The least developed countries report 2024

Chapter I

Carbon markets and sustainable development: Bridging economic, environmental and technological divides

United Nations

A. Carbon markets and the least developed countries: Setting the stage

Numerous carbon markets exist, established by national governments and private actors, and under the auspices of the United Nations Framework Convention on Climate Change (UNFCCC). While the primary function of those markets is to finance reductions of greenhouse gases (GHGs) where mitigation costs are the lowest, increasingly, they are being linked with broader policy objectives, such as the Sustainable Development Goals. Many least developed countries (LDCs) are participating in carbon markets, and are among the early movers in emerging carbon trading arrangements under Article 6 of the Paris Agreement. This begs the question of whether and how LDCs can effectively leverage these markets to address their unique challenges, while also contributing to global efforts to mitigate climate change. This report examines the current participation of LDCs in carbon markets and the potential to mobilize finance for GHG mitigation in these countries. It also identifies the opportunities and risks associated with such participation, and provides recommendations for policymakers and climate negotiators in LDCs and their development partners to maximize the benefits of carbon markets for LDCs.

1. Key questions and context

Achieving the Sustainable Development Goals in LDCs necessitates addressing interlocking challenges across multiple policy areas. Solutions are needed to establish complementarity between economic growth and climate action, between deep pools of private capital in developed countries and unmet financing needs in LDCs, and between structural transformation and nature conservation. Carbon markets are seen by many as a possible answer to these challenges. This report examines the unique opportunities and challenges LDCs face within the evolving carbon market landscape, and the potential of carbon markets to mobilize capital flows and serve as catalysts for sustainable development in LDCs.

A critical debate revolves around the question of whether carbon markets can help fund solutions to the climate crisis in LDCs and contribute to rapidly scaling up financial flows to these countries. This is a matter of utmost importance for these countries, given their desperate need of climate finance and development finance. The high expectations of many LDCs concerning the potential

A central question is whether carbon markets **can help fund climate solutions** in LDCs

benefits of carbon trading underline the urgency and importance of this topic.

The Least Developed Countries Report 2024 builds on some of the previous reports in the series that highlight the path towards green structural transformation in LDCs (UNCTAD, 2022a) and their urgent need for crisis-resilient development finance (UNCTAD, 2023). By assessing the role of carbon markets in the context of these complex challenges, this report aims to provide evidence-based and actionable recommendations for LDC policymakers and their development partners.

The global carbon market space is fragmented, and includes both private and public actors. On the one hand, carbon trading has been a feature of the global climate architecture since the Kyoto Protocol was signed in 1997. On the other hand, private companies are tapping into the voluntary carbon market to offset parts of their own emissions and substantiate climate-related claims. Meanwhile, LDCs are participating in various carbon markets and plan to expand their engagement. Therefore, it is crucial to understand the role of carbon markets and the costs and benefits of LDC participation in them.

This report is timely as carbon markets are entering a new phase. Climate negotiators are finalizing detailed rules for those markets under Article 6 of the Paris Agreement, which provides a framework for carbon trading in the context of nationally determined contributions (NDCs). Furthermore, amidst criticisms of greenwashing, initiatives to strengthen the integrity and quality of carbon credits and related corporate claims are emerging around the voluntary carbon market.

The report highlights carbon market activities in LDCs and analyses the potential and preconditions for their scaling up. It presents case studies of various project types in selected LDCs and discusses their impacts. It also explores the policy frameworks and institutional capacities required to ensure that LDCs can effectively participate in and benefit from carbon markets. Finally, it discusses the challenges and risks inherent in carbon markets, including price and demand volatility and regulatory uncertainties.

The report has the following objectives:

- Provide policymakers from LDCs and from their development partners with a better understanding of the development implications – both positive and negative – of LDC participation in carbon markets. This includes highlighting possible medium- to long-term consequences of the obligations that these countries take on when engaging with carbon markets;
- Identify how LDCs' interests can be safeguarded, with a view to helping their policymakers gauge the opportunities and navigate potential pitfalls from operationalizing Article 6 of the Paris Agreement, which, inter alia, allows countries to use internationally traded carbon credits to meet emission reduction targets specified in their NDCs;
- Discuss whether and to what extent participation in carbon markets can be leveraged to accelerate structural transformation in LDCs' economies in order for them to reach their development goals (e.g. those of Agenda 2030 and the Doha Programme of Action);
- Provide arguments and ideas for positioning LDCs in ongoing and future international climate negotiations.

The report is structured as follows. The remainder of this chapter takes stock of the global carbon trading landscape, including its structure, basic principles and recent trends, such as the operationalization of Article 6 of the Paris Agreement. Thereby, it sets the stage for the subsequent analysis, which focuses on LDC-specific carbon market issues.

Chapter II details the current state and potential of carbon markets to mobilize finance and support GHG mitigation in LDCs. It presents the volume and market value of carbon credits generated from LDC-hosted mitigation projects. It

then goes on to discuss LDC-specific opportunities and risks associated with their participation in carbon trading under Article 6 of the Paris Agreement and through the voluntary carbon market.

Chapter III provides an in-depth analysis of carbon market activities in LDCs, including case studies of projects under the Clean Development Mechanism and in the voluntary carbon market. It describes the range of operational levels at which LDCs have the potential to generate quality carbon credits and extract better value from mitigation projects. In addition to identifying successes and failures, the case studies highlight key players, stakeholders and relationships.

Chapter IV examines the regulatory and institutional frameworks necessary to ensure well-functioning and trustworthy carbon markets, whether implemented at the multilateral or national level. It first outlines the mechanisms already agreed upon under the Paris Agreement, and then examines ongoing discussions and negotiations on additional but critical rules for the functioning of these markets. It considers the institutions, regulations and mechanisms LDCs need to put in place in order to participate in carbon markets, and draws lessons from other developing countries' experiences.

Chapter V summarizes the main findings of the report, and presents policy options and recommendations for policymakers and climate negotiators in LDCs and their development partners. It warns against certain pitfalls of carbon market and also offers proposals for the international community to enhance the developmental benefits that LDCs could potentially derive from participating in carbon markets.

2. From the Kyoto Protocol to the Paris Agreement

There is broad-based consensus that climate change poses a significant threat to the environment, human health and socioeconomic development, and that the key to limiting global warming is to reduce GHG emissions. Deep and immediate cuts to GHG emissions are necessary to prevent dangerous levels of global warming. According to the Intergovernmental Panel on Climate Change (IPCC), global GHG emissions need to decrease by 43 per cent by 2030 from their 2019 levels and reach net-zero by around 2050 to limit global temperature rise to 1.5 degrees Celsius above pre-industrial levels (IPCC, 2023).

The recognition of the need for collective action to protect the climate system as a global common good led to the establishment of the UNFCCC in 1992, which today has 198 Parties, including all United Nations Member States. The key objective of the UNFCCC, as stated in the Convention's Article 2, is the "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system" (United Nations, 1992).

The Kyoto Protocol, signed in 1997, was the first step towards operationalizing the UNFCCC by setting binding targets for developed countries to reduce their emissions of six GHGs[1] relative to the levels in the reference year 1990 over two commitment periods (2008–2012 and 2013–2020).[2] To reach the Kyoto targets, governments deployed various policy instruments, many of which aimed at incentivizing emission reductions by putting a price on carbon (box I.1). By early 2024, there were 36 emission trading systems (ETS) and 39 carbon tax

[1] These are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulphur hexafluoride (SF_6). GHGs quantities are typically expressed in tons of CO_2-equivalent as they differ with respect to their global warming potential.

[2] In this section, developed countries refers to countries listed in Annex B of the Kyoto Protocol. The United States signed but did not ratify the Kyoto Protocol; Canada withdrew from the Kyoto Protocol in 2012; the Russian Federation committed to a binding target under the first but not the second commitment period.

schemes implemented around the world, together covering 24 per cent of global GHG emissions (World Bank, 2024).

Emissions trading is based on the understanding that, while GHG emissions contribute to global warming, irrespective of where or by whom they are emitted, the costs of mitigating those emissions differ across countries, sectors and individual emitters. Because of these differences, carbon markets that facilitate carbon trading between emitters can help to reduce the overall costs of implementing GHG mitigation targets. The Kyoto Protocol allowed for international carbon trading by introducing three so-called flexible mechanisms: Joint Implementation, the Clean Development Mechanism, and emissions trading. These mechanisms allowed countries with emission reduction obligations to achieve part of their emission reductions in other countries where mitigation costs were cheaper. Joint Implementation and emissions trading are concerned with trading emission permits between developed countries. The former is based on emission reduction units from mitigation projects, whereas emissions trading allows countries that have reduced their emissions below the permitted levels to sell excess permits. The Clean Development Mechanism, which is a centralized mechanism under the auspices of the UNFCCC allows developed countries to use certified emission reduction credits generated from mitigation projects in developing countries to fulfil their Kyoto targets. The flexible mechanisms under the Kyoto Protocol and domestic regulations in developed countries are designed to meet national emission limits, and have led to carbon trading activity involving governments and corporations, and thus to the emergence of carbon markets.

Article 6 of the Paris Agreement provides for two carbon trading frameworks: **a bilateral and decentralized one, and a centralized one**

Carbon markets can be defined as systems in which carbon credits or emission permits are bought and sold. In this report, carbon credits refer to tradable certificates representing emission reductions achieved through GHG mitigation projects, while emission permits – sometimes also called allowances – correspond to rights to emit GHGs that are allocated by regulatory bodies (box I.1). When carbon credits are used by emitters to reduce the volume of their emissions subject to regulatory measures, such as permit requirements or carbon taxes, they are also called carbon offsets. Carbon markets can be broadly categorized as compliance markets, which encompass emissions trading that takes place to fulfil statutory carbon control requirements, and the voluntary carbon market, which is largely based on demand by private corporations that have made emission reduction commitments or want to market products and activities as climate-friendly/climate-neutral. However, the boundaries between different carbon markets are not always clear-cut, and systems are becoming increasingly interconnected, as discussed later.

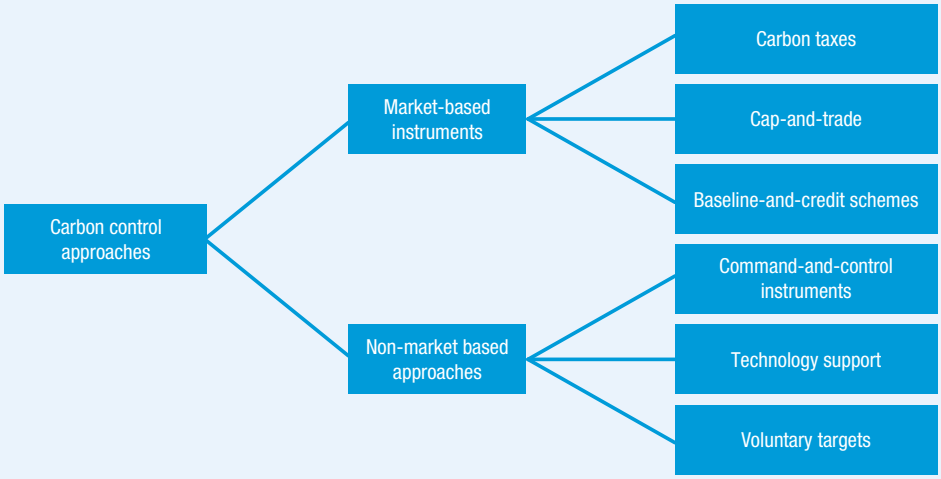
The Paris Agreement, adopted at the twenty-first Conference of the Parties to the UNFCCC (COP21) in 2015, created a global treaty regulating GHG emissions. The agreement takes a bottom-up approach, bringing together all countries under the principle of common but differentiated responsibilities. The rules for the operationalization of the Paris Agreement – the so-called Paris Rulebook – stipulate that countries have to submit to the UNFCCC secretariat, and update every five years, NDCs. The NDCs specify intended mitigation and adaptation targets. Similar to the flexible mechanisms of the Kyoto Protocol, Article 6 of the Paris Agreement allows for "voluntary international cooperation" (United Nations, 2015), such as carbon trading, for the implementation of NDCs.

Article 6 of the Paris Agreement provides for two separate but related frameworks for carbon trading (figure I.1): one enables decentralized, bilateral agreements between countries, and the other creates a centralized mechanism similar to and succeeding the Clean Development Mechanism. The former allows countries a large degree of flexibility in implementation,

Box I.1
Carbon pricing and GHG mitigation

Regulators can use various instruments to implement economy-wide GHG emission reductions. Broadly, these instruments can be classified as market-based and non-market-based (box figure I.1). The latter include command-and-control instruments, which implement emission reductions by directly setting emission limits or standards, imposing mandatory use of specific technologies, or prohibiting certain emitting activities. Market-based instruments work through the price system to create incentives for emitters to reduce emissions and invest in low-carbon technologies. A major advantage of market-based instruments is that they allow emitters – often a heterogeneous group of entities with different abatement costs and technological choices – more flexibility, so that economy-wide emission reduction targets can be achieved at lower overall compliance costs. As market-based instruments effectively create a price for carbon emissions, they are also called carbon pricing instruments.

