm (backed by Invenergy Campo Palomas wind farm)
Securitisation (ABS) Bond	Refinance portfolios of green projects or proceeds are earmarked for green projects	Recourse is to a group of projects that have been grouped together (e.g. solar leases or green mortgages)	Tesla Energy (backed by residential solar leases); Obvion (backed by green mortgages)
Covered Bond	Earmarked for eligible projects included in the covered pool	Recourse to the issuer and, if the issuer is unable to repay the bond, to the covered pool	Berlin Hyp green Pfandbrief; Sparebank 1 Bolligkredit green covered bond
Loan	Earmarked for eligible projects or secured on eligible assets	Full recourse to the borrower(s) in the case of unsecured loans. Recourse to the collateral in the case of secured loans, but may also feature limited recourse to the borrower(s).	MEP Werke, Ivanhoe Cambridge and Natixis Assurances (DUO), OVG
Other debt instruments	Earmarked for eligible projects		Convertible Bonds or Notes, Schuldschein, Commercial Paper, Sukuk, Debentures

Notes: Table 5.3: Types of green bonds. Source: Climate Bonds Initiative, no date.

The World Bank was a frontrunner in this field. The Bank's private lending arm, the International Finance Corporation, issued its first green bond in 2010 and by June 2021 it had issued 178 green bonds with a total value of over US$10.5 billion (World Bank, 2021). The global market in green bonds gained traction in 2014 when the corporate sector began paying serious attention (Flammer, 2021). It has grown exponentially since this point, reaching a milestone of USD$1 trillion in cumulative issuance in 2020 (Climate Bonds Initiative, no date), and rising again to US$1.6 trillion by the end of 2021 (Climate Bonds Initiative, 2021: 2). Morgan Stanley (2017) referred to this trend as the "green bond boom" (although it is important to recognize that "green bonds still only account for less than 1% of the global bond market") (Sangiorgi and Schopohl 2021). Eighty countries have now issued green bonds, in 47 currencies (Climate Bonds Initiative, 2021: 2). In 2016, China represented the largest share of all green bonds issued (36%) followed by the United States (16%) (ECLAC, 2017: 19). But by 2021, the United States had become the leading country in this market, as shown in graph 5.13.

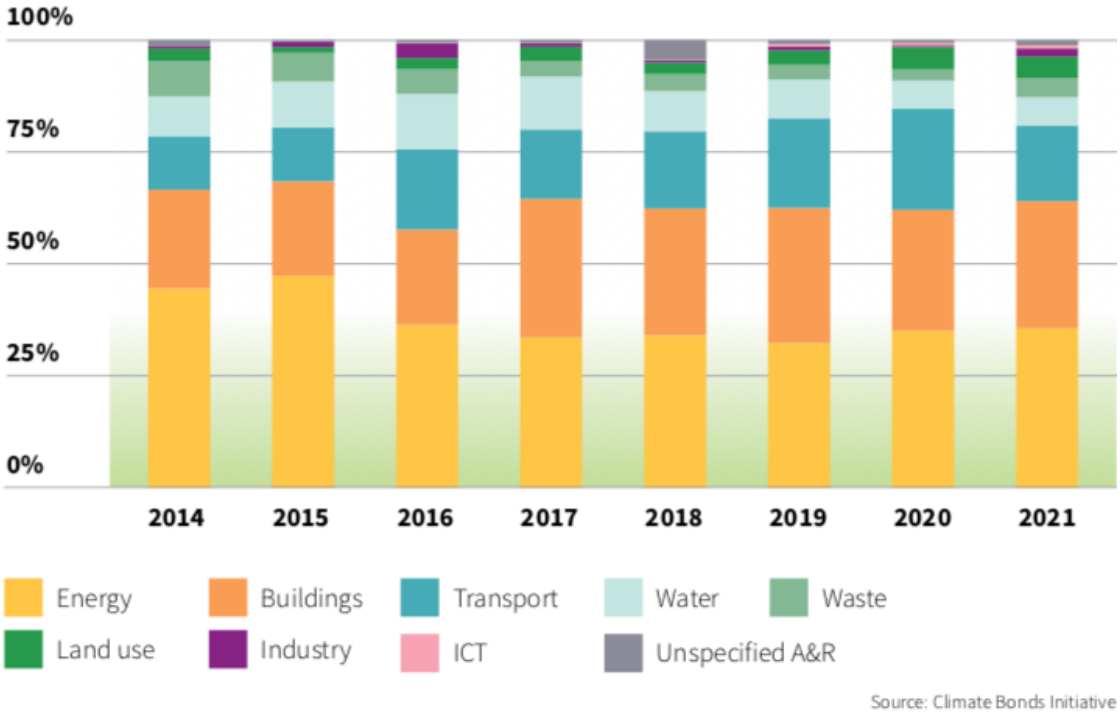
Graph 5.13: Countries that have issued green bonds



Notes: Graph 5.13: Countries that have issued green bonds. Source: Climate Bonds Initiative, 2021 (a): 9.

Energy, buildings, and transport account for over 80% of all green bonds issued (graph 5.14).

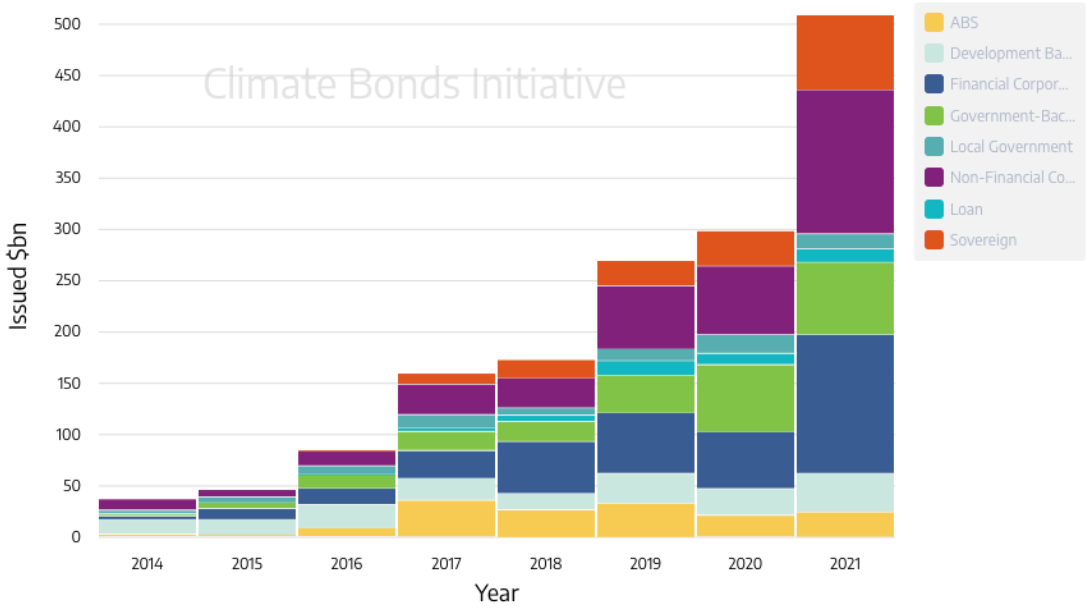
Graph 5.14: Green bonds issued by sector



Notes: Graph 5.13: Countries that have issued green bonds. Source: Climate Bonds Initiative, 2021 (a): 11.

Data from Climate Bonds Initiative shows that financial and non-financial corporates account for the largest share of bonds issued (a combined total of 44% of cumulative green bonds by the end of 2021) (see graph 5.15). They are followed by government-backed entities (15%), development banks (13%, sovereigns (10%), asset-backed securities (9.59%), local governments (5.17%), and loans (3%) (Climate Bonds Initiative, 2021 (b).

Graph 5.15: Green bond issuer type



Notes: Graph 5.15: Green bond issuer type. Source: Climate Bonds Initiative, 2021 (b)

Recent survey data offers insight into the motives driving green bond issuance. A survey of global issuers representing 29% of total green bond issuances (across 34 countries and 29 industries) revealed that "the three main drivers to enter the green bond market were reputational benefits, the signaling effect of green bonds and issuers' desire to curb climate change" (Sangiorgi and Schopohl, 2021). The least important factor driving issuance decisions was a desire to increase stock price (Sangiorgi and Schopohl, 2021). Internal stakeholders (particularly the organization's board and staff) were identifies as most influential in decisions to issue green bonds, while regulators were perceived as the least influential (Sangiorgi and Schopohl, 2021). The survey found that "Regarding the costs of green bond issuance, most respondents consider green bond issuance costs to be higher than those of plain vanilla bonds but acceptable due to the additional benefits that they derive from green bonds" (Sangiorgi and Schopohl, 2021). Most also reported higher levels of investor demand for green bonds than their plain vanilla bonds, with about half their issue being allocated to dedicated green investors (Sangiorgi and Schopohl, 2021).

In response to the lack of global guidelines to govern the green bond market, the International Capital Market Association (ICMA) established the Green Bond Principles in 2015 and has since updated these annually to reflect developments in the market and stakeholder perceptions (ICMA, 2021). "The Principles outline best practices when issuing bonds serving social and/or environmental purposes through global guidelines and recommendations that promote transparency and disclosure, thereby underpinning the integrity of the market. The Principles also raise awareness of the importance of environmental and social impact among financial market participants, which ultimately aims to attract more capital to support sustainable development (ICMA, 2021)." The Principles outline best practices in four areas:

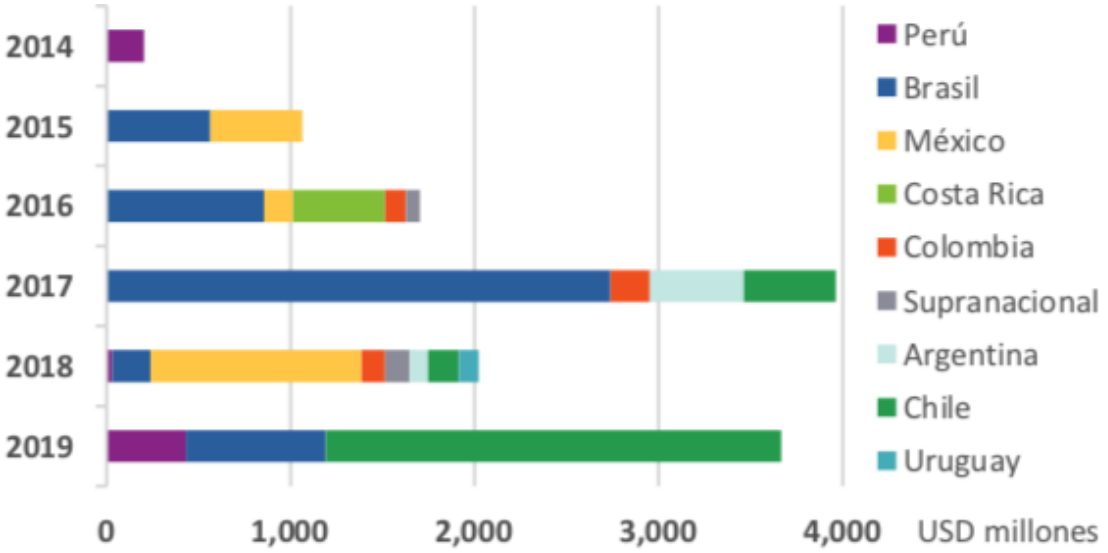
1) **Use of proceeds**: the proceeds of a bond should be used for projects with clear environmental benefits; these categories include renewable energy, energy efficiency, pollution prevention and control, environmentally sustainable management of living natural resources and land use, biodiversity conservation, clean transportation, sustainable water and wastewater management, climate change adaptation, circular economy adapted products, and green buildings (ICMA, 2021: 4-5).
2) **Process for project evaluation and selection**: issuers should communicate the environmental objectives of projects; how the project fits one or more of the eligible categories; details of social and environmental risks. Issuers are also "encouraged" to explain how the project is positioned within their broader sustainability objectives; how the project is aligned with official or market-based taxonomies; and possible measures to mitigate social and/or environmental risks (ICMA, 2021: 5).
3) **Management of proceeds**: "The net proceeds of the Green Bond, or an amount equal to these net proceeds, should be credited to a sub-account, moved to a sub-portfolio or otherwise tracked by the issuer in an appropriate manner, and attested to by the issuer in a formal internal process linked to the issuer's lending and investment operations for eligible Green Projects." It is recommended that internal tracking methods be audited by a third party (ICMA, 2021: 6).
4) **Reporting**: Issuers should prepare annual reports on the use of proceeds to be renewed annually until full allocation; this should provide information on the projects that have been financed by the bond, the amounts allocated and the expected impact. Performance should be evaluated qualitatively and, when feasible, quantitatively (ICMA, 2021: 6).

The guidelines are entirely voluntary and do not constitute a certification scheme (ECLAC, 2017: 12). Since these guidelines were established there have been efforts to establish voluntary best-practice certification schemes. Principal among these is the Climate Bonds Standard and Certification Scheme, which was designed to align

with the Green Bond Principles. The scheme aims to increase confidence among investors that bonds conform to low-carbon criteria, but it does not evaluate credit risks (Climate Bonds Initiative, 2021 (c). "Assets that receive Certification are aligned with the Paris Agreement of 1.5C degrees of warming, i.e. net zero emissions by 2050 or earlier" (Climate Bonds Initiative, 2021 (c). The European Commission has also proposed adoption of a EU green bond standard (EUGBS): "Once it is adopted by co-legislators, this proposed Regulation will set a gold standard for how companies and public authorities can use green bonds to raise funds on capital markets to finance such ambitious large-scale investments, while meeting tough sustainability requirements and protecting investors" (European Commission, No date (2). The EUGBS will also be a voluntary standard.

There is growing optimism in the potential for green bonds to help Latin American countries close the "infrastructure gap" by accessing the capital required to build infrastructure that is adapted to the demands of sustainable development (ECLAC, 2017: 23). ECLAC estimates that the region must double its annual investments to US$320 billion to meet its infrastructure demands (ECLAC, 2017: 41). This will only be possible by expanding access to private capital sources. So far, Latin America has been a small player in the international green bond market, representing only 2% of bonds issued between 2007 and 2019 (Climate Bonds Initiative, 2019: 2). By 2019, only 9 of 33 Latin American countries had issued a green bond, however this had increased to 16 by 2022 (Climate Bonds Initiative, 2019: 3). Any regional level analysis of green bonds is necessarily distorted by data from Brazil, which is by far the largest player in the green bond market in Latin America. Over 40% of all green bonds issued in the region are in Brazil, and the majority of these are issued by Brazilian national entities (Climate Bonds Initiative, 2019: 23). At the regional level, the market in green bonds plunged in 2018 before recuperating in 2019. But as graph 5.16 shows, it was the considerable market fall in Brazil in 2018 which produced this pattern (due to uncertainty about the impact of a Bolsonaro presidency) (Climate Bonds Initiative, 2019: 23).

Graph 5.16: Green bonds issued in Latin America



Notes: Graph 5.16: Green bonds issued in Latin America. Source: Climate Bonds Initiative, 2019: 5.

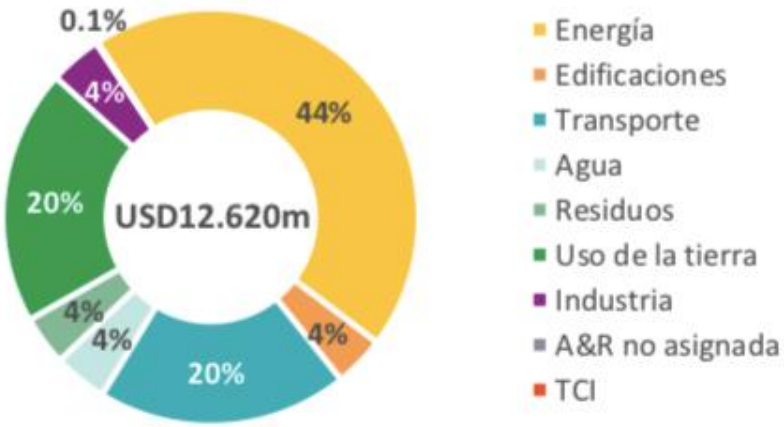
In April 2021, the Inter-American Development Bank launched the Green Bond Transparency Platform to promote transparency in the regional green bond market. "The platform aims to support the harmonization and standardization of green bond

reporting for green bond issuers and to enable all users to analyze where the proceeds of the bonds are invested, and what environmental performance was realized" (Green Bond Transparency Platform, 2022). Current data shows that 164 green bonds have been issued in Latin America, with 16 active countries. The total value of bonds issued is US$30.8 billion, with a total disbursement of US$12.1 billion. The average term to maturity is nine years (Green Bond Transparency Platform, 2022).

In 2020, the first green bond fund in Latin America was launched. The purpose of LAGREEN is to "finance climate- and resource-friendly investments and to mobilize local and international private capital towards the issuance of more green bonds in Latin America" (LAIF, 2020). It has a total budget of €450,000,000 for the period 2020 to 2030, and is co-financed by KfW, the Latin American Investment Facility (LAIF), the Inter-American Development Bank, and the EU (LAIF, 2020). The expectation is that the fund will mobilize further investment in green bonds (in the order of US$3 for every US$1 invested by the LAGREEN), resulting in total investments of US$2 billion over the ten year period.

Analysis of Latin America's experience with green bonds markets so far points to several key lessons (ECLAC, 2017: 41-42). First, small countries have limited access to international capital markets and lack the capacity to issue local bonds; as a result, almost all the locally and internationally issued green bonds in Latin America have gone to large economies, principally Brazil and Mexico followed by Chile (Climate Bonds Initiative, 2019: 5). Second, local bond markets are driven largely by local pension funds with a willingness to invest in sustainable development projects. Third, guarantees or partial guarantees from the government and/or regional/multilateral banks have been key to attracting significant capital market participation. Fourth, local green bonds tend to have a smaller value and more limited maturity period compared to international green bonds. This means that large infrastructure investments will generally require access to international bonds. Fifth, the sectors that are benefitting most from green bonds in Latin America are energy, transport, and agriculture and forestry.

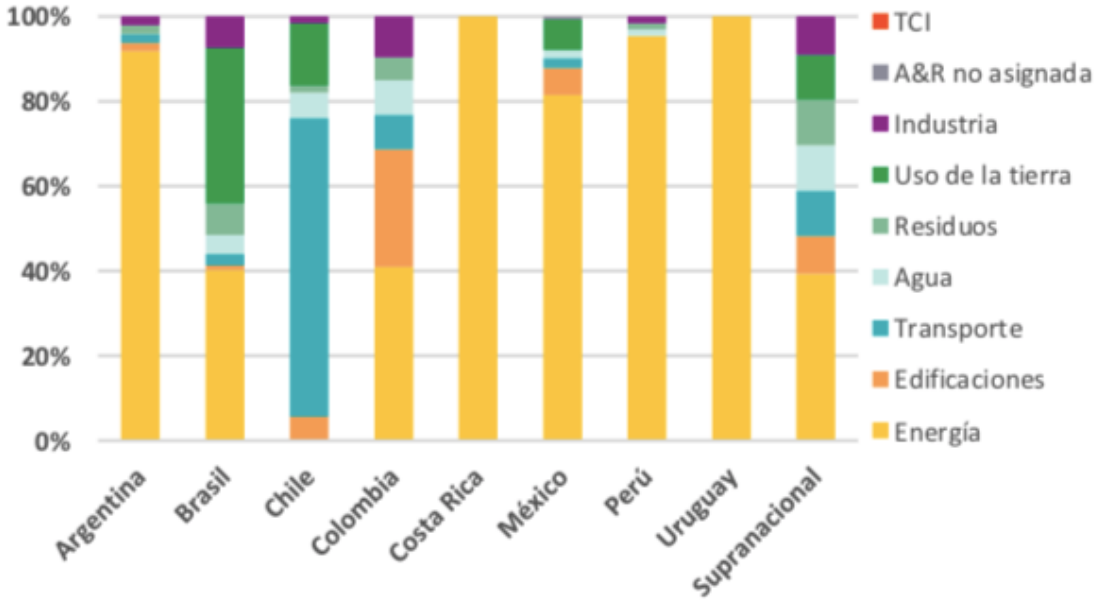
Graph 5.17: Green bonds by sector



Notes: Graph 5.17: Green bonds by sector. Energy 44%; Buildings 4%; Transport 20%; Water 4%; Waste 4%; Land use 20%; Industry 4%. Source: Climate Bonds Initiative, 2019: 6.

The strong presence of agriculture is notable given that this is a sector that suffers from under-investment on a global scale. However, it should be noted that Brazil's strong investment in this sector is distorting regional patterns; most countries are not issuing green bonds for this sector, as shown in graph 5.18.

Graph 5.18: Green bonds by sector and country



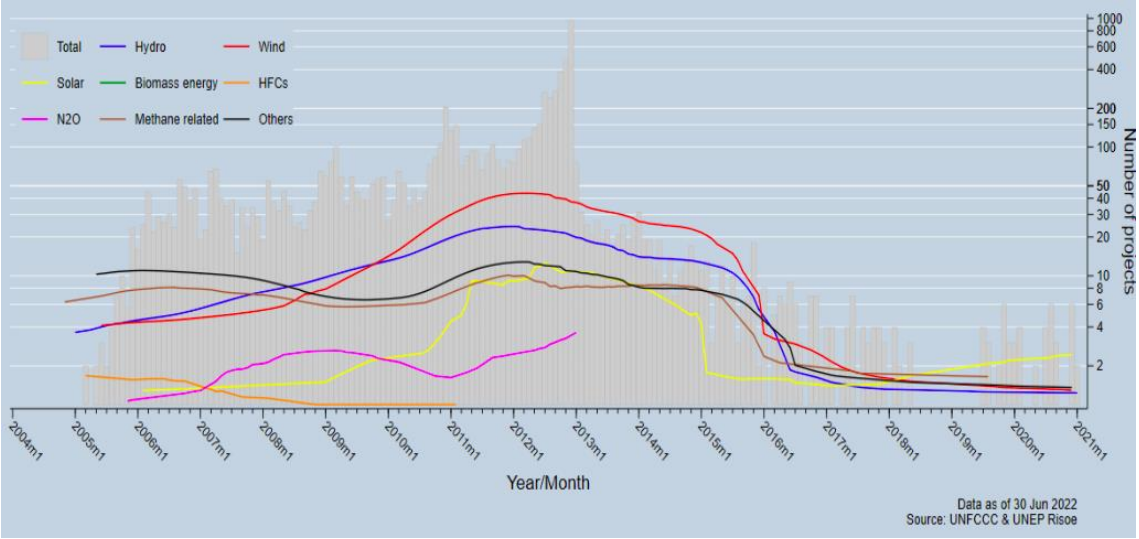
Notes: Graph 5.18: Green bonds by sector and country. Yellow = Energy; Orange = Buildings; Turquoise = Transport; Sky blue = Water; Light green = Waste; Dark green = Land use; Purple = Industry. Source: Climate Bonds Initiative, 2019: 6.

Sixth, lessons can be learnt from the most active countries in green bond markets, in particular from the targeted initiatives they have launched to attract investment (the creation of funds, investment promotion agencies and project models). And finally, Latin America is a small participant in the international green bond market but an increasing number of bonds are being issued and there are significant opportunities for continued growth (ECLAC, 2017: 41-42). To realize the full potential for green bonds in the region, countries should consider developing local markets, bringing together public, private and institutional investors; encourage greater participation from pension and private funds; and strengthen regulatory institutions to provide investors with greater confidence in green projects (ECLAC, 2017: 42).

5.7 Carbon offset markets

The Clean Development Mechanism was crucial for helping several Parties meet their commitments under the Kyoto Protocol between 2008 and 2012. Graph 5.19 shows the distribution of projects by type, and reveals that renewable energy projects accounted for the largest share of CDM projects: wind and hydro energy projects were prominent, as well as solar (UNFCCC. 2022 (f). Other types of projects included energy efficiency, methane reduction, and very small numbers of fuel switch, transportation, afforestation/reforestation, and HFC/PFC/SF/N2O reduction projects (UNFCCC, 2022 (h).

Graph 5.19: Distribution of projects by type



Notes: Graph 5.19: Distribution of projects by type. Source: UNFCCC, 2022 (g)

Empirical evidence of the CDM's contribution to actually reducing GHG emissions has been weak; on the contrary, there is substantial evidence that the concept of carbon offsetting the underpins the CDM is inherently flawed and ineffective in practice (See, for example, Song, 2019). An evaluation of the CDM projects in which the European Union participated under the Kyoto Protocol found that 85% had a low likelihood of reducing emissions; only 2% had a high likelihood of doing so (Cames et al., 2016: 10-11). Summarizing some of the problems and limitations of carbon offsetting, Lyle (2018: 10) writes: "Offsets carry the risk of encouraging people to believe that they need not change their behavior, thus creating irreversibility in consumption and production patterns. Offsetting often lacks due diligence on effectiveness and requires costly management and administration". The effectiveness of projects was undermined by a failure to ensure additionality (i.e., ensuring that credits were issued only for projects that would not have otherwise occurred) and permanence. Other criticisms centered on the cumbersome centralized bureaucracy that accompanied the market mechanism and forced project designers to comply with multiple social and environmental criteria rather than focus only on GHG abatement (Di Leva and Vaughan, 2021).

Nevertheless, carbon offsetting is an attractive option for countries or companies that wish to purchase emissions credits rather than reducing GHG emissions. As a result, there was considerable interest in including an offset market in the Paris Agreement (illustrative is the fact that the majority of NDCs indicate an interest in using market mechanisms) (Brandemann et al., 2021: 1). Article 6 of the Paris Agreement allows for "cooperative arrangements" among Parties, which is the language chosen in 2015 to allow for a future international market in carbon credits (or "internationally transferred mitigation outcomes", ITMOs). However, it took negotiators another 6 years to agree on the rules of a carbon offset market (Di Leva and Vaughan, 2021). The Article 6 rules were finalized in Glasgow at the end of 2021, and form part of the Glasgow Pact (Espelage, et al., 2022). Given the risk of double counting (whereby both the implementing party and credit purchasing party claim the emissions reduction in their national inventories), Article 6 projects will be subject to strict integrity procedures to ensure "transparency, accuracy, completeness, comparability, and consistency" (UNFCCC, 2016, Article 4.13). There are some concerns that the new authorization system and supervisory board will take a long time to establish, with delays possibly extending until 2030 (Di Leva and Vaughan, 2021). Article 6 establishes two channels for trading or transferring carbon credits. Article 6.2 allows governments (that are parties to the Paris Agreement) to

voluntarily transfer mitigation outcomes bilaterally or plurilaterally. This decentralized channel reflects the bottom-up spirit of the Paris Agreement because it does not place this transfer under the authority of the UNFCCC Conference of the Parties. Instead, parties can agree amongst themselves the terms of transfer (ADB. 2020: 5, 14). The methodologies for measuring the mitigation outcome are not determined by the UNFCCC but rather by the participating parties. However, participating parties have to comply with UNFCCC reporting rules, which requires submission of an initial report, an annual report, and a biennial report for each project. Article 6.4 establishes a separate governance mechanism for trading carbon credits. While Article 6.2 provides for bilateral/plurilateral cooperation, 6.4 establishes a global carbon market under the authority of the UNFCCC. This Article 6.2 mechanism will operate in a similar way to the CDM: a centralized body will develop and approve methodologies for measuring mitigation outcomes in terms of CO2 reductions; accredit participating entities; and register project activities.

A key concern among negotiators, and one of the issues that caused several years' delay in reaching agreement on Article 6 rules, was the question of whether pre-2021 CDM credits could be transferred to the present period. The CDM had an end date of 2020, this created a problem because the CDM implementation period overlapped with the Paris Agreement despite the fact that the CDM has no place in the Paris Agreement. Some countries that had already committed to CDM project wanted to be able to use these associated carbon credits towards their NDCs. Others, however, were concerned about the impact this would have on efforts to reduce global GHG emissions. The issue of "legacy carbon credits" and transition of the CDM was therefore a sticking point in negotiations. At COP26 in Glasgow, parties reached a compromise that allows for CDM credits to be used towards achievement of first-round NDCs (not in revised NDCs) if the project was registered after 2012. This means that credits issued between 2013 and 2020 will be eligible. Any credits purchased in or before 2012 or in 2020 will not unusable. This allows some legacy (or "zombie") credits to be taken out of the market (Di Leva and Vaughan, 2021; Carbon Market Institute, 2021).

The new Article 6 mechanisms that replace the CDM take effect as of 2021, meaning that countries can trade emissions credits (ITMOs) generated from project activities from 2021. "Like all carbon credits, ITMOs are created by projects that either reduce emissions or remove gasses in one place, with the payments coming from another place. They become ITMOs when those places are in different countries and the reduction is transferred from one country's national greenhouse-gas inventory to another country's greenhouse-gas inventory. This can happen at the government level, for example as when Switzerland purchased ITMOs from Peru. However, it's more likely to happen at the corporate level when a company in one country purchases ITMOs from abroad to meet compliance criteria at home (Zwick, 2021)." Article 6 activities must deliver overall mitigation of emissions that is additional to business-as-usual (through increased emissions reductions or increased removal of emissions through enhancement of sinks). They should also contribute to sustainable development objectives and respect human rights (Carbon Market Institute, 2021). Double counting will be avoiding by making the host country responsible for deciding whether it will use credits towards meeting its own NDC or sell them to another country. Article 6 projects are likely to look very similar to CDM projects: renewable energy (wind, hydro, solar), energy efficiency, fuel switching, methane reduction, etc.

Beyond the UNFCCC, a private voluntary carbon offset market has been growing over the past twenty years. Companies buy and sell carbon credits voluntarily to meet their own carbon neutral goals (such as when airline offers passengers the option of purchasing a credit to offset their flight). These are referred to as "Voluntary Emission Reductions" (VERs). The new Article 6 rules only apply to offsetting projects that

have the aim of meeting NDC targets. If a company is purchasing carbon credits to meet its own voluntary carbon neutrality target, it will not be subject to the rules of Article 6. A voluntary private carbon market will still exist outside the UNFCCC because there are no restrictions on private offset projects. If a landowner in one country wants to plant trees and sell carbon credits to a company or consumers in their own country or another country, there are no formal international rules against this. However, these carbon credits cannot be counted towards an NDC. It remains to be seen whether governments will try to exert greater control over private carbon markets that operate on their sovereign territory (Streck, 2021). Key players in private carbon markets, such as Gold Standard, have already indicated their intention to align their rules with the Paris framework (Gold Standard. 2022). Gold Standard explained its reasoning as follows:

> "As governments introduce ever-more ambitious national targets, we will inevitably see a growth in the use of markets for compliance purposes and in parallel may see voluntary use of carbon credits decline over time. By aligning with the framework and rules of the Paris Agreement, the expertise, ingenuity and rigor of independent project development, standard-setting and market infrastructure can be applied to serve new compliance uses that are already emerging. Finally, aligning with the framework and rules of the Paris Agreement mitigates the risk of inadvertently undermining or rendering inefficient government efforts, which could in turn cast doubt on the efficacy and appropriateness of voluntary efforts" (Gold Standard, 2022).

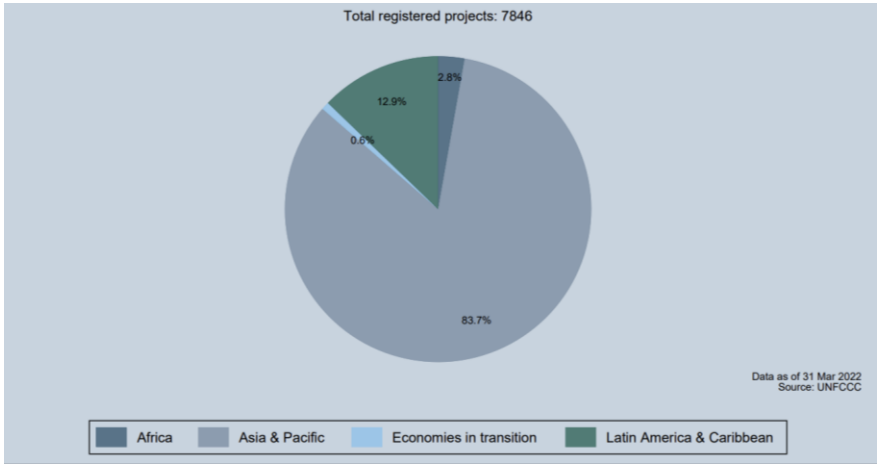
What are the implications for Latin America of the new Article 6 rules? Most Latin American countries have long been supportive of carbon-offset projects, including those involving forests; these are generally seen as an opportunity to secure financial support for a sensitive and strategic sector. Their support, which has diverged from the position among most G77 countries, helped secure agreement on the inclusion of flexible mechanisms in the Kyoto Protocol (Sanhueza and Antonissen, 2014: 21). The Development Bank of Latin America (CAF) anticipates that Latin America may become one of a few global centers in the carbon market (together with China, the US, and Europe). CAF sees multiple benefits to developing a regional market, in terms of job creation, tax revenue, and development finance that targets sustainability and poverty reduction (CAF, 2021). In addition to a supply of diverse credit-generating project, gaining "critical mass" in this region will require "infrastructure that has a legal basis, taxonomy, certifications, as well as a whole chain of sophisticated and expensive services necessary for risk identification, pricing, credit integrity assurance and market predictability". It will also require professionals with the capacity to operate this infrastructure and carry out each step of the project cycle ("origination, development, execution, and monitoring") (CAF, 2021). CAF identifies seven key challenges towards establishing a regional carbon market in Latin America:

> "The first is associated with an immediate vision that conceives national markets as an instrument to gain local political influence and broaden the tax base. A second challenge is that there is already some movement around the formation of sub-regional markets, which could help harmonize regulations and standards, but also undermine a regional vision. A third is the need to promote taxonomy, harmonization of standards and norms, certifications, mutual recognition and other complex issues that normally permeate the regional market process. A fourth challenge is the limited availability of capabilities and the region's known market flaws. A fifth is institutional and

governance weaknesses. Another challenge is the very unequal size of the region's domestic markets, which could lead to mistrust between countries. A seventh challenge is the limited availability of adequate and attractive financial and non-financial instruments for mobilizing resources to finance projects at competitive prices and conditions" (CAF, 2021).

A key challenge for Latin America as a region will be to improve the distribution of carbon offset projects in the new post-2021 era of carbon markets. Insights can be drawn from the experience of the CDM. As graph 5.20 shows, the Asia Pacific region hosted the greatest number of CDM projects (83.7%), followed by Latin America and the Caribbean (12.9%).

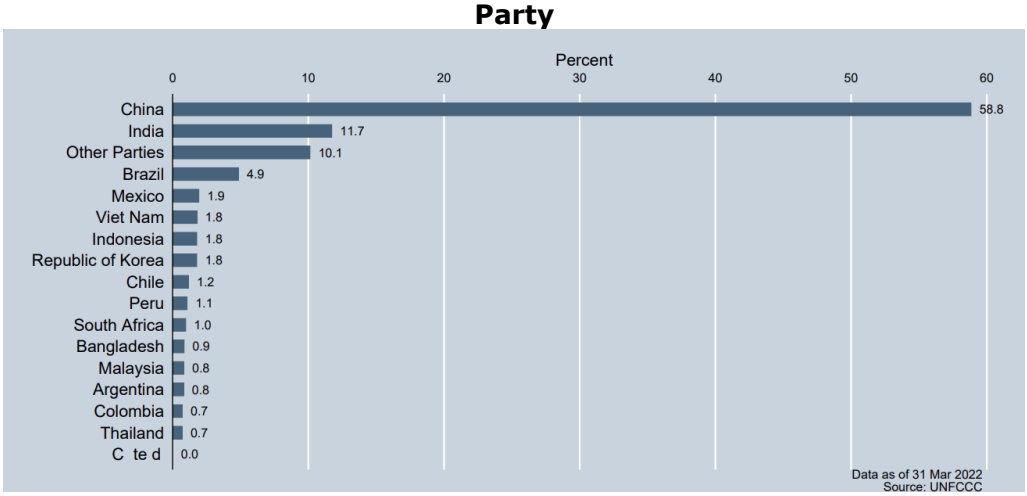
Graph 5.20: Distribution of registered projects by UNFCCC region



Notes: Graph 5.20: Distribution of registered projects by UNFCCC region. Source: UNFCCC, 2022 (b)

When the CDM market is measured in terms of carbon credits (CERs), we can see that China attracted the greatest market share, with nearly 60% of all credits issued originating in China. Brazil was the leading country in Latin America (4.9%), followed by Mexico (1.9%), Chile (1.2%), Peru (1.1%), Argentina (0.8%) and Colombia (0.7%).

Graph 5.21: Distribution of expected CERs from registered projects by Host Party



Notes: Graph 5.21: Distribution of expected CERs from registered projects by Host Party. Source: UNFCCC, 2022 (c)

The unequal distribution of CDM projects in the region is evident when we consider that ten countries did not have a single CDM project (Suriname, Trinidad and Tobago, Barbados, Granada, Saint Lucia, Saint Vincent and the Grenadines, Dominica, Antigua and Barbuda, Saint Kitts and Nevis, and Dominican Republic), and eight others had fewer than 10 projects (Guyana, Bolivia, Paraguay, Belize, El Salvador, Cuba, Jamaica, Bahamas) (UNFCCC. 2022 (d). By comparison, Argentina had 48 projects, Chile had 121, Brazil had 385, and Mexico had 204 projects (UNFCCC, 2022 (e).

Another aspect of Article 6 that is particularly relevant for the LAC region is the eligibility of REDD+ projects. The Article 6 rules were long anticipated by advocates of REDD+ and those actors already participating in REDD+ projects. However, the finalization of these rules at the Glasgow summit in 2021 left considerable ambiguity about the inclusion of REDD+. The UN-REDD program observed that "as the crowds dispersed from Glasgow and returned to their desks to digest the technical details of the decisions – particularly the Article 6 decisions – varying interpretations have emerged regarding the role of REDD+ in Article 6 – with some saying it's clearly eligible under Article 6, others saying it's been excluded, and others noting it is not clear" (UN-REDD, 2022 (b). Article 6 does not explicitly exclude any particular sector, but its criteria make some analysts question whether the forestry sector could satisfy the criteria. Forestry projects are likely to be more straightforward in Article 6.2 arrangements than in Article 6.4 arrangements because 6.2 allows participating governments to decide their own methodologies (HFW, 2021). Forestry projects may be approved under Article 6.4 arrangements, but it will depend on how the methodologies are designed and whether participating entities are able to satisfy the requirements of these methodologies. According to UN-REDD's interpretation of the agreement, REDD+ projects will be eligible for Article 6.4 projects (i.e., they will be able to generate ITMOs that count towards NDC targets), if they fulfill the rules of the Warsaw Framework and the market-specific rules and provisions of Article 6. The Warsaw Framework rules were explained in Section 2. If a project fulfills these criteria it will then have to satisfy the Article 6.4 Supervisory Body's eligibility assessment (UN-REDD, 2022 (c). Precisely how the Supervisory Body will determine eligible activities and methodologies remains to be seen. One important eligibility rule is that projects have to deliver emission *reductions* or *removals*, not just *avoid* future emissions. A further question that remains uncertain is whether those countries that have participated in REDD+ projects will want to maintain, increase, or scale back their participation in a context where all countries are expected to reduce their emissions. Under the CDM, developing countries were the beneficiaries of offsetting projects in general because they were not expected to meet quantified emission reductions targets. In the context of the Paris Agreement, selling credits entails an opportunity cost because the emissions reduction cannot be counted towards the selling country's own NDC. Countries will need to assess whether selling carbon credits will curtail their capacity to fulfil their current NDC and/or to scale up their ambition in future NDCs (World Bank, 2020: 49). The increased attention to environmental integrity will place pressure on countries to show that double counting (i.e., including reductions in both buying and selling countries' NDCs) does not take place.

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