UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT

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2024

The least developed countries report

Leveraging carbon markets for development

United Nations

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The Least Developed Countries Report 2024: Leveraging Carbon Markets for Development

Corrigendum

1. Page 45, last sentence

For the existing text *substitute*

Thus, the recognition of suppressed demand offers considerable potential in LDCs, where the basic human needs of large segments of the population are not being met, particularly with regard to relevant infrastructure services such as power supply (see section A.1.c. above, on renewable energy and carbon markets).

2. Page 49, first full sentence

For the existing text *substitute*

For instance, criticism of the integrity of carbon credits contributed to a staggering 61 per cent drop in the overall market value of the voluntary carbon market, from $1.87 billion in 2022 to $723 million in 2023 (Forest Trends' Ecosystem Marketplace, 2024).

3. Page 56, table 3.1, sources

For the existing text *substitute*

UNCTAD calculations, based on data from the United Nations Department of Economic and Social Affairs, Population Division, *World Population Prospects: The 2022 Revision* and the United States Energy Information Administration, International Energy Data.

4. Page 58, last sentence

For the existing text *substitute*

Figure 2.1 details these categories and the corresponding data sources.

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Note

The term “dollars” ($) refers to United States dollars unless otherwise specified.

The term “billion” signifies 1,000 million.

The term “ton” signifies metric ton, i.e. 1,000 kilograms.

Annual rates of growth and change refer to compound rates.

Use of a dash (–) between dates representing years, e.g. 1981–1990, signifies the full period involved, including the initial and final years. A slash (/) between two years, e.g. 1991/92, signifies a fiscal or crop year.

Throughout the report, the term “least developed country” refers to a country included in the United Nations list of the least developed countries (see classifications below).

The terms “country” and “economy”, as appropriate, also refer to territories or areas.

Tables

Two dots (..) indicate that the data are not available or are not separately reported.

One dot (.) indicates that the data are not applicable.

A dash (–) indicates that the amount is nil or negligible.

Percentages do not necessarily add up to totals because of rounding.

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Classifications

The least developed countries

Unless otherwise specified, in this report, the least developed countries are classified according to a combination of geographical and structural criteria. The small island least developed countries that are geographically in Africa or Asia are therefore grouped with Pacific islands, to form the island least developed countries group, given their structural similarities. Haiti and Madagascar, which are regarded as large island States, are grouped together with the African least developed countries. The resulting groups are as follows:

African least developed countries and Haiti: Angola, Benin, Burkina Faso, Burundi, Central African Republic, Chad, Democratic Republic of the Congo, Djibouti, Eritrea, Ethiopia, Gambia, Guinea, Guinea-Bissau, Haiti, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mozambique, Niger, Rwanda, Senegal, Sierra Leone, Somalia, South Sudan, Sudan, Togo, Uganda, United Republic of Tanzania, Zambia

Asian least developed countries: Afghanistan, Bangladesh, Cambodia, Lao People's Democratic Republic, Myanmar, Nepal, Yemen

Island least developed countries: Comoros, Kiribati, Sao Tome and Principe, Solomon Islands, Timor-Leste, Tuvalu

Other groups of countries and territories

Developed countries and territories: Albania, Andorra, Australia, Austria, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Canada, Croatia, Cyprus, Czechia, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, Latvia, Liechtenstein, Lithuania, Monaco, Luxembourg, Malta, Montenegro, Kingdom of the Netherlands, New Zealand, North Macedonia, Norway, Poland, Portugal, Republic of Korea, Republic of Moldova, Romania, Russian Federation, San Marino, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom of Great Britain and Northern Ireland, United States of America, Holy See, Bermuda, Gibraltar, Greenland

Other developing economies: For analytical purposes and statistical convenience throughout this report, including in the overview, main text, annexes, references, figures, boxes, maps and tables, as well as infographics, the use of "other developing economies" refers to countries, territories and areas that are classified as developing economies by UNCTAD (see https://unctadstat.unctad.org/EN/Classifications.html) and are not among the least developed countries.

What are the least developed countries? Number of countries in 2024

In 2024, the following 45 countries are designated by the United Nations as the least developed countries: Afghanistan, Angola, Bangladesh, Benin, Burkina Faso, Burundi, Cambodia, Central African Republic, Chad, Comoros, Democratic Republic of the Congo, Djibouti, Eritrea, Ethiopia, Gambia, Guinea, Guinea-Bissau, Haiti,

Kiribati, Lao People's Democratic Republic, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mozambique, Myanmar, Nepal, Niger, Rwanda, Sao Tome and Principe, Senegal, Sierra Leone, Solomon Islands, Somalia, South Sudan, Sudan, Timor-Leste, Togo, Tuvalu, Uganda, United Republic of Tanzania, Yemen, Zambia

Status reviewed every three years

The list of the least developed countries is reviewed every three years by the Committee for Development Policy, a group of independent experts that reports to the Economic and Social Council of the United Nations. Following the review, the Committee may recommend, in its report to the Economic and Social Council, countries for addition to the list or the graduation of current countries from the category. In 2017–2020, the Committee undertook a comprehensive review of the least developed country criteria, which were further refined in 2023. The resulting revised criteria were first applied at the triennial review in 2024.

The following criteria and thresholds for inclusion in the least developed country category or for graduation from the category were applied at the 2024 review:

(a) An income criterion, based on a three-year average estimate of the gross national income per capita in United States dollars, using conversion factors based on the World Bank Atlas methodology. The threshold for inclusion and graduation is based on the thresholds of the World Bank low-income category. For the 2024 triennial review, the threshold for inclusion was set at $1,088 or less; the threshold for graduation was set at $1,306 or more.

(b) A human assets index, comprising a health subindex and an education subindex. The health subindex has the following three indicators: under-five mortality rate; maternal mortality ratio; and prevalence of stunting. The education subindex has the following three indicators: lower secondary school completion rate; adult literacy rate; and gender parity index for lower secondary school completion. All six indicators are converted into indices using established methodologies with an equal weight. For the 2024 triennial review, the thresholds for inclusion and graduation were set at 60 or below and 66 or above, respectively.

(c) An economic and environmental vulnerability index, comprising an economic vulnerability subindex and an environmental vulnerability subindex. The economic vulnerability subindex has the following four indicators: share of agriculture, forestry and fishing in gross domestic product; remoteness and landlockedness; merchandise export concentration; and instability of exports of goods and services. The environmental vulnerability subindex has the following four indicators: share of population in low elevated coastal zones; share of the population living in drylands; instability of agricultural production; and victims of disasters. All eight indicators are converted into indices using established methodologies with an equal weight. For the 2024 triennial review, the thresholds for inclusion and graduation were set at 36 or above and 32 or below, respectively.

At each triennial review, all countries in developing regions are reviewed against the criteria. If a non-least developed country meets the established inclusion thresholds for all three criteria in a single review, it may become eligible for inclusion. Inclusion requires the consent of the country concerned and becomes effective immediately after the General Assembly takes note of the recommendation of the Committee for Development Policy. No recommendations were made for inclusion at the triennial review in 2024.

To graduate from the least developed country category, a country must meet the established graduation thresholds of at least two of the criteria for two consecutive triennial reviews. Countries that are highly vulnerable, or have very low human assets, are eligible for graduation

only if they meet the other two criteria by a sufficiently high margin. As an exception, a country with a per capita income that is sustainably above the income-only graduation threshold, set at three times the graduation threshold ($3,918 for the 2024 triennial review), becomes eligible for graduation, even if it does not meet the other two criteria.

Graduation from the least developed country category

The following seven countries have graduated from the least developed country category:

- Botswana, December 1994
- Cabo Verde, December 2007
- Maldives, January 2011
- Samoa, January 2014
- Equatorial Guinea, June 2017
- Vanuatu, December 2020
- Bhutan, December 2023

The Committee for Development Policy has recommended graduation from the least developed country category for several countries in the past. Among them, Sao Tome and Principe is slated for graduation in 2024; Bangladesh, the Lao People's Democratic Republic and Nepal are scheduled for graduation in 2026; and Solomon Islands is scheduled for graduation in 2027.

At the 2024 triennial review, Rwanda, Uganda and the United Republic of Tanzania were found to have met the graduation thresholds for the first time. All three countries met two of the three criteria, namely the economic and environmental vulnerability index criterion and the human assets index criterion. These countries are scheduled to be considered again in 2027 and, if they meet the criteria for a second time, could be recommended for graduation.

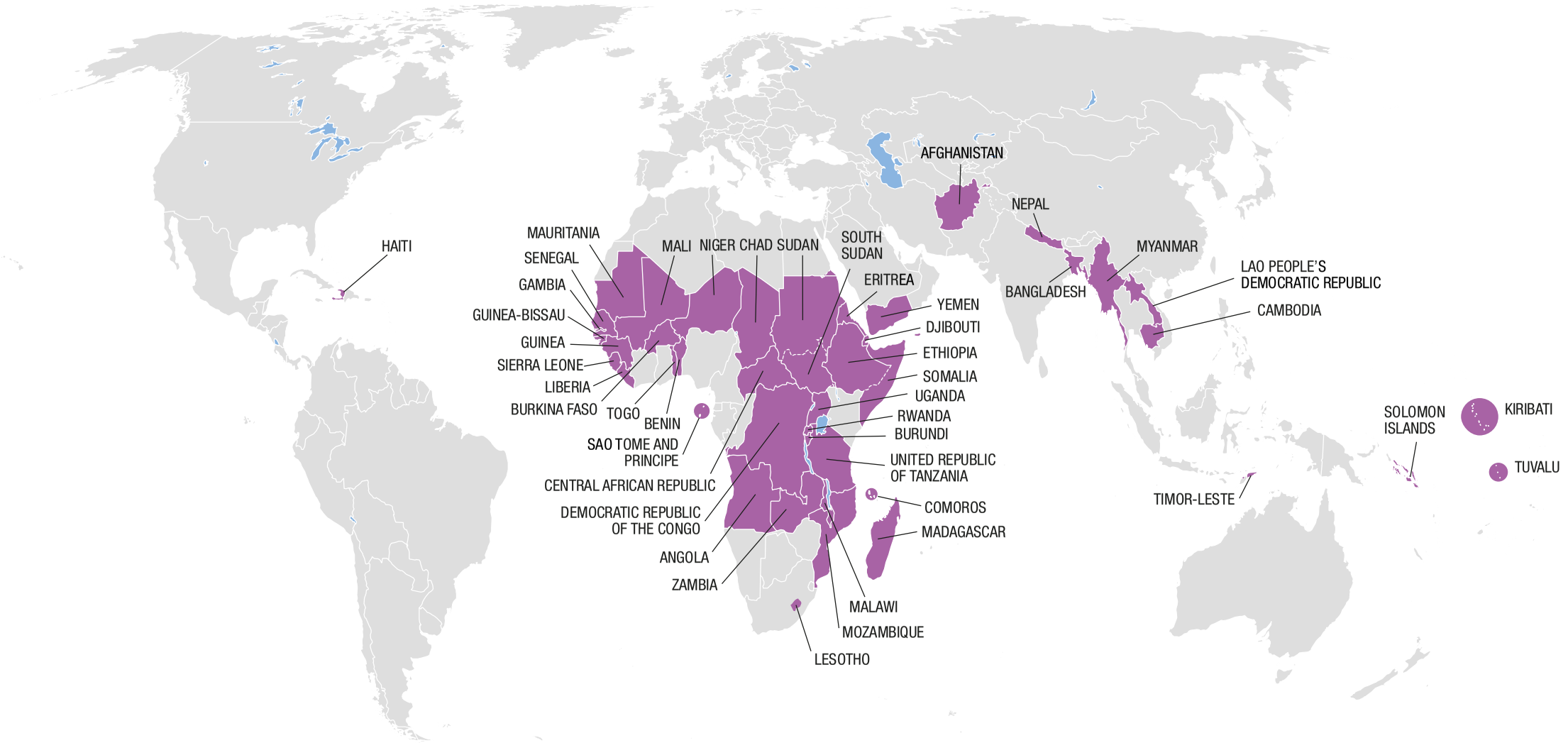
Kiribati and Tuvalu were recommended for graduation in 2018 and 2012, respectively, but the Economic and Social Council deferred a decision on their graduation. In resolution 2024/7, the Economic and Social Council, recalling its decision in 2021 to defer the consideration of the graduation of Kiribati and Tuvalu to 2024, further decided to consider their graduation at a later date.