Box figure I.1
Different approaches to controlling carbon emissions



Source: UNCTAD.

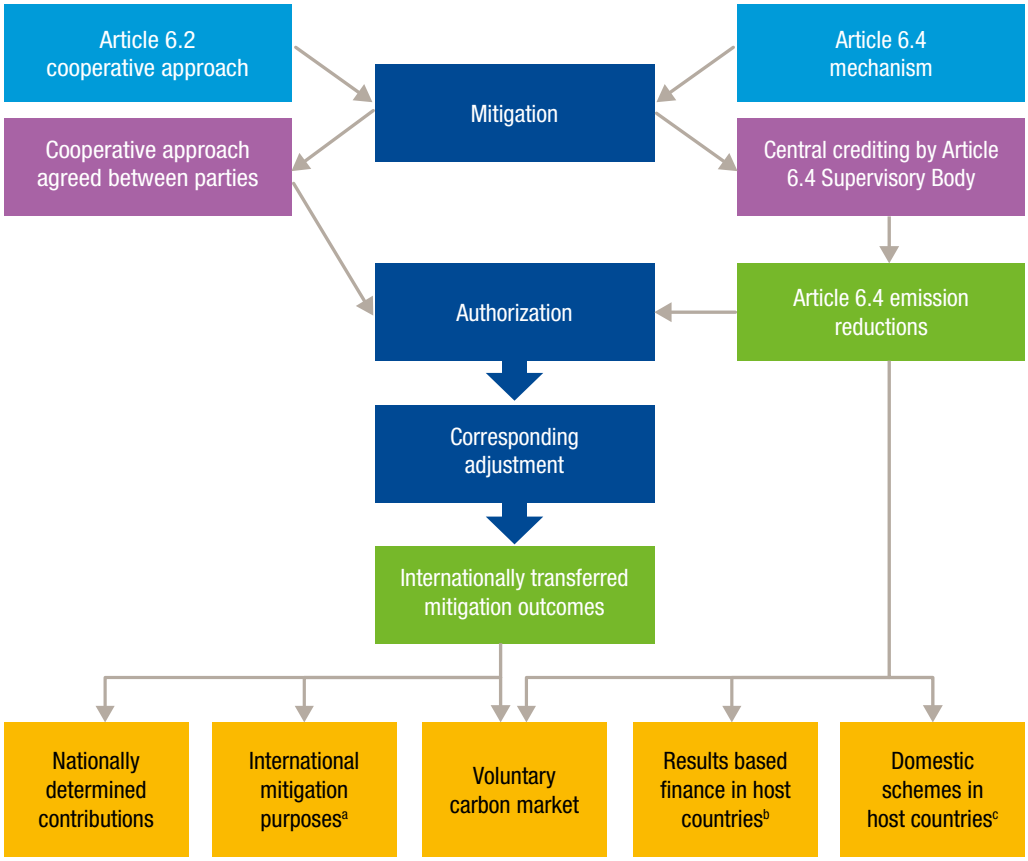
Carbon pricing is based on the principle that the costs of the negative externality caused by GHG emissions should be internalized into the decision-making processes of emitters. The two primary forms of carbon pricing are carbon taxes and emission trading systems. Carbon taxes impose a direct price on carbon emissions, often levied per ton of CO_2-equivalent emitted. Emission trading systems are based on permits, each representing the right to emit a certain amount of CO_2-equivalent GHGs. As regulators typically set an upper limit or "cap" on available emission permits, these schemes are called cap-and-trade systems. Permits can be allocated to regulated entities in different ways, including free allocation proportional to past emissions ("grandparenting"), auctioning of permits, or a combination thereof. After an initial allocation, emitters can buy and sell permits in a secondary market. The auctioning of permits and permit trading leads to the formation of a price for carbon emissions, which creates incentives to reduce emissions equivalent to a carbon tax. Carbon taxes and cap-and-trade systems can coexist within the same jurisdiction, where they either function separately, by covering different sectors or types of emitters, or take a hybrid form when emitters subject to a carbon tax can use carbon credits to reduce taxable emissions. Domestic carbon pricing can also be complemented by carbon border adjustments, which aim to align the carbon prices for imported goods and domestically produced goods. These border adjustments have a similar effect as tariffs (UNCTAD, 2022b).

Source: UNCTAD.

Figure I.1

Article 6 gives rise to two separate but related crediting schemes

Carbon crediting under Article 6 of the Paris Agreement



Source: UNCTAD.

Note: [a] For example, the Carbon Offsetting and Reduction Scheme for International Aviation.
[b] For example, a grant agreement with a donor.
[c] For example, domestic emissions trading system or carbon tax.

whereas the latter requires consensus by all Parties to the Paris Agreement on rules, methodologies and admitted activities before it can become fully operational. While all the details of the rules for operationalizing Article 6 have not been finalized – as no consensus was reached at COP28 in 2023 in Dubai – countries have already started to implement bilateral agreements under Article 6.2. This testifies to the willingness of many countries, both on the demand and the supply side of carbon markets, to use carbon trading as a tool to implement climate policy strategies.

Under Article 6.2, countries can establish bilateral cooperation arrangements that lead to emission reductions in one country, with a share of those reductions being transferred to the other country. This means that one country (typically a developed country) contributes financially and through technical cooperation to mitigation projects in another country (typically a developing country), and receives so-called internationally transferred mitigation outcomes in return. The receiving country can then count these internationally transferred mitigation outcomes towards achieving its own NDC. According to the guidance on Article 6.2 agreed at COP26 in Glasgow in 2021 (UNFCCC, 2022a), the transferring Party (i.e. the country where emission reduction took place) has to authorize the transfer and use towards the receiving party's NDC. The host country then makes a "corresponding adjustment," which means adjusting its emissions balance

so that it cannot count the internationally transferred mitigation outcomes towards its own NDC in order to avoid double counting. Host countries can also authorize internationally transferred mitigation outcomes to be used for "international mitigation purposes" – generally understood to include the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) – and "other mitigation purposes", which could open Article 6.2-generated internationally transferred mitigation outcomes to the voluntary carbon market. While there is no central regulatory or supervisory body for bilateral agreements under Article 6.2, there are rules concerning reporting and accounting. For instance, a central Article 6 database, to be managed by the UNFCCC secretariat, will record and track internationally transferred mitigation outcomes.

Article 6.4. establishes a centralized baseline and credit scheme[3] overseen by a Supervisory Body for managing a registry, accrediting third-party verification bodies and the trading of carbon credits. The Article 6.4. mechanism, also known as the Paris Agreement Crediting Mechanism, replaces the Clean Development Mechanism, under which no new projects could be registered after 31 December 2020. Accordingly, there was a window for active Clean Development Mechanism projects to register for transition to the new mechanism if they were active as of 1 January 2021 and complied with the rules of Article 6.4. Mitigation projects, after approval by the host country and the Article 6.4 Supervisory Body and independent verification, generate what are termed Article 6.4 Emission Reductions. While detailed rules have not yet been agreed upon, top-level "rules, modalities and procedures" were established at COP26 (UNFCCC, 2021). These rules, modalities and procedures include a focus on strengthening the rules on demonstrating additionality[4] and avoiding carbon leakage,[5] as well as aiming to promote "increasing ambition over time." Furthermore, a sustainable development tool will assess and monitor potential negative and positive impacts on the Sustainable Development Goals, and establish environmental and social safeguards. The rules, modalities and procedures also include the mandatory cancellation of 2 per cent of Article 6.4 Emission Reductions in order to further global emission reductions and the transfer of 5 per cent of Article 6.4 Emission Reductions to the Adaptation Fund to generate revenue for adaptation projects. There is flexibility for LDCs in the Article 6.4 rules, especially with regard to baseline setting and exemptions from administrative fees, which are discussed in chapter II of this report.

Top-level agreed rules focus on strengthening the criteria for demonstrating additionality and avoiding carbon leakage

Similar to the rules for Article 6.2, host countries of mitigation projects can authorize Article 6.4 Emission Reductions to be internationally transferred for use towards the achievement of NDCs and/or for international mitigation purposes and/or other purposes. Authorized Article 6.4 Emission Reductions become internationally transferred mitigation outcomes, and thus are subject to the same rules as internationally transferred mitigation outcomes generated under Article 6.2 arrangements, including the requirement for corresponding adjustments. Article 6.4 Emission Reduction units that are not authorized by host countries (i.e. where no corresponding adjustment takes place), are called mitigation contribution units and can be counted towards the host country's NDC or for other purposes, such as for

[3] Baseline and credit schemes are carbon market mechanisms where a baseline level of emissions is established for a specific activity or sector, and participants earn tradeable carbon credits for reducing emissions below this baseline.

[4] Additionality refers to the requirement that a project must result in GHG emission reductions that are additional to what would have occurred in the absence of the project. This concept ensures that the emission reductions are beyond any reductions that would happen under a business-as-usual scenario.

[5] Carbon leakage occurs when a GHG mitigation project leads to an increase in GHG emissions outside the boundaries of the mitigation project, thereby undermining its emission reduction efforts.

use in domestic carbon pricing schemes or results-based financing arrangements.

Detailed guidelines and rules need to be agreed by the Parties to the Paris Agreement before new Article 6.4 projects can be registered under the mechanism. Recommendations on such guidelines and rules presented by the Article 6.4 Supervisory Body at COP28 did not achieve consensus. In particular there were disagreements around methodologies and the treatment of GHG removals. A decision was therefore postponed to COP29 in 2024.[6] However, Clean Development Mechanism projects that successfully transition to Article 6.4[7] constitute a project pool ready for crediting once the Paris Agreement Crediting Mechanism becomes fully operational.

Not all internationally transferred mitigation outcome units are interchangeable

While Articles 6.2 and 6.4 can lead to the issuance of internationally transferred mitigation outcomes, it is important to note that not all internationally transferred mitigation outcome units are fungible, as Article 6 gives rise to internationally transferred mitigation outcomes with different characteristics depending on whether they are authorized by host countries for use towards the achievement of their NDCs, international mitigation purposes, other mitigation purposes, or a combination thereof. The Article 6 database will include information on the authorized purposes of internationally transferred mitigation outcomes, but will also identify whether they originate in Article 6.2 or 6.4, their vintage and underlying sectors (UNFCCC, 2022b), which adds further dimensions of differentiation of internationally transferred mitigation outcomes.

3. Compliance carbon markets

Compliance markets feature ETSs with domestic, regional and international scope, and, in some cases, links exist between different ETSs. While all ETSs are based on the same basic principle – reducing overall compliance costs by allowing emitters to trade emission permits – substantial design and configuration differences exist between the existing systems. Key differences include sectors covered and their GHGs, the setting of caps, the method of permit allocation, rules regarding price stability, and compliance flexibility, such as the option to use carbon credits to offset emissions. Except in cases of linked systems,[8] permits are not fungible across different ETSs. As a result of these differences, prices of carbon permits differ significantly among schemes (figure I.2). For instance, in December 2023, the average spot price per ton of CO_2 in the European Union ETS was $77.36, which was more than 10 times higher than the spot price of permits in the Republic of Korea ETS, which traded at $6.92.

The European Union ETS, launched in 2005, was the first large-scale cap-and-trade system, and is the largest scheme in terms of traded value.[9] It comprises the 27 member States of the European Union plus Iceland, Liechtenstein and Norway, and covers about 38 per cent of GHG emissions in these countries.[10] After several years of piloting subnational ETSs, China launched its national ETS in 2021, which is the largest such scheme in terms of the volume of covered emissions (World Bank, 2022).

6 Some issues, such as the treatment of emission avoidance under Article 6, have been deferred to 2028.

7 Clean Development Mechanism projects that have registered for transition have until 31 Dec 2025 to successfully implement the transition to the Article 6.4 Mechanism.

8 The Québec and California ETSs were linked in 2014, and the Swiss ETS was linked with the European Union ETS in 2020. The United Kingdom ETS used to be part of the European Union ETS, but separated from it in 2021 after that country left the European Union.

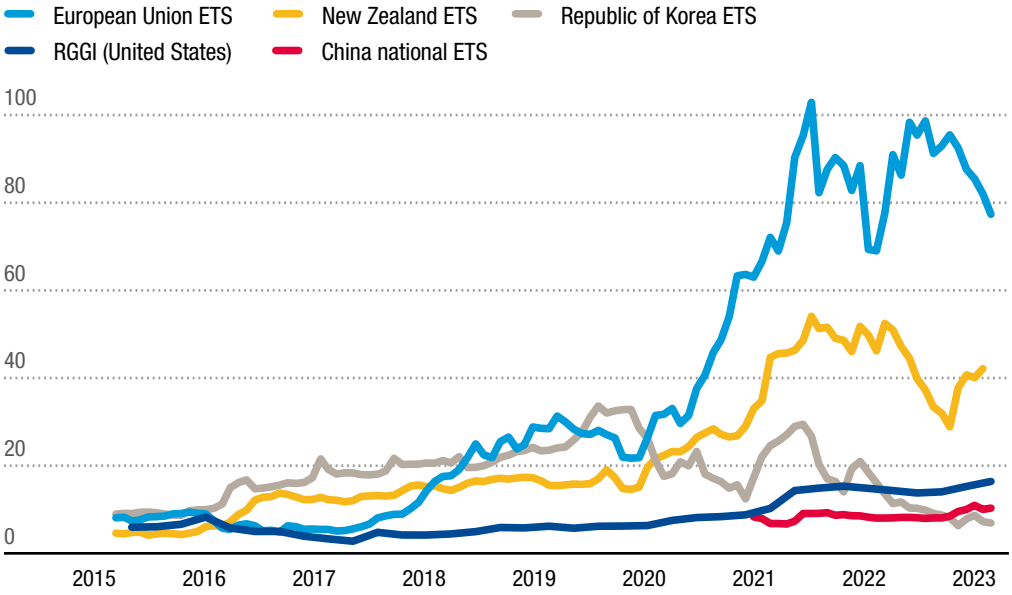
9 There are earlier examples of smaller scale schemes with voluntary participation, such as the United Kingdom Emissions Trading Scheme and a scheme covering CO_2 emissions in the electricity sector in Denmark.

10 Based on data from the World Bank Carbon Pricing Dashboard, available at https://carbonpricingdashboard.worldbank.org/ (accessed 1 June 2024).

Figure I.2

Carbon prices vary greatly across emission trading schemes

Permit prices in selected emissions trading schemes, 2015–2023
(Dollars per ton of carbon dioxide)



Source: UNCTAD, based on data from ICAP (International Carbon Action Partnership) Allowance Price Explorer, available at https://icapcarbonaction.com/en/ets-prices (accessed 10 March 2024).

Note: Prices are monthly averages. The Regional Greenhouse Gas Initiative (RGGI) covers the power sector in the States of Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. ETS, emissions trading scheme/system.

The use of carbon credits is limited in most ETSs (table I.1). Of the existing 36 active ETSs, 14 exclude the use of carbon credits. Among these is the European Union ETS, which allowed regulated entities to substitute Clean Development Mechanism and Joint Implementation credits for part of their emissions in its initial three phases,[11] but it stopped the use of carbon credits in phase 4 (2021–2030). Similarly, the Swiss ETS, which was linked with the European Union ETS in 2020, stopped accepting certified emission reduction credits in 2021. Under the New Zealand ETS, certified emission reduction credits were initially accepted for compliance, subject to qualitative restrictions, but were excluded in 2015 (Leining, 2022). Data to April 2024 show that 21 ETSs allowed emitters to use carbon credits as a share of their emissions, but only accepted domestic carbon credits.[12] The Republic of Korea ETS is the only scheme that allows the use of international carbon credits, but limits and conditions apply (La Hoz Theuer et al., 2023). For instance, regulated entities can only use carbon credits up to a maximum of 5 per cent of their emissions, and for international credits, only certified emission reduction credits from Clean Development Mechanism projects that have been developed by firms in the Republic of Korea are allowed.

There are also carbon tax schemes that allow the use of carbon credits. However, like ETS, national carbon tax rules generally only allow domestically generated credits. The only exception, as of April 2024, is

Most emissions trading schemes **limit the use of carbon credits**

[11] In phases 2 and 3, quantitative limits and qualitative restrictions with regard to the type of underlying mitigation projects applied.

[12] Based on information from the International Carbon Action Partnership Map, available at https://icapcarbonaction.com/en (accessed 2 May 2024).

Box I.2
The Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA)

A global initiative, CORSIA was established by the International Civil Aviation Organization (ICAO) to reduce GHG from aviation. ICAO has set 85 per cent of 2019 emissions as CORSIA's baseline from 2024 until the end of the scheme in 2035.

Under CORSIA, airlines are required to monitor, report and offset their carbon emissions above 2020 levels by purchasing carbon credits that fulfil the CORSIA Emissions Unit Eligibility Criteria. CORSIA operates in three phases: a pilot phase (2021–2023), a voluntary first phase (2024–2026), and a mandatory second phase (2027–2035) for all participating States except LDCs, landlocked developing countries (LLDCs), small island developing States (SIDS) and States which accounted for less than 0.5 per cent of the global volume of air transport activity in 2018. In the period 2021–2035, CORSIA aims to offset an estimated 2.5 billion tons of CO_2-equivalent GHGs (ICAO, 2019).

This scheme provides a framework for the aviation industry to reduce its carbon footprint and contribute to global efforts to combat climate change. However, its effectiveness hinges on robust monitoring, reporting and verification mechanisms, as well as the integrity of used carbon credits.

[a] Integrity here refers to the credibility, reliability and trustworthiness of the carbon credits in representing genuine, quantifiable and verifiable reductions or removals of GHG emissions.

Source: UNCTAD.

the Singapore carbon tax, which specifies that up to 5 per cent of emissions subject to the carbon tax can be offset using international carbon credits, which "must not be counted more than once in contravention of the Paris Agreement" (Government of Singapore, 2023). This seems to imply that carbon credits must be correspondingly adjusted to be eligible.

Overall, so far, compliance markets do not offer meaningful entry points for carbon credits generated in LDCs. However, policies and regulations for GHG mitigation can, and do, change and evolve over time. Several new ETSs, carbon taxes and other compliance schemes are being discussed, prepared and implemented around the world. For instance, the CORSIA, a different compliance scheme from ETS and carbon taxes (box I.2), is likely to generate significant demand for carbon credits, including from LDC host countries.

4. The voluntary carbon market

The basic principle of the voluntary carbon market is similar to the baseline and credit schemes created under the Kyoto Protocol and the Paris Agreement in that it generates carbon credits from mitigation projects that are traded on carbon markets. The main difference between them is that the voluntary carbon market is not based on an international agreement, a common body of rules or a unified registry. Consequently, it is a fragmented market featuring a plethora of different credit types and qualities that are traded at different prices on various marketplaces.

A key factor of differentiation between carbon credits traded on the voluntary carbon market is the standard against which they are verified. Various standards have been developed by private sector or non-governmental organization (NGO) initiatives. The two standards with the largest market

Table I.1

The use of carbon credits is limited in most emission trading schemes

Emission trading schemes in compliance markets as of March 2024

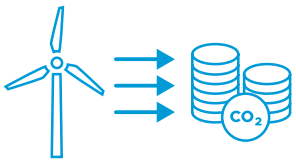
Scheme	Start	Share of GHG emissions covered (Percentage)	Carbon credits allowed
European Union ETS	2005	38	no
Alberta TIER (Canada)	2007	62	domestic
New Zealand ETS	2008	48	no
Switzerland ETS	2008	12	no
Regional Greenhouse Gas Initiative (United States)	2009	14	domestic
Tokyo CaT (Japan)	2010	18	domestic
Saitama ETS (Japan)	2011	18	domestic
California CaT (United States)	2012	76	domestic
Guangdong pilot ETS (China)	2013	40	domestic
Kazakhstan ETS	2013	47	domestic
Shanghai pilot ETS (China)	2013	36	domestic
Tianjin pilot ETS (China)	2013	35	domestic
Quebec CaT (Canada)	2013	79	domestic
Beijing pilot ETS (China)	2013	24	domestic
Shenzhen pilot ETS (China)	2013	30	domestic
Hubei pilot ETS (China)	2014	27	domestic
Chongqing pilot ETS (China)	2014	51	domestic
Republic of Korea ETS	2015	89	domestic and CDM
Fujian pilot ETS (China)	2016	51	domestic
British Columbia GGIRCA (Canada)	2016	0	domestic
Massachusetts ETS (United States)	2018	9	no
Saskatchewan OBPS (Canada)	2019	43	no
Canada federal OBPS	2019	1	domestic
Newfoundland and Labrador PSS (Canada)	2019	38	no
Mexico pilot ETS	2020	40	domestic
China national ETS	2021	32	domestic
Germany ETS	2021	39	no
United Kingdom ETS	2021	28	no
New Brunswick ETS (Canada)	2021	52	no
Ontario EPS (Canada)	2022	26	no
Austria ETS	2022	40	no
Montenegro ETS	2022	43	no
Indonesia ETS	2023	26	no
Washington CCA (United States)	2023	70	domestic
Nova Scotia OBPS (Canada)	2023	87	no
Australia Safeguard Mechanism	2023	26	domestic

Source: UNCTAD, based on information in the Article 6 pipeline database of the UNEP Copenhagen Climate Centre (UNEP-CCC), available at https://unepccc.org/article-6-pipeline (accessed 3 July 2024).

Note: CaT, Cap and Trade; CCA, Climate Commitment Act; CDM, Clean Development Mechanism; EPS, Emissions Performance Standards; ETS, Emissions Trading Scheme/System; GGIRCA, Greenhouse Gas Industrial Reporting and Control Act; GHG, greenhouse gas; OBPS, Output-Based Pricing System; PSS, Performance Standards System; TIER, Technology Innovation and Emissions Reduction Regulation.

The Verified Carbon Standard and Gold Standard for the Global Goals have a combined market share of 97 per cent in LDCs

shares are the Verified Carbon Standard and the Gold Standard for the Global Goals. Both cover a broad range of project types and are available in all geographical areas. Data to May 2024 show that, together, the Verified Carbon Standard and Gold Standard for the Global Goals accounted for 79 per cent of issued carbon credits. In LDCs, they are even more dominant, with a joint market share of 97 per cent. Other standards focus on specific sectors, project types or geographical areas. For instance, the Plan Vivo standard focuses on smallholder and community projects.[13]



Technology-based carbon credits are primarily generated by **renewable energy projects**

The complexity and fragmentation of the voluntary carbon market has led to the emergence of entities that define principles or criteria for the quality of carbon credits, and the claims based thereon, with the aim of strengthening the voluntary carbon market's integrity and credibility. On the supply side, this includes the Core Carbon Principles developed by the Integrity Council for the Voluntary Carbon Market,[14] which assesses standards against the Core Carbon Principles; successful standards will be able to use the Core Carbon Principles label. There is also the Carbon Credit Quality Initiative, founded by environmental NGOs, which provides a rating system for the quality of carbon credits. On the demand side, the Claims Code of Practice by the Voluntary Carbon Market Integrity Initiative provides guidance for emission reduction claims made by corporations based on carbon credits sourced on the voluntary carbon market.[15] Meanwhile, CORSIA has established emissions unit eligibility criteria, and also provides a quality seal for compliant standards on the voluntary carbon market.[16]

In addition, the forthcoming "Principles for Carbon Markets with Integrity and Credibility", developed by the United Nations Taskforce on Carbon Markets, applicable to all carbon crediting mechanisms, will provide guidance on integrity and credibility across the full lifecycle of carbon market activities.

Mitigation projects in the voluntary carbon market can be grouped into two broad categories, depending on whether they are nature-based or technology-based. Nature-based credits include forest-related activities, such as REDD+ (box I.3), and afforestation/reforestation,[17] which account for the bulk of credit supply from this category; and projects that reduce emissions from land-use and agriculture. Technology-based credits primarily come from renewable energy projects, but also from mitigation activities in energy efficiency projects, industrial processes, household devices, waste disposal and transport.

From its beginnings in the early 2000s to 2021, the voluntary carbon market has witnessed rapid growth in issued and retired credit volumes (figure I.3). In 2021, issuances reached their peak at 362 metric tons of carbon dioxide-equivalent ($MtCO_2e$) after which they dropped in two consecutive years to reach 308 $MtCO_2e$ in 2023. Retired volumes peaked in 2022, at 183 $MtCO_2e$, before falling to 174 $MtCO_2e$ in 2023. The stock of unretired carbon credits has continuously increased over the past two decades to reach 877 $MtCO_2e$ in 2023 – about five times the retired volume in that year. Claims of corporate greenwashing[18] and criticism of the integrity of carbon credits might have contributed to the fall in demand in 2023.

[13] https://www.planvivo.org/what-we-do.

[14] https://icvcm.org/core-carbon-principles/.

[15] https://vcmintegrity.org/vcmi-claims-code-of-practice/.

[16] Emission unit programmes can apply to the Technical Advisory Body of the ICAO for inclusion in the list of CORSIA Eligible Emissions Units. The Advisory Body recommends compliant programmes to the ICAO Council, which decides whether or not to include them.

[17] REDD+ stands for Reducing Emissions from Deforestation and Degradation, plus sustainable forest management and conservation, and enhancement of forest stocks.

[18] Greenwashing in the context of carbon credits occurs when corporations market themselves as climate conscious without undertaking real efforts to reduce GHG emissions across their operations. Carbon credits can be tools that enable greenwashing, as they can be used to underpin climate-related claims.

Box I.3
Reducing Emissions from Deforestation and Forest Degradation

Forests play an important role for the climate, as they absorb and store large quantities of carbon. However, global forest cover has decreased substantially over the past few decades. During the period 1990 to 2020, deforestation amounted to 420 million hectares, approximately equivalent to the size of the European Union, with a net loss of forest area of 178 million hectares (FAO, 2020). Africa, where 33 of the 45 LDCs are located, experienced the highest annual rate of net forest loss in 2010–2020, and was the only region where the rate of net forest loss increased in each of the three decades over the period 1990–2020 (FAO, 2020). Deforestation and forest degradation are significant contributors to global GHG emissions, accounting for approximately 11 per cent of such emissions globally (UNEP, 2021). According to the IPCC, reducing deforestation and forest degradation has the highest economical potential to mitigate GHGs within the agriculture, forestry and other land-use categories (IPCC, 2022), and thus plays a critical role in helping countries to stay within the emission limits compatible with a 1.5°C target.

Given this vital role of forests, REDD (Reducing Emissions from Deforestation and Forest Degradation) was developed under the IPCC, as a global initiative aimed at mitigating GHG emissions from forests through forest protection. Its core concept revolves around financial incentives for developing countries to reduce emissions by slowing deforestation and managing forest resources more sustainably. REDD+ expands the original scope to include conservation, sustainable management of forests and enhancement of forest carbon stocks.

REDD+ operates through a phased approach, involving three stages: readiness, implementation and payment for results (UNFCCC, 2024). There are various mechanisms that support REDD+ activities, including the United Nations Collaborative Programme on Reducing Emissions from Deforestation and Forest Degradation in Developing Countries, the Global Environment Facility, the Green Climate Fund, and the Forest Carbon Partnership Facility. REDD+ activities also account for a significant share of the voluntary carbon market, particularly in LDCs (chapter II).

Source: UNCTAD.

This is because, ultimately, carbon credits traded in the voluntary carbon market derive their value from buyers' trust in their underlying projects, which is based on the credibility and robustness of the verification and certification standard and process. In 2023, there were reports that questioned the integrity and quality of forest carbon credits traded in the voluntary carbon market (West et al., 2023; Greenfield, 2023).[19] Also, carbon credits from cookstove projects, where GHG mitigation is based on reducing the collection of wood for fuel, have been criticized for over-crediting (Gill-Wiehl et al., 2024). Given that forestry and cookstoves are the two main project categories in LDCs (see following chapter), these countries are particularly vulnerable to potential fallout of these criticisms, and may face increased scrutiny and pressure to ensure the transparency and effectiveness of their mitigation projects.

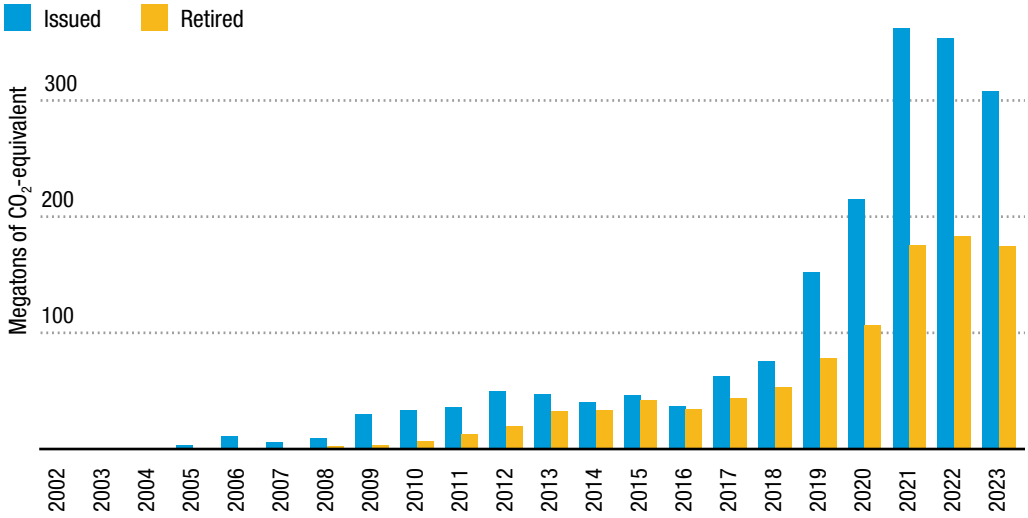
As carbon credits traded in the voluntary carbon market vary on multiple dimensions, there are large price differences between and within project types. In general, buyers pay price premiums for high integrity credits (i.e. those certified to more robust and stringent standards) and for credits that have (more) positive sustainable development impacts and are of newer vintage. For instance, in 2022, carbon credits with

[19] See also https://www.theguardian.com/environment/2023/jan/18/revealed-forest-carbon-offsets-biggest-provider-worthless-verra-aoe.

Figure I.3

Ebbing confidence dents growth in voluntary carbon markets

Issued and retired carbon credits in the voluntary carbon market, 2002–2023

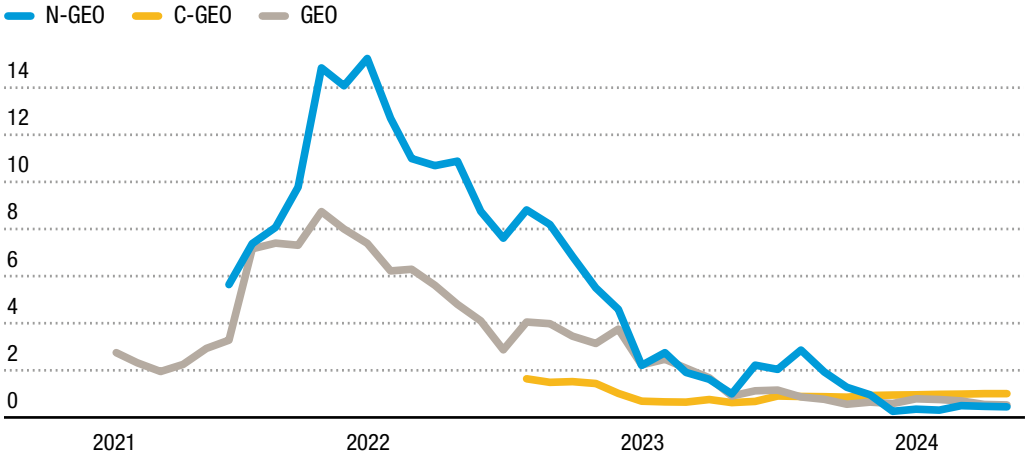


Source: UNCTAD, based on data in the Climate Focus Voluntary Carbon Market Dashboard (updated 8 March 2024), available at https://climatefocus.com/initiatives/voluntary-carbon-market-dashboard/ (accessed 10 March 2024).

Figure I.4

Carbon credit futures prices on the voluntary carbon market tumbled to historical lows in 2023 and 2024

Carbon credit front-month future contracts, 2021–2024
(Dollars)



Source: UNCTAD, based on data from Refinitiv.

Note: GEO: Global Emissions Offset; N-GEO: Nature-based Global Emissions Offset; C-GEO: Core Global Emissions Offset. The futures prices correspond to the front-month contracts for credits worth one metric ton of CO_2-equivalent, traded on the New York Mercantile Exchange (NYMEX). GEO includes credits that follow CORSIA standards; N-GEO includes nature-based credits that meet Verra's Climate Community and Biodiversity Standard; C-GEO includes technology-based credits aligned with the initial Core Carbon Principles of the Taskforce on Scaling Voluntary Carbon Markets.

certified positive sustainable development impacts traded at a 78 per cent price premium in over-the-counter (OTC) transactions[20] (Forest Trends' Ecosystem Marketplace, 2023). Buyers of carbon credits on the voluntary carbon market can also have preferences for specific project types or regions, thereby leading to greater price differentiation. For example, an analysis by UNCTAD, based on Climate Impact X (CIX) data, shows that carbon credits from cookstove projects in LDCs command a higher price than in other countries.

Given that many transactions in the voluntary carbon market take place over the counter, price transparency is limited. However, carbon credits and derivatives are traded in an increasing number of exchanges (UN SSE, 2023). In recent years, exchange-traded standardized futures contracts bundling similar carbon credit types have emerged and provide benchmark prices. For instance, in 2021, the CME Group launched Global Emissions Offset (GEO), a physically settled futures contract for carbon credits that are eligible under CORSIA.[21] Futures contracts that are limited to nature-based credits (N-GEO) and technology-based credits (C-GEO) have followed. And, the Singapore-based carbon exchange, CIX, provides a series of price indices for various types of carbon credits.[22] Recent price trends of futures contracts show high volatility and a significant market downturn, in particular since 2023, across carbon credit types (figure I.4). Prices in OTC markets showed more resilience, but also fell in 2023 (Forest Trends' Ecosystem Marketplace, 2024).

Overall, the carbon market landscape is complex, and it is still evolving at a significant pace. Against this backdrop, the following chapter introduces and analyses the main question of the report, namely: what are the opportunities, challenges and pitfalls associated with LDC participation in carbon markets?

Widespread use of over-the-counter transactions in the voluntary market results in **limited price transparency**

[20] OTC transactions are private agreements for buying and selling carbon credits directly between parties without using a formal exchange platform.

[21] https://www.cmegroup.com/markets/energy/emissions/cbl-global-emissions-offset.html

[22] https://www.climateimpactx.com/

References

FAO (2020). *Global Forest Resources Assessment 2020: Main Report*. Food and Agriculture Organization of the United Nations. Rome.

Forest Trends' Ecosystem Marketplace (2023). *State of the Voluntary Carbon Markets 2023*. Forest Trends Association. Washington.

Forest Trends' Ecosystem Marketplace (2024). *State of the Voluntary Carbon Markets 2024*. Forest Trends Association. Washington.

Gill-Wiehl A, Kammen DM and Haya BK (2024). Pervasive over-crediting from cookstove offset methodologies. *Nature Sustainability*. 7(2): 191–202, Nature Publishing Group.

Government of Singapore (2023). Carbon Pricing Act 2018, Carbon Pricing Regulations 2023. Available at https://sso.agc.gov.sg/SL-Supp/S661-2023/Published/20231006?DocDate=20231006.

Greenfield P (2023). Revealed: More than 90% of rainforest carbon offsets by biggest certifier are worthless, analysis shows. *The Guardian*, January. Available at https://www.theguardian.com/environment/2023/jan/18/revealed-forest-carbon-offsets-biggest-provider-worthless-verra-aoe.

ICAO (2019). *ICAO Environmental Report 2019*. International Civil Aviation Organization. Ottawa.

IPCC (2022). *Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Intergovernmental Panel on Climate Change. Geneva.

IPCC (2023). *Summary for Policymakers. In: Climate Change 2023: Synthesis Report. Contribution of Working Groups I, II and III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change*. Intergovernmental Panel on Climate Change. Geneva.

La Hoz Theuer S, Hall M, Eden A, Krause E, Haug C and De Clara S (2023). Offset Use Across Emissions Trading Systems. International Carbon Action Partnership. Berlin. Available at: https://icapcarbonaction.com/system/files/document/ICAP%20offsets%20paper_vfin.pdf.

Leining C (2022). A Guide to the New Zealand Emissions Trading Scheme: 2022 Update. Available at https://www.motu.nz/assets/Documents/our-research/environment/climate-change-mitigation/emissions-trading/A-Guide-to-the-New-Zealand-Emissions-Trading-System-2022-Update-Motu-Research.pdf.

UN SSE (2023). How exchanges can maximize the opportunities of carbon markets. United Nations Sustainable Stock Exchanges. Geneva.

UNCTAD (2022a). *The Least Developed Countries Report 2022: The Low-Carbon Transition and Its Daunting Implications for Structural Transformation*. United Nations publication. Sales No. E.22.II.D.40. New York and Geneva.

UNCTAD (2022b). Carbon Pricing: A Development Reality Check. United Nations. United Nations publication. Sales No. E.22.II.D.40. Geneva.

UNCTAD (2023). *The Least Developed Countries Report 2023: Crisis-Resilient Development Finance*. United Nations publication. Sales No. E.23.D.27. Geneva.

UNEP (2021). Factsheet: Deforestation. United Nations Environment Programme.

UNFCCC (2021). Rules, modalities and procedures for the mechanism established by Article 6, paragraph 4, of the Paris Agreement. No. Decision 3/CMA.3. United Nations Framework Convention on Climate Change. Bonn, Germany.

UNFCCC (2022a). Guidance on cooperative approaches referred to in Article 6 paragraph 2, of the Paris Agreement. No. Decision 1/CMA.3. United Nations Framework Convention on Climate Change. Bonn, Germany.

UNFCCC (2022b). Matters relating to cooperative approaches referred to in Article 6, paragraph 2, of the Paris Agreement. No. Decision 6/CMA.4. United Nations Framework Convention on Climate Change. Bonn, Germany.

UNFCCC (2024). What is REDD+? Available at https://unfccc.int/topics/land-use/workstreams/redd/what-is-redd.

United Nations (1992). United Nations Framework Convention on Climate Change. United Nations. Available at: https://unfccc.int/files/essential_background/background_publications_htmlpdf/application/pdf/conveng.pdf.

United Nations (2015). Paris Agreement. United Nations. Available at: https://unfccc.int/sites/default/files/english_paris_agreement.pdf.

West TAP, Wunder S, Sills EO, Borner J, Rifai SW, Neidermeier A, Frey GP and Kantoleon A (2023). Action needed to make carbon offsets from forest conservation work for climate change mitigation. *Science*. 381(6660):873–877, American Association for the Advancement of Science.

World Bank (2022). *State and Trends of Carbon Pricing 2022*. World Bank. Washington.

World Bank (2024). *State and Trends of Carbon Pricing 2024*. World Bank. Washington.