At the 2024 triennial review of, the Committee for Development Policy decided to defer its decision on the graduation of Myanmar and Timor-Leste to 2027.

Least Developed Countries (LDCs)

45 countries

Africa 33, Asia 8, Caribbean 1, Pacific 3



Base map source UN Geospatial - August 2024

Note: The boundaries and names shown and the designations used on this map do not imply official endorsement or acceptance by the United Nations. Final boundary between the Republic of Sudan and the Republic of South Sudan has not yet been determined. Dotted line represents approximately the Line of Control in Jammu and Kashmir agreed upon by India and Pakistan. The final status of Jammu and Kashmir has not yet been agreed upon by the parties.

Abbreviations and acronyms

CO_2e	carbon dioxide equivalent
COP	Conference of the Parties
GDP	gross domestic product
GHG	greenhouse gas
ICAO	International Civil Aviation Organization
LDC	least developed country
NDC	nationally determined contribution
ODA	official development assistance
UNFCCC	United Nations Framework Convention on Climate Change

Foreword

As the world seeks innovative solutions to address the climate and finance crisis simultaneously and achieve the Sustainable Development Goals, carbon markets have emerged as a beacon of hope. These markets are seen as enablers of climate ambition and catalysts of capital flows towards developing countries, offering a promising pathway to unlock sustainable development. As carbon markets take shape, in line with Article 6 of the Paris Agreement, and initiatives to enhance the integrity of the voluntary carbon market emerge, we are stepping into a future filled with potential and pitfalls.

At this critical stage, *The Least Developed Countries Report 2024: Leveraging Carbon Markets for Development* tackles the essential and timely questions of whether, and to what extent, carbon markets can contribute to green structural transformation in the least developed countries. These countries have contributed only marginally to the climate crisis but are among the most climate-vulnerable countries in the world. Most least developed countries are small emitters of greenhouse gases, yet they have chosen to play an active part in the global response to climate change by setting ambitious targets in their nationally determined contributions. This presents challenges and opens up opportunities for synergies and building bridges across policy areas.

This report serves as a beacon of clarity through data-driven analysis and case studies, highlighting the current state of play and the future potential of carbon markets to mobilize finance and undertake mitigation of greenhouse gases in the least developed countries. The institutional requirements and technical capacities necessary for least developed countries to benefit from these markets are examined, while associated challenges and risks are highlighted. Furthermore, the report equips policymakers, climate negotiators and development practitioners with an evidence base and deeper understanding of the implications of participating in international carbon markets and conveys the importance of alignment with domestic policy priorities. In doing so, the report provides much needed clarity about what carbon markets can and cannot achieve in the least developed countries, empowering policymakers with comprehensive knowledge.

The analysis presented in the report shows that carbon markets are not a panacea that can solve the pressing issue of financing sustainable development in the least developed countries. They are not a substitute for official development assistance or for climate finance flows – particularly for adaptation, which is these countries' priority. Carbon markets represent one tool in the toolbox that can expand the range of options available for the least developed countries to implement their own plans for green structural transformation, while contributing to global efforts to limit greenhouse gas emissions.

This report delves into the potential of carbon markets as a catalyst for the economic development of the least developed countries. It explores how these countries can integrate carbon trading into their economic strategies, ensuring that environmental sustainability and economic growth go hand in hand. By examining case studies, best practices and policy recommendations, the report provides a comprehensive road map for the least developed countries to capitalize on the opportunities presented by carbon markets.

Rebeca Grynspan
Secretary-General of UNCTAD

Glossary

Term	Definition
Additionality (in the context of carbon markets)	A requirement that a mitigation project must result in greenhouse gas (GHG) emission reductions that are additional to what would have occurred in the absence of the project, to ensure that the emission reductions are beyond any reductions that would happen under a business-as-usual scenario.
Allowance	A permit that allows a company or entity to emit a certain amount of GHGs; each allowance typically equals one ton of carbon dioxide equivalent (CO_2e).
Article 6, paragraph 4 emission reductions under the Paris Agreement	Measurable reductions of GHG emissions from a particular activity or area over a defined period, quantified as metric tons of CO_2e; the credits, generated under the Article 6.4 mechanism and supervised by a United Nations body, can be traded in order to assist countries and entities in achieving emission reduction goals.
Cap and trade	A system whereby a limit (cap) is set on the total amount of GHGs that can be emitted by covered entities, with companies issued or purchasing emission permits, and required to hold a quantity of allowances equivalent to their emissions; companies exceeding their allowances must purchase additional permits.
Carbon credit	A tradable certificate representing emission reductions achieved through GHG mitigation projects.
Carbon leakage	Leakage occurs when a GHG mitigation project leads to an increase in GHG emissions outside the boundaries of the mitigation project, thereby undermining its global emission reduction efforts.
Carbon market	A market in which carbon credits or emission permits are bought and sold.
Carbon offset	A reduction in GHG emissions, or an increase in carbon storage, that is used to compensate for emissions that occur elsewhere as a result of industrial or other human activity, particularly in the context of a carbon trading mechanism.

Term	Definition
Carbon Offsetting and Reduction Scheme for International Aviation	A harmonized scheme established by the International Civil Aviation Organization (ICAO), whereby airplane operators acquire and cancel emission units from the global carbon market to offset emissions from their own operations.
Carbon tax	A fee imposed on the burning of fossil fuels (coal, oil, natural gas) based on their carbon content, aimed at reducing GHG emissions
Certified emission reduction	A Kyoto Protocol unit corresponding to one ton of CO_2e emissions, issued for verified emission reductions or removals achieved by projects approved under the Clean Development Mechanism.
Clean Development Mechanism	A system established under the Kyoto Protocol to permit developed countries to meet part of their binding climate targets by buying certified emission reduction units.
Compliance carbon market	A carbon market in which emission trading takes place to fulfil statutory carbon control requirements.
Conference of the Parties (COP)	The supreme decision-making body of the United Nations Framework Convention on Climate Change (UNFCCC), which convenes annually to review the implementation of the Convention and take decisions necessary to promote the effective implementation of the Convention.
Emission permit	The right to emit a certain amount of GHGs, allocated by regulatory bodies; also referred to as an emission allowance.
Emission reduction units	Units generated by joint implementation projects under the Kyoto Protocol, representing the reduction of one ton of CO_2e.
Emission trading system	A market-based approach to controlling GHG emissions, whereby emitters can buy or sell emission permits under a regulatory cap on total emissions.
Gold standard	A certification programme used to verify carbon emission reduction projects administered by the Gold Standard Foundation.

Term	Definition
Greenhouse gas	Gases that contribute to the greenhouse effect by absorbing infrared radiation; the main gases are carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride.
Greenwashing	The deceptive practice of making false, exaggerated or unsubstantiated claims about the environmental benefits of a product, service or practice.
Integrity of carbon credits	The credibility, reliability and trustworthiness of carbon credits in representing genuine, quantifiable and verifiable reductions or removals of GHG emissions.
Intergovernmental Panel on Climate Change	The United Nations body of scientists and experts responsible for assessing the science underpinning the concept of climate change, which provides policymakers with regular scientific assessments on climate change, its implications and potential future risks, as well as adaptation and mitigation strategies.
Internationally transferred mitigation outcomes	Units representing GHG reductions that can be traded under Article 6 of the Paris Agreement.
Joint implementation	A facility under the Kyoto Protocol that allowed annex B countries (or companies from those countries) to fund and/or run a project to reduce emissions in another annex B country.
Kyoto Protocol	An international treaty that operationalizes UNFCCC, adopted at the third session of COP on 11 December 1997 in Kyoto, Japan, under which annex B countries adopted legally binding commitments to reduce anthropogenic GHG emissions, which came into force on 16 February 2005.
Nationally determined contributions	Efforts defined by each Party to the Paris Agreement with regard to helping meet the long-term temperature reduction goals set out in the Agreement in the form of a climate action plan to cut emissions and adapt to climate-related impacts within a set time frame.
Paris Agreement	An international treaty on climate change adopted by 196 Parties to UNFCCC at COP 21 in Paris, on 12 December 2015, which entered into force on 4 November 2016.

Term	Definition
Programme of activity	Modality of project development under the Clean Development Mechanism or other carbon market frameworks that allows multiple emission reduction projects to be grouped together under a single administrative framework.
Project activities	Individual projects under the Clean Development Mechanism that aim to reduce GHG emissions.
Rules, modalities and procedures	Detailed guidelines established under the Paris Agreement that outline the technical and administrative processes necessary for the operation of mechanisms such as emission trading and emission reduction projects.
Suppressed demand	A situation in which minimum service levels necessary for human development are unavailable to people or only available at an inadequate level (e.g. in areas that are not connected to a power grid and emissions from electricity use are low or zero), introduced under the Clean Development Mechanism; this concept sought to enable the participation of countries with low historical and current emission levels, and accounting for suppressed demand in mitigation projects could lead to higher volumes of creditable emission reductions.
United Nations Framework Convention on Climate Change	An international environmental treaty established to address climate change, providing a framework for negotiating international agreements (protocols) that aim to stabilize GHG concentrations in the atmosphere in order to prevent dangerous human interference with the climate system; adopted on 9 May 1992 and entered into force on 21 March 1994.
Verified carbon standard	A certification programme that is used to verify carbon emission reduction projects administered by Verra, a carbon credit registry.
Voluntary carbon market	A decentralized market in which private actors voluntarily buy and sell carbon credits that represent certified removals or reductions of GHGs.

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.

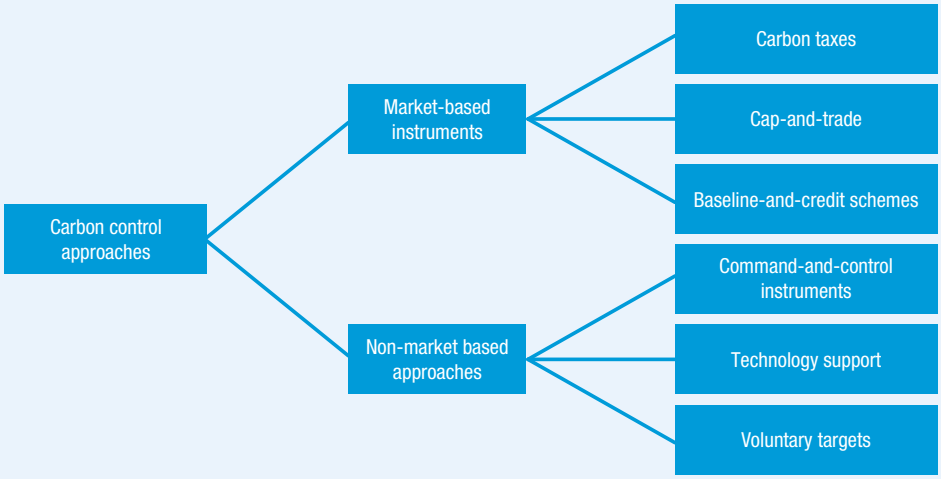
The Paris Agreement, adopted at the twenty-first Conference of the Parties to the UNFCCC (COP21) in 2015, created a global treaty regulating GHG emissions. The agreement takes a bottom-up approach, bringing together all countries under the principle of common but differentiated responsibilities. The 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.

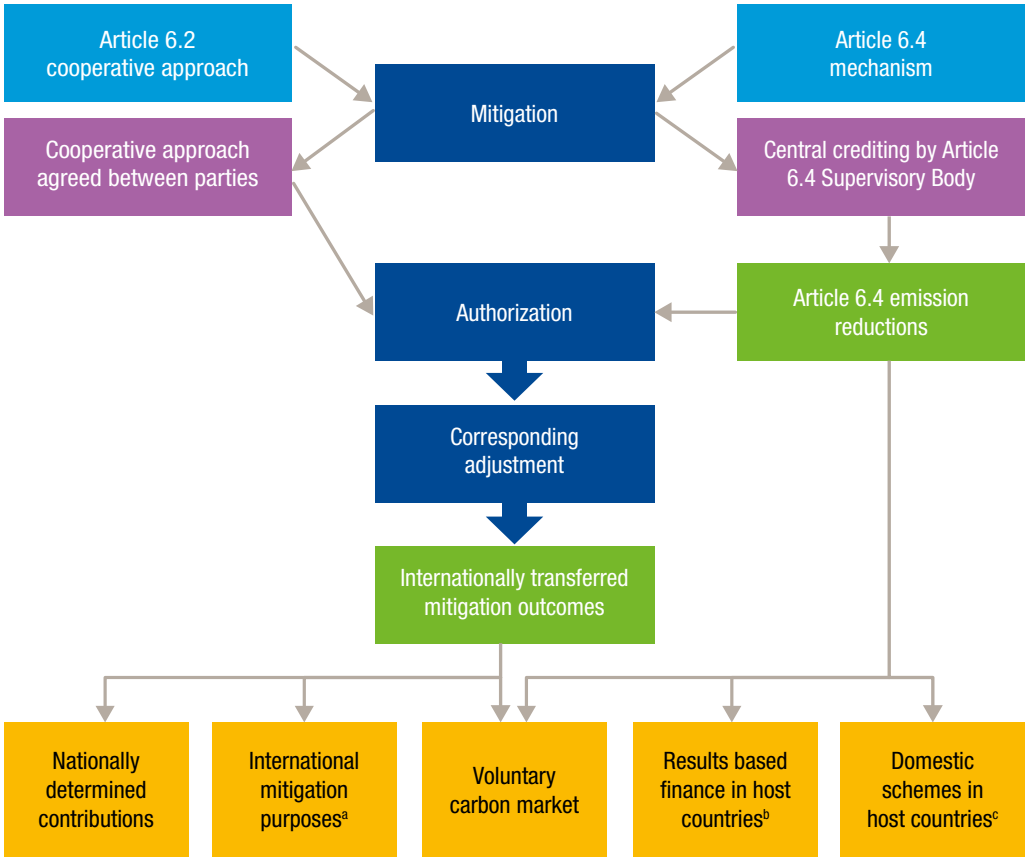
Carbon pricing is based on the principle that the costs of the negative externality caused by GHG emissions should be internalized into the decision-making processes of emitters. The two primary forms of carbon pricing are carbon taxes and emission trading systems. Carbon taxes impose a direct price 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.

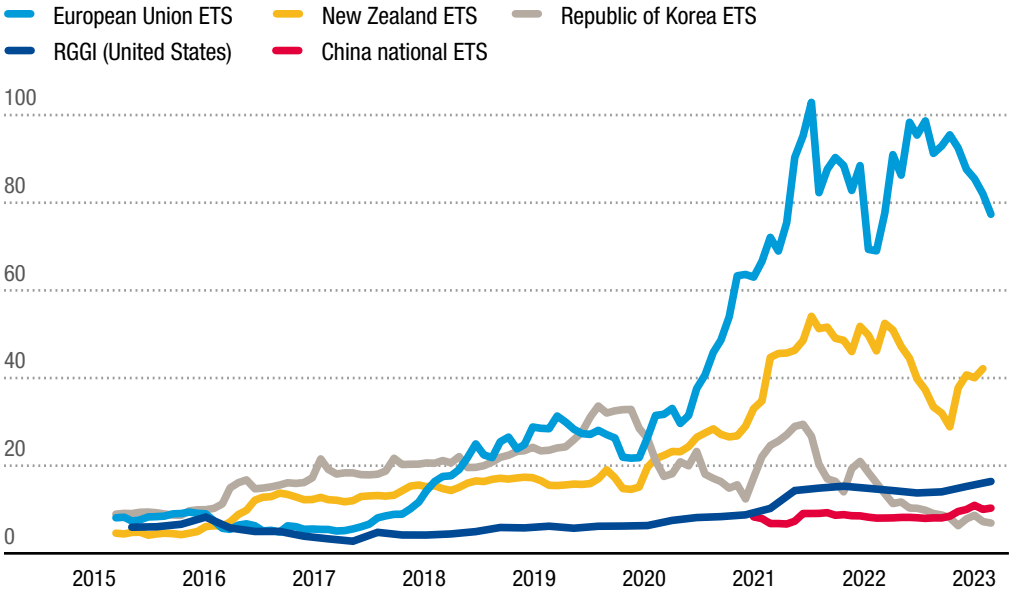
9 There are earlier examples of smaller scale schemes with voluntary participation, such as the United Kingdom Emissions Trading Scheme and a scheme covering CO_2 emissions in the electricity sector in Denmark.

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

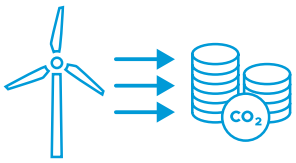
Scheme	Start	Share of GHG emissions covered (Percentage)	Carbon credits allowed
European Union ETS	2005	38	no
Alberta TIER (Canada)	2007	62	domestic
New Zealand ETS	2008	48	no
Switzerland ETS	2008	12	no
Regional Greenhouse Gas Initiative (United States)	2009	14	domestic
Tokyo CaT (Japan)	2010	18	domestic
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.

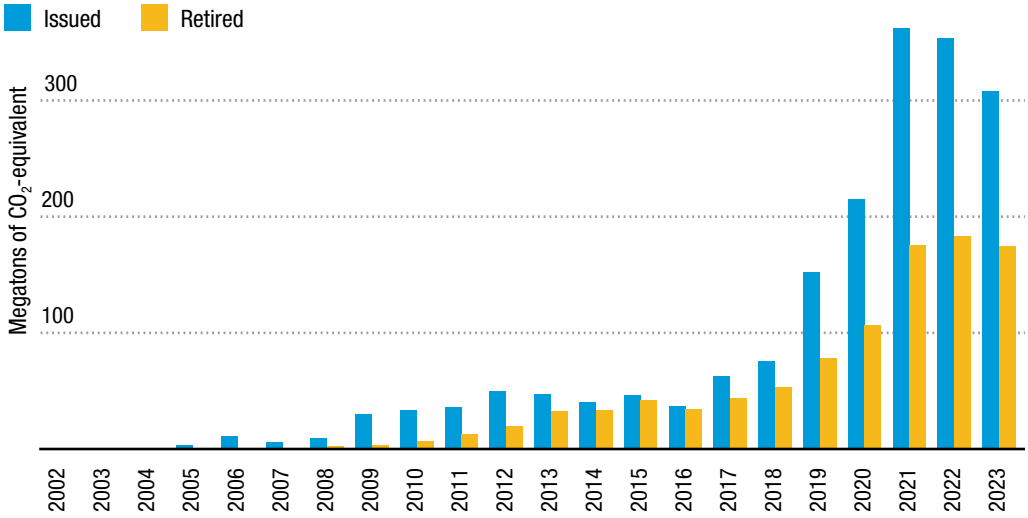
As carbon credits traded in the voluntary carbon market vary on multiple dimensions, there are large price differences between and within project types. In general, buyers pay price premiums for high integrity credits (i.e. those certified to more robust and stringent standards) and for credits that 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

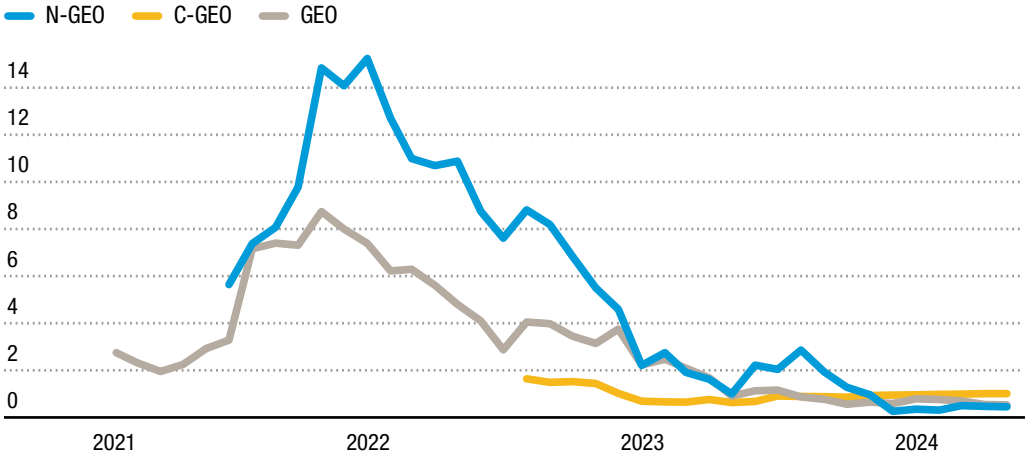


Source: UNCTAD, based on data in the Climate Focus Voluntary Carbon Market Dashboard (updated 8 March 2024), available at https://climatefocus.com/initiatives/voluntary-carbon-market-dashboard/ (accessed 10 March 2024).

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/

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The least developed countries report 2024

Chapter II

Carbon market participation: Opportunities, challenges and pitfalls

United Nations

A. Where do the least developed countries fit in carbon markets?

Development finance and climate finance delivered through bilateral and multilateral channels have proved insufficient to fund the investment needs of least developed countries (LDCs) for meeting their goals in key areas of sustainable development. Consequently, it is believed that carbon markets could be a possible source of additional finance for this purpose. This chapter provides an analysis of the current state of carbon markets and their future potential to mobilize finance for greenhouse gas (GHG) mitigation efforts in LDCs. Specific risks and opportunities associated with LDCs' participation in carbon trading under Article 6 of the Paris Agreement and through the voluntary carbon market are also discussed.

1. The performance and future potential of carbon markets in the least developed countries

(a) The current landscape and recent trends

Chapter 1 highlights in detail the global carbon market landscape including its structure and recent trends. To assess the performance and potential of carbon markets in LDCs, a two-step analysis is undertaken. First, the patterns and outcomes of baseline and credit schemes in LDCs are analysed, followed by an assessment of the potential for scaling up their carbon market activities.

LDCs were early participants in the voluntary carbon market. The Gold Standard and Verra, the two main standards on the voluntary carbon market and the dominant standards in LDCs, started issuing carbon credits in 2008 and 2009, respectively. The first carbon credits from LDC-hosted mitigation projects in the voluntary carbon market were issued in 2009 from a cookstoves project in Cambodia.[1] In 2010, carbon credits were issued from mitigation projects in 8 LDCs with the number rising to 16 by 2014. And by April 2024, 38 out of 45 LDCs were hosting mitigation projects that had issued carbon credits. The LDC share of credits issued from mitigation projects in the total credits from such project hosted by developing countries as a whole has been on the rise, from 5 per cent of cumulative issued credits in 2013 to 23 per cent in 2023. Moreover, 6 LDCs, namely Bangladesh, Cambodia, the Democratic Republic of the Congo, Malawi, Uganda and Zambia, were among the top 20 developing countries with the highest volume of issued credits.

Although there is some evidence that participation in the Clean Development

[1] Cookstove projects focus on replacing traditional stoves with cleaner, more efficient ones in order to reduce GHGs from wood fuel consumption, which is a major driver of deforestation. It is estimated that half of all wood harvested worldwide is used as fuel including for cooking (Bailis et al., 2015).

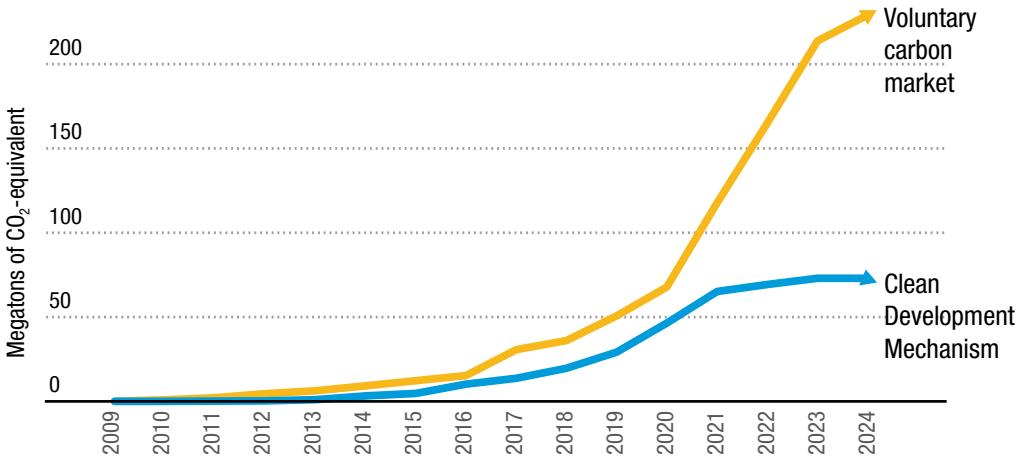
Mechanism can contribute to building domestic capacity for voluntary carbon market participation in developing countries, including LDCs (Andonova and Sun, 2019), LDC uptake of the Clean Development Mechanism was slower than for the voluntary carbon market, and participation remains less widespread. While the Clean Development Mechanism started to issue certified emission reduction credits in 2005, the first LDC-sourced certified emission reduction credits were not issued until 2010, when one project in the Lao People's Democratic Republic and another in the United Republic of Tanzania came online. By 2014, certified emission reduction credits had been issued from only seven LDCs, and, over the course of the lifespan of the Clean Development Mechanism, certified emission reduction credits were issued from 21 of the current 45 LDCs. The introduction of the operational mode of programme of activities under the Clean Development Mechanism, together with financial support for underrepresented host countries – including LDCs – played a key role in lowering transaction costs and facilitating access (UNFCCC, 2009). Overall, by May 2024, 37 per cent of all certified emission reduction credits issued from LDCs were sourced from programmes of activities, compared with only 2 per cent from other developing economies (ODEs).[2] In retrospect, LDCs played only a marginal role in the Clean Development Mechanism, collectively accounting for just 3 per cent of all certified emission reduction credits issued through the mechanism. This is due to the high concentration of certified emission reduction credit issuances in the three main certified emission reduction credit source countries: Brazil, China and India. Despite this, three LDCs, namely Bangladesh, Cambodia and Uganda, are among the top 20 developing countries with the highest volume of issued certified emission reduction credits.

Figure II.1 shows that, particularly since 2020, the voluntary carbon market was the main source of carbon credits from LDC-based baseline and credit schemes. From 2020 to 2021 the issuance of LDC-sourced carbon credits saw a growth spurt, increasing from 18 $MtCO_2e$ to

Figure II.1

The bulk of carbon credits sourced in least developed countries comes from the voluntary carbon market

Cumulative issued carbon credits from the Clean Development Mechanism and voluntary carbon market



Source: UNCTAD, based on data from the UNEP CDM pipeline and the registries of the Gold Standard, Verra, Plan Vivo and Climate Forward.

Note: Data for 2024 cover the period 1 January to 30 April 2024.

[2] UNCTAD calculation based on data in the UNEP Clean Development Mechanism pipeline as of 30 April 2024.

51 $MtCO_2e$. During the same period, the Clean Development Mechanism was starting to wind down as it stopped accepting new project registrations on 31 December 2020 and preparations for a successor scheme under Article 6.4 of the Paris Agreement commenced. Overall, as on May 2024, 310 $MtCO_2e$ worth of credits were issued by baseline and credit schemes for mitigation projects hosted by LDCs. Of these, 237 $MtCO_2e$ (76 per cent) were issued in the voluntary carbon market and 73 $MtCO_2e$ (24 per cent) under the Clean Development Mechanism.

Both voluntary carbon market and Clean Development Mechanism participation is highly concentrated within the LDC group.[3] As on May 2024, the six largest LDC host countries – Bangladesh, Cambodia, the Democratic Republic of the Congo, Malawi, Uganda and Zambia – jointly accounted for 75 per cent of all carbon credits issued from LDC-hosted projects in the voluntary carbon market (table II.1). Concentration is even higher for the Clean Development Mechanism, with the 6 largest host countries – Bangladesh, Cambodia, Malawi, Myanmar, Nepal and Uganda – accounting for 80 per cent of all issued certified emission reduction credits. A major factor driving concentration across countries is the presence of particularly large individual projects or groups of projects, which in turn also implies high concentration at the country level. For instance, the Mai Ndombe REDD+ Project in the Democratic Republic of the Congo (see chapter III for a case study) accounts for

Table II.1

Baseline and credit schemes are highly concentrated within the least developed country group

Total issued credits in least developed countries as of May 2024

	Country	Share in LDC total (Percentage)	Cumulative share (Percentage)
Voluntary carbon market Total volume in LDCs as of May 2024: 237 $MtCO_2e$	Cambodia	22	22
	Democratic Republic of the Congo	14	36
	Bangladesh	12	49
	Uganda	11	60
	Malawi	8	68
	Zambia	7	75
Clean Development Mechanism Total volume in LDCs as of May 2024: 73 $MtCO_2e$	Bangladesh	26	26
	Uganda	17	44
	Cambodia	13	57
	Myanmar	10	66
	Nepal	7	74
	Malawi	6	80

Source: UNCTAD, based on data from the UNEP CDM pipeline and the registries of the Gold Standard, Verra, Plan Vivo and Climate Forward.

Note: Figures have been rounded to full percentages.

[3] High concentration is also a feature of FDI and ODA flows to LDCs. For instance, in 2023, the six largest FDI destinations among LDCs accounted for 58 per cent of total FDI inflows to the LDCs (calculation based on data provided with UNCTAD (2024)) and, in 2022, the six largest ODA recipients among LDCs accounted for 41 per cent of total ODA flows to LDCs (calculation based on data from the OECD Creditor Reporting System).

92 per cent of all voluntary carbon market credits issued in that country as on May 2024. And the Dapein Hydropower Project in Myanmar accounts for 69 per cent of all certified emission reduction credits issued in that country. Five projects designed to reduce leakages in local gas distribution networks account for 80 per of voluntary carbon market credits and for 63 per cent of certified emission reduction credits for Bangladesh. And in Malawi, five cookstove projects registered under Verra by the same project developer, account for 53 per cent of all voluntary carbon market credits in that country. Incidentally, this is the same company that developed four of the five gas leakage projects in Bangladesh and numerous carbon projects in other LDCs and ODEs suggesting that there is also concentration at project developer level.

There is also concentration at the sectoral level with 52 per cent of credits issued in the voluntary carbon market originating from nature-based solutions and another 35 per cent from household-level interventions (figure II.2).

Nature-based solution credits sourced in LDCs come almost exclusively from the forestry sector, and primarily from REDD+ activities. Within the household category, cookstove projects account for 84 per cent of issued credits and 15 per cent from interventions aimed at improving access to clean water through boreholes and household water purifiers.[4] Cookstoves projects are widely deployed in LDCs, as they are relatively low-cost compared to other mitigation options. And they seem to address an area of Sustainable Development Goal 7 (Affordable and clean energy) that is particularly relevant for LDCs, where, as on 2021, there were 891 million people (40 per cent of the global total) who relied mainly on polluting fuels and technologies for cooking.[5] It is not surprising, therefore, that 41 LDCs have included clean cooking or related goals in their nationally determined contributions (NDCs) (Clean Cooking Alliance, 2024).

The share of renewable energy-based carbon credits in LDCs is negligible, at 2 per cent of issued credits, whereas in ODEs, this is the largest sectoral category, accounting for 45 per cent, compared with only 8 per cent for household projects.

The sectoral distribution of issued credits is different for LDCs under the Clean Development Mechanism (figure II.3). Here, renewable energy accounts for the largest share (41 per cent), followed by household projects (39 per cent). Within the renewable energy category, the share of hydropower projects is 96 per cent of issued credits, while that of solar is only 1 per cent and no credits were issued for wind power projects. This is in stark contrast to ODEs, where wind power projects account for 47 per cent of all credits issued in the renewable energy category. In this context, high upfront investment costs of technology, infrastructure and grid integration, as well as technical capacity limitations, are likely the major barriers to implementing wind power projects in LDCs (Diógenes et al., 2020). More than two thirds of household-based credits come from cookstoves. The significant share of credits issued in the non-renewable energy sector does not reflect a general pattern; rather, it is due to large-scale projects that aim at reducing leakages from natural gas networks in Bangladesh[6] and a new gas-fired power plant in Mozambique.[7]

[4] Figures are rounded percentages; based on data from the Voluntary Carbon Market Dashboard by Climate Focus (updated 7 May 2024). Lighting and solar home systems account for less than 0.5 per cent of credits from the household category.

[5] UNCTAD calculation based on WHO Global Health Observatory, available at https://www.who.int/data/gho (accessed 5 June 2024).

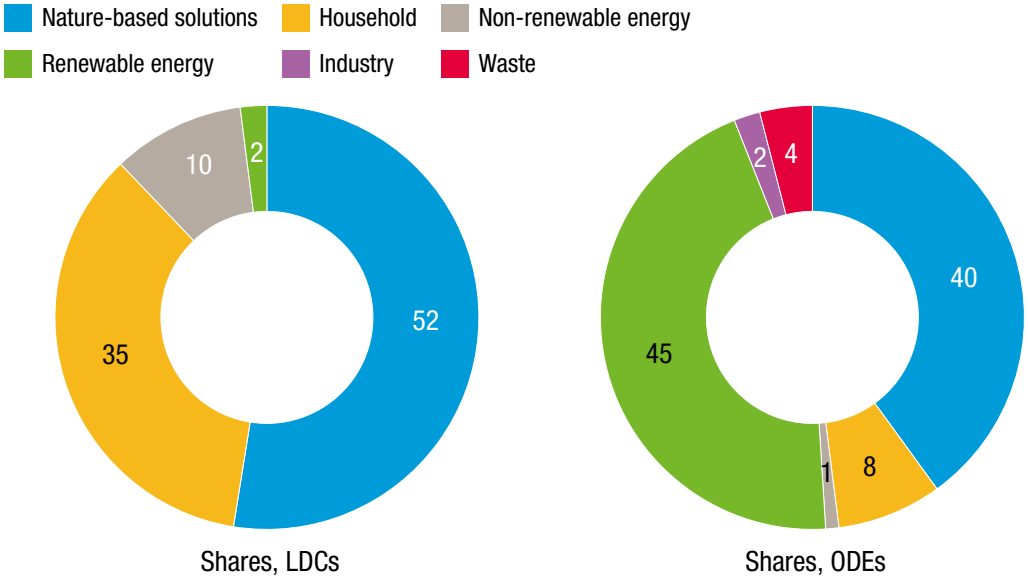
[6] See https://cdm.unfccc.int/Projects/DB/TUEV-RHEIN1418008670.0/history, https://cdm.unfccc.int/Projects/DB/RINA1583155371.9/history, https://cdm.unfccc.int/Projects/DB/RINA1583158638.05/history, https://cdm.unfccc.int/Projects/DB/RINA1583318622.49/history and https://cdm.unfccc.int/Projects/DB/RINA1583328291.33/history.

[7] See https://cdm.unfccc.int/Projects/DB/CarbonCheck_Cert1479296630.72/view.

Figure II.2

Nature-based and household projects account for the bulk of credits issued in the voluntary carbon market in least developed countries

Shares of issued credits in the voluntary carbon market, by sector and country group* (Percentage)



* Cumulative until May 2024

Source: UNCTAD calculations, based on data from the registries of the American Carbon Registry, Architecture for REDD+ Transactions, Biocarbon, Cercarbono, Climate Action Reserve, Climate Forward, Global Carbon Council, Gold Standard, Plan Vivo, Puro.earth and Verra, and the Voluntary Carbon Market Dashboard of Climate Focus (updated 7 May 2024).

Notes: Percentages may not total 100 due to rounding. "Non-renewable energy" comprises all project types along the value chains of fossil fuel industries, including reducing fugitive emissions from natural gas networks, fuel switching to natural gas in power generation, coal mine methane, and gas recovery and utilization from oilfields. Fuel switching to natural gas in industrial plants is included under industry. Shares for LDCs do not show industry and waste, which account for less than 0.1 per cent of issued credits; likewise, a category "other", comprising the sum of carbon capture and storage and transport, is not shown.

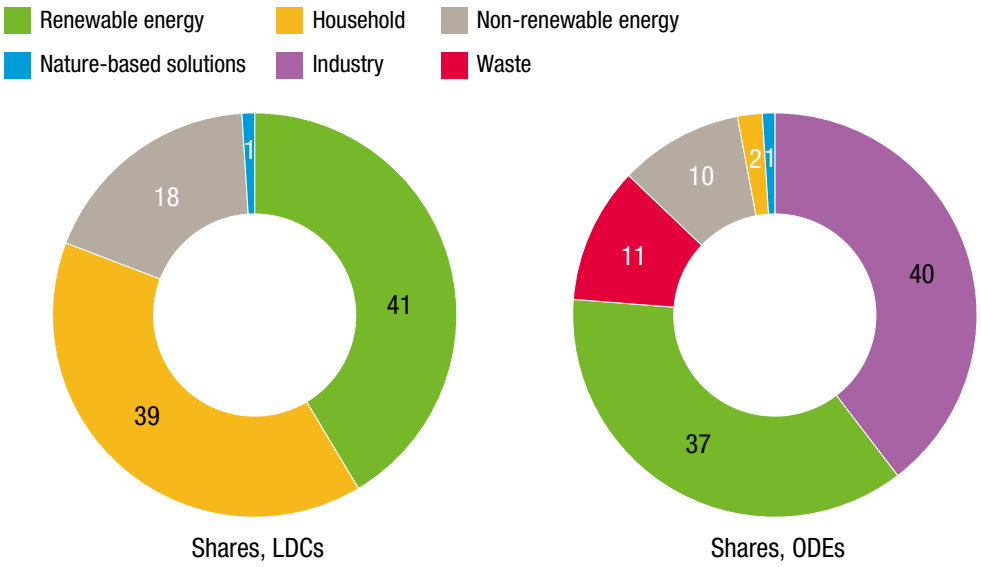
The bulk of carbon credits from baseline and credit schemes in LDCs originates from mitigation projects that aim at reducing emissions through forest protection, cleaner cookstoves and renewable energy. Overall, emissions reductions accounted for 96 per cent of all issued credits for the period January 2009 to May 2024, compared with only 4 per cent in the carbon removal category (comprising mainly reforestation and afforestation projects). The major reasons for this difference are the longer implementation periods and higher upfront costs of reforestation and afforestation projects, issues relating to monitoring and verification of sequestered carbon and risks, as well as uncertainties with regard to permanence. The distinction between emission reductions and removal is important in the context of carbon markets as the latter trades at a significant premium in the voluntary carbon market. For example, in 2023, removal-based credits traded at a premium of 245 per cent over the counter in the voluntary carbon market (Forest Trends' Ecosystem Marketplace, 2024).

Owing to the lack of transparency in carbon markets, in particular with regard to benefit-sharing, it is not possible to assess the volume of funds that were transferred to LDCs through those markets. However, it is possible to estimate the market value of LDC-sourced carbon credits in the voluntary carbon market by using average prices paid in market transactions and the volumes of issued credits. It must be noted that this market value does not represent

Figure II.3

Renewable energy and household projects account for 80 per cent of credits issued under the Clean Development Mechanism in least developed countries

Shares of issued credits in total credits under the Clean Development Mechanism, by sector and country group*
(Percentage)



* Cumulative to May 2024

Source: UNCTAD calculations, based on data from the UNEP CDM pipeline.

Note: Percentages may not total 100 due to rounding. In this chapter, certified emission are classified in the same categories as voluntary carbon market credits shown in figure II.2 to allow comparability of sectoral shares and volumes across all baseline and credit schemes. For «non-renewable energy», please see the note to figure II.2. Fuel switching to natural gas in industrial plants is included under industry. Shares for LDCs do not show industry and waste, which account for less than 0.5 per cent of issued credits; likewise, transport is not shown.

the size of financial transfers to the LDC host countries from underlying projects, since carbon markets are characterized by the presence of brokers, resellers and other intermediaries, all of which extract significant shares of the value created by mitigation activities (Carbon Market Watch, 2023). Calculating the market value of certified emission reduction credits sourced from LDCs faces similar constraints as for the voluntary carbon market. Although certified emission reduction credits are all certified by a centralized authority (the Clean Development Mechanism Executive Board), they are traded on various marketplaces, but with considerable price differentiation along underlying project characteristics. However, average prices paid on the United Nations online platform for voluntary cancellation of certified emission reduction credits are reported by the UNFCCC (2024), which are used to calculate the market values shown in table II.2.

The available data indicates that LDC-hosted mitigation projects in the voluntary carbon market and under the Clean Development Mechanism generated an estimated market value of $75.8 million in 2019, increasing to $305.1 million in 2021 due to a large rise in the value of nature-based credits (table II.2). In 2022, the market value increased to $403.5 million but dipped slightly to $403 million in 2023. Also in 2023, the household category – the bulk of which comprises cookstoves projects – became the largest category in the voluntary carbon market for the first time, in terms of both volume and value, accounting for 59 per cent of the

Table II.2

Baseline and credit schemes in least developed countries created a market value of $403 million in 2023

Volumes, average prices and market value of carbon credits sourced from least developed countries

Sector	2019			2020			2021			2022			2023		
	Volume ($MtCO_2e$)	Price ($/tCO_2e$)	Value (millions of $)	Volume ($MtCO_2e$)	Price ($/tCO_2e$)	Value (millions of $)	Volume ($MtCO_2e$)	Price ($/tCO_2e$)	Value (millions of $)	Volume ($MtCO_2e$)	Price ($/tCO_2e$)	Value (millions of $)	Volume ($MtCO_2e$)	Price ($/tCO_2e$)	Value (millions of $)
Nature-based solutions	11.11	4.33	48.10	12.47	5.40	67.36	40.23	5.78	232.54	21.92	10.14	222.30	15.96	9.72	155.12
Household	4.47	3.84	17.17	5.35	4.34	23.24	6.02	5.36	32.28	11.88	8.55	101.59	30.70	7.70	236.40
Renewable energy	0.36	1.42	0.51	0.55	1.08	0.60	0.96	2.16	2.07	0.91	4.16	3.80	0.92	3.88	3.56
Industry/ non-renewable energy	0.00	3.87	0.00	0.00	0.98	0.00	4.11	2.16	8.88	13.04	5.39	70.30	1.27	3.65	4.65
Waste	0.01	2.45	0.04	0.02	2.69	0.05	0.00	3.63	0.02	0.01	7.23	0.06	0.00	7.48	0.03
Total voluntary carbon market			65.82			91.24			275.77			398.05			399.76
Clean Development Mechanism	9.55	1.04	9.94	17.25	0.97	16.73	18.72	1.57	29.40	4.15	1.30	5.40	3.68	0.87	3.20
Total baseline and credit			75.80			108.00			305.20			403.50			403.00

Source: UNCTAD calculations, based on data from Forest Trends' Ecosystem Marketplace, 2021, 2022, 2023, 2024), the registries of the Gold Standard, Verra, Plan Vivo and Climate Forward, UNEP CDM pipeline and UNFCCC (2024).

Note: Due to rounding, some totals may not correspond with the sum of the separate figures. Certified emission reduction credit prices are based on average prices on the United Nations online platform for voluntary cancellation of certified emission reductions. Sectoral disaggregation for average certified emission reduction prices is not included in UNFCCC reports on this platform.

total market value of LDC-hosted mitigation projects in the voluntary carbon market and under the Clean Development Mechanism.

The value created by carbon markets is small compared to other external finance flows to the least developed countries

Overall, the value created by LDCs-hosted mitigation projects in carbon markets is small compared to other external finance flows to LDCs, which themselves are insufficient to meet the needs of LDCs (UNCTAD, 2023a). For instance, the market value of $403 million created by LDC-sourced carbon credits in 2023 corresponded to 1.3 per cent of the $31 billion of foreign direct investment (FDI) inflows, 1.1 per cent of net bilateral official development assistance (ODA) flows from Development Assistance Committee members and 0.6 per cent of the $66 billion remittances received by LDCs.[8] Moreover, the actual financial transfers to LDCs and communities hosting mitigation projects were significantly lower than the value created by downstream market transactions. This suggests that, so far, carbon markets have not made a significant contribution to sustainable development finance or to climate finance in the LDCs.

(b) The potential for land-based GHG mitigation in the least developed countries

Land-based emissions (i.e. emissions from land-use change, forestry and agriculture)[9] are responsible for the bulk of the LDCs' GHG emissions (UNCTAD, 2022). In 2021, total GHG emissions of the LDCs, including land-based emissions, amounted to 2.99 gigatons of CO_2-equivalent ($GtCO_2e$).[10] Of these, 1.35 $GtCO_2e$ (45 per cent) were from land-use change and forestry and 1 $GtCO_2e$ (33 per cent) was from agriculture. While the LDCs as a group were responsible for only 6 per cent of global GHG emissions in 2021, they accounted for 17 per cent of global GHG emissions from agriculture and for 42 per cent of GHG emissions from land-use change and forestry from all countries with net-positive emissions in this category. The Democratic Republic of the Congo accounted for the bulk of GHG emissions from land-use change and forestry in LDCs (630 $MtCO_2e$), followed by Myanmar (113 $MtCO_2e$) and Mozambique (73 $MtCO_2$). The three LDCs with the largest GHG emissions from the agricultural sector in 2021 were Ethiopia (124 $MtCO_2e$), Bangladesh (88 $MtCO_2e$) and Chad (82 $MtCO_2e$). These figures highlight the importance of land-based GHG emissions in LDCs and point to a significant potential in LDCs to contribute to global GHG mitigation efforts.

To assess the potential for land-based climate mitigation in LDCs, a dataset provided by Roe et al. (2021) is used.[11] It covers the forestry and agricultural sectors,[12] which also encompasses cookstoves and other household level interventions where mitigation is based on reduced collection of fuelwoods. This means that the sectoral scope of the analysis below of LDCs' mitigation potential covers the main projects currently funded through carbon markets in these countries, as nature-based credits and cookstoves make up 88 per cent of credits in the voluntary carbon market and 77 per cent of total credits issued through baseline and credit schemes (voluntary carbon market and Clean Development Mechanism combined).

Roe et al. (2021) cover projections up to 2050, and provide an assessment of country-level land-based mitigation potential disaggregated by sector. Their study also estimates both the technical

[8] Based on data from the *World Investment Report 2024* (UNCTAD, 2024), preliminary figures included in *ODA levels in 2023* (OECD, 2024), and the World Bank, World Development Indicators database, respectively.

[9] These emissions calculations are based on data in the Climate Watch online database, available at https://www.climatewatchdata.org/ghg-emissions (accessed 11 July 2024). The land-use change and forestry categories also include emissions from drained organic soils and fires.

[10] 1 $GtCO_2e$ = 1 000 $MtCO_2e$.

[11] See annex 2 for detailed notes on methodology notes for data usage and adaptation, based on Roe et al. (2021).

[12] In addition to forests, the data also cover peatland, grassland and mangroves, with the latter being one of the "blue carbon" ecosystems.

and cost-effective potential for mitigation. The cost-effective potential (the basis of the figures presented below) includes economically viable interventions at a carbon price of $100/tCO$_2$e. As this threshold is much higher than current prices for carbon credits, the estimates should be seen as an upper bound of a realistic potential. The global estimates of Roe et al. (2021) are in a similar range as previous assessments including IPCC (2015) and UNEP (2017). Naturally, the analysis presented in this chapter is subject to the caveats of Roe et al. (2021) such as the risk that future climate change impacts could reduce the potential for land-based mitigation.

For the period 2020–2050, the total cost-effective mitigation potential at $100/tCO$_2$e of land-based measures in LDCs is estimated to be 1 794 MtCO$_2$e/year, representing 15 per cent of the global cost-effective mitigation potential. Figure II.4 provides a breakdown of the cost-effective potential of different land-based measures as a percentage of total emissions. The data shows that the largest mitigation potential in LDCs lies in protecting forests and other ecosystems, accounting for 47 per cent of the total, followed by sequestering carbon through agricultural practices with a share of 28 per cent of the total potential. The restoration and management of forests and other ecosystems also have significant potential, at 14 per cent and 8 per cent, respectively.

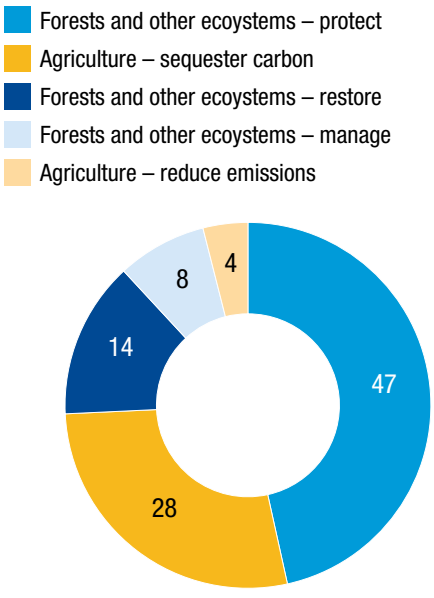
At the country level, the data shows significant variation in the mitigation potential (figure II.5). For instance, the Democratic Republic of the Congo shows the highest mitigation potential, at 382 MtCO$_2$e/year, mainly due to its vast natural forests and other ecosystems,[13] followed by Myanmar with 169 MtCO$_2$e/year and the United Republic of Tanzania with 123 MtCO$_2$e/year. The Democratic Republic of the Congo and Myanmar are among the top 15 countries worldwide with the highest cost-effective mitigation potential from land-based measures (Roe et al., 2021). At the other end of the spectrum, there are 17 LDCs where the cost-effective land-based mitigation potential is less than 10 MtCO$_2$e/year.

There are also significant differences between countries in terms of the sectoral composition of the land-based mitigation potential. For 16 LDCs, protecting forests and other ecosystems holds the largest potential, while the largest category for 22 LDCs is carbon sequestration in agriculture.

Figure II.4

Forests contain the bulk of land-based greenhouse gas mitigation potential in least developed countries

Shares of cost-effective annual mitigation potential (MtCO$_2$e) at $100/tCO$_2$ in least developed countries as a group, 2020–2050
(Percentage)



Source: UNCTAD, based on data from Roe et al. (2021).

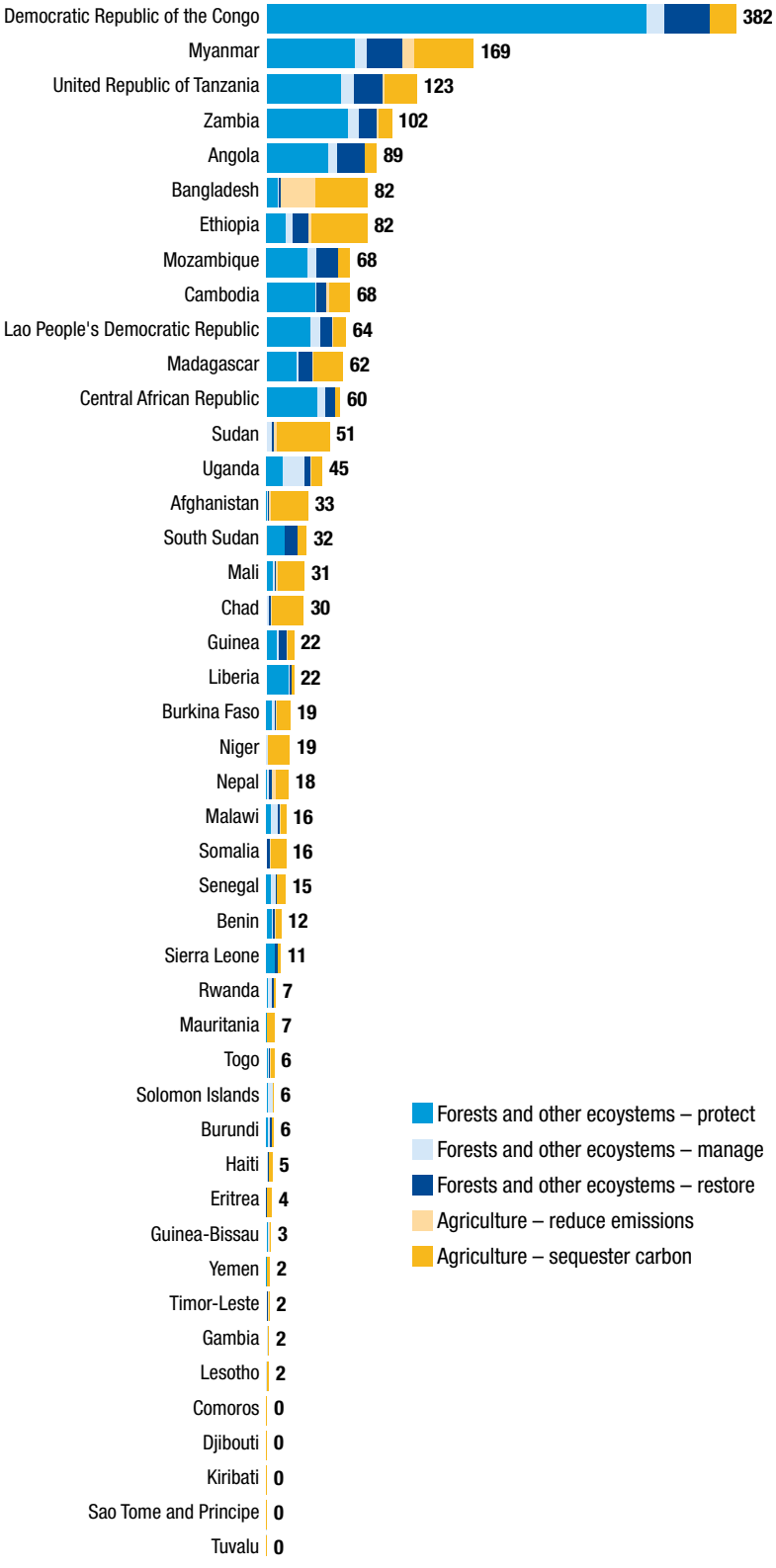
Note: Percentages may not total 100 due to rounding.

[13] Initiatives and support mechanisms focused on leveraging the unique potential of the Democratic Republic of the Congo for REDD+ activities include the Central African Forest initiative, the National REDD+ Fund, the European Union REDD Facility and the Forest Carbon Partnership Facility.

Figure II.5

Land-based greenhouse gas mitigation potential varies across least developed countries

Estimated annual mitigation potential mitigation potential of the least developed countries, 2020–2050 ($MtCO_2e$) at $\$100/tCO_2$



Source: UNCTAD, based on data from Roe et al. (2021).

At the sectoral level, the Democratic Republic of Congo shows the highest total mitigation potential in protecting forests and other ecosystems, with an estimated 310 $MtCO_2e$/year, or 37 per cent of the total LDC potential in this category. It is followed by Myanmar, Zambia, the United Republic of Tanzania and Angola, with potentials of 72 $MtCO_2e$/year, 67 $MtCO_2e$/year, 61 $MtCO_2e$/year and 51 $MtCO_2e$/year, respectively. In the "forest and other ecosystems – manage" category, the five LDCs with the highest mitigation potential are Uganda (18 $MtCO_2e$/year), the Democratic Republic of the Congo (14 $MtCO_2e$/year), Myanmar (11 $MtCO_2e$/year), the United Republic of Tanzania (10 $MtCO_2e$/year) and Zambia (8 $MtCO_2e$/year). Following a similar pattern, the highest mitigation potentials in restoring forests and other ecosystems lie in the Democratic Republic of the Congo (37 $MtCO_2e$/year), Myanmar (28 $MtCO_2e$/year), the United Republic of Tanzania (23 $MtCO_2e$/year) and Angola (18 $MtCO_2e$/year).

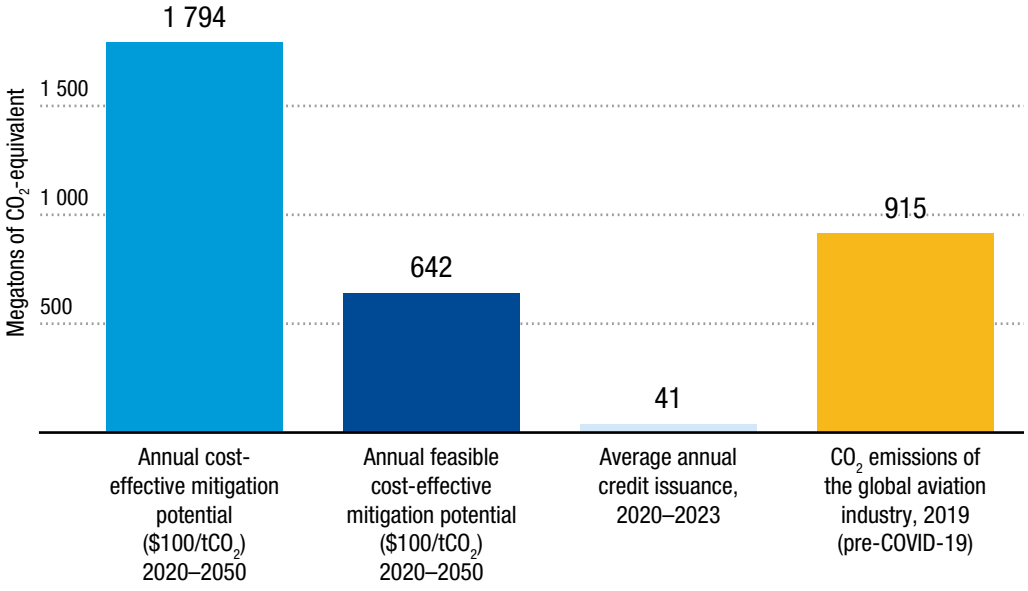
The country with the largest potential to sequester carbon in agriculture is Myanmar (48 $MtCO_2e$/year), followed by Ethiopia (45 $MtCO_2e$/year) and the Sudan (43 $MtCO_2e$/year). While emissions reduction in the agricultural sector accounts for only 4 per cent of the total cost-effective potential mitigation in the LDCs, it presents significant opportunities, particularly for Bangladesh, with a mitigation potential of 29 $MtCO_2e$/year, or roughly 45 per cent of the total for LDCs.

During the period 2020–2023, the average annual credit volume issued for nature-based solutions and household interventions in the voluntary carbon market and the Clean Development Mechanism amounted to 41 $MtCO_2e$ corresponding to 2.3 per cent of the 1,794 $MtCO_2e$ cost-effective land-based mitigation potential in LDCs (figure II.6). This figure shows that, so far, carbon markets unlocked only a minor share of the land-based mitigation potential of LDCs. However, there are significant differences at the country level. At the upper end of the spectrum, Malawi and Rwanda have a share of 29 per cent and 24 per cent, respectively, followed by Cambodia with

Carbon markets have harnessed **only a small share of land-based mitigation potential** in least developed countries

Figure II.6

Carbon markets have unlocked only a small share of land-based mitigation potential in least developed countries



Source: UNCTAD, based on data from Roe et al. (2021), the UNEP CDM pipeline, the registries of the Gold Standard, Verra, Plan Vivo and Climate Forward, and ICAO (2022).

15 per cent. Four other LDCs shares are in the range of 5–10 per cent (see annex table 1.1 for the shares of all the LDCs). There is also a stark contrast between the share of carbon removal in carbon credit volumes and total land-based mitigation potential in LDCs. While removals account for only 4 per cent of credit volumes issued in baseline and credit schemes, they contain an estimated share of 44 per cent of the cost-effective mitigation potential in LDCs.[14] Since credit prices for removal-based credits are significantly higher and more stable than for emission reductions, carbon removals represent an opportunity to expand carbon market activities in a particularly attractive market segment.

Improving the enabling conditions for investments in greenhouse gas mitigation in least developed countries is crucial

Two main factors that explain the low volume of land-based carbon credits issued compared with their cost-effective potential are the feasibility of mitigation projects in LDCs and the price of land-based carbon credits. The term "feasibility" here refers to the capacity of a country to effectively implement land-based mitigation projects. It includes all factors that determine the likelihood of cost-effective mitigation projects being undertaken. Feasibility scores in Roe et al. (2021) encompass enabling conditions across economic, institutional, geophysical, technological, sociocultural and environmental-ecological dimensions, based on the definition of feasibility by the Intergovernmental Panel on Climate Change (IPCC). The median feasibility score for implementing land-based mitigation measures in the LDCs is 36, which is low compared to ODEs (48) and developed countries (64). Thirty-three LDCs rank within the 25th percentile, while the remaining 12 rank within the 50th percentile, indicating that LDCs face significant barriers to implementing land-based mitigation measures. These figures also suggest that investments in strengthening the feasibility of land-based mitigation projects in LDCs, including through capacity-building, could contribute to unlocking their potential.

Using these country-level feasibility scores to scale the cost-effective mitigation potential at $100/t$CO_2$ in LDCs leads to an estimated feasible cost-effective mitigation potential of 642 $MtCO_2e$ per year (figure II.6). This corresponds to 70 per cent of the CO_2 emissions of the global aviation industry in 2019[15] (the last year before the COVID-19 pandemic caused a drop in air traffic), equivalent to 2 per cent of global anthropogenic CO_2 emissions.

An analysis of feasibility scores, combined with information on economy-wide emissions and mitigation potentials, provides a clearer picture of where investments can be the most effective. It also highlights specific challenges and opportunities faced by LDCs. Following Roe et al. (2021), figure II.7 plots the feasibility scores against the cost-effective potential as a percentage of GHG emissions. Based on this presentation, LDCs can be broadly categorized into six sections (A to F). Countries in sections A and B possess a land-based mitigation potential greater than 100 per cent of total country emissions and are thus potential carbon sinks. Countries in the middle sections (C and D) have potentials between 30 per cent and 100 per cent, while countries in sections E and F have less than 30 per cent mitigation potential relative to total emissions, primarily due to their low land-based mitigation potential.

Section A (very high potential, low feasibility) contains 10 LDCs, including the Democratic Republic of the Congo, Burundi and Myanmar, indicating high cost-effective potential but with existing implementation barriers. Section B (very high potential, medium feasibility) includes Rwanda and Uganda, which have high cost-effective potential with moderate feasibility. Section C (high potential, low feasibility) includes 18 LDCs, predominantly in Africa where the potential for land-based mitigation measures is significant, but the capacity

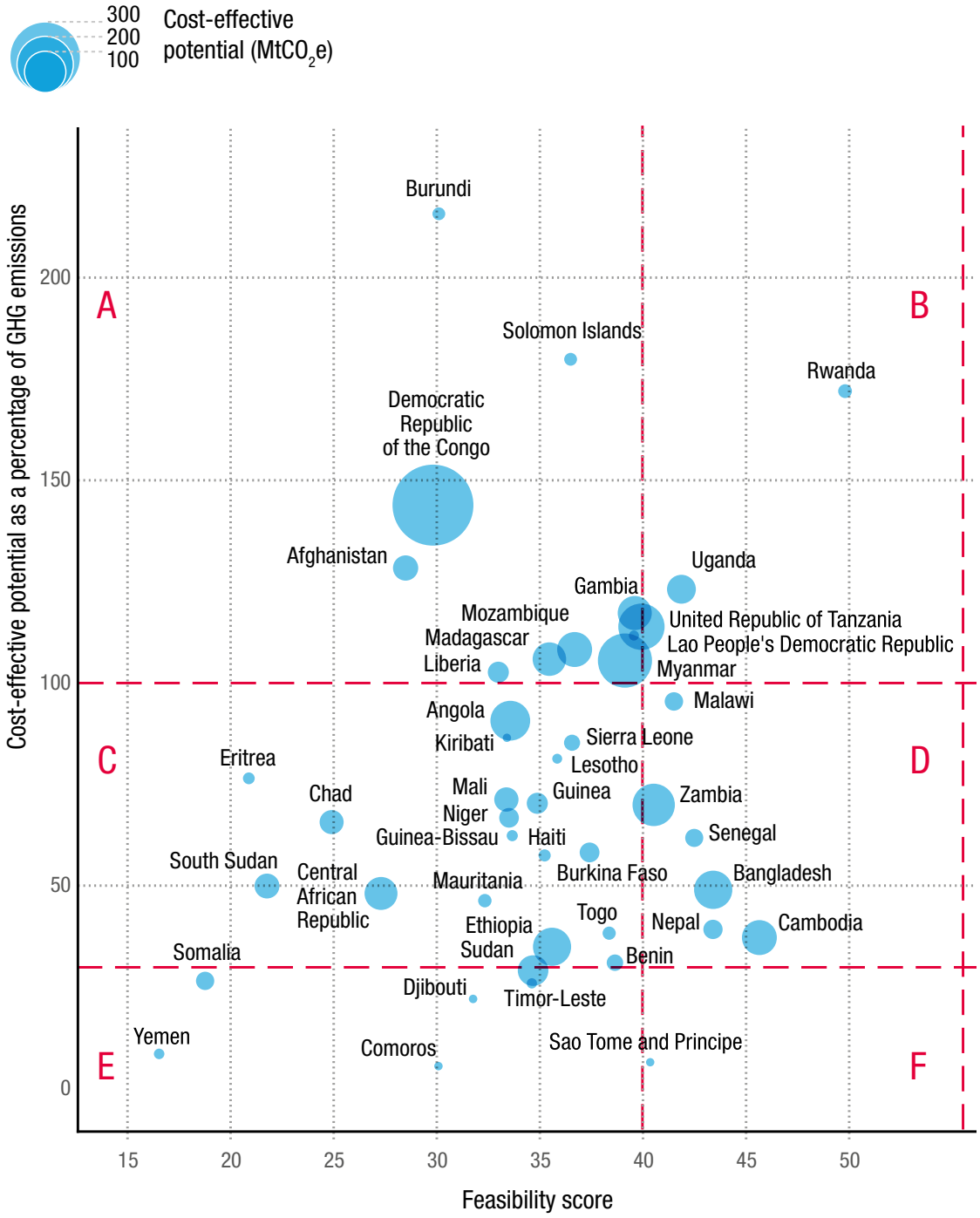
[14] See annex 2 for an explanation of the calculation of shares of emission reductions and carbon removals.

[15] The CO_2 emissions of the global aviation industry in 2019 are estimated at 915 $MtCO_2e$ (ICAO, 2022).

Figure II.7

Cost-effective potential and implementation feasibility vary across least developed countries

Feasibility scores and cost-effective mitigation potential as a share of total greenhouse gas emissions



Source: UNCTAD calculations, based on data from Roe et al. (2021).

Note: The feasibility score (0–100) is plotted against the total cost-effective land-based mitigation potential as a percentage of total country GHG emissions. Circles represent the relative size of the total cost-effective potential in $GtCO_2e$ per year. The vertical dashed lines indicate the global interquartile range of feasibility scores. The horizontal lines represent thresholds where land-based measures can deliver over 30 per cent of cost-effective mitigation potential (aligned with a global 1.5° trajectory) and over 100 per cent (indicating the capability to achieve net-zero or negative emissions solely through land-based measures).

Current carbon credit prices are too low to realize land-based mitigation potential in least developed countries

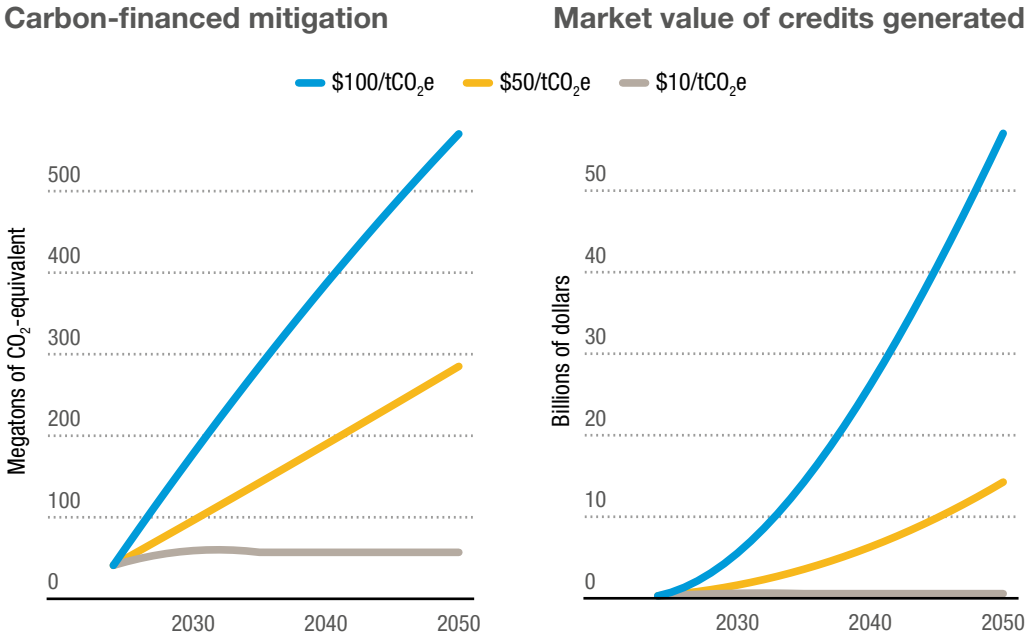
for realization remains a challenge. Section D (high potential, medium feasibility) covers LDCs where land-based mitigation measures are likely to be effective. Section E (low potential, low feasibility) includes the Sudan, Somalia and Yemen. Section F (low potential, medium feasibility), which features only Sao Tome and Principe, suggests that while relatively feasible, the cost-effective potential in this country is limited.

In addition to feasibility scores, which affect the likelihood of implementing mitigation projects, carbon credit prices can act either as drivers of or barriers to investments in mitigation projects in LDCs. Figure II.8 shows a simulation of carbon-financed land-based mitigation in LDCs and corresponding market values of generated carbon credits for the period 2024 to 2050. The simulation shows that, unless carbon prices increase substantially from current levels, only a marginal share of the land-based mitigation potential in LDCs will be realized through 2050. For instance, in a scenario where land-based carbon credit prices plateau at $10, 97 per cent of the mitigation potential in LDCs would remain unused through 2050. Given the huge potential of land-based mitigation in these countries, this would signify a missed opportunity to make a significant contribution to achieving the objectives of the Paris Agreement. In this

Figure II.8

At current carbon credit prices, most of the land-based mitigation potential in least developed countries would remain untapped

Simulation of land-based greenhouse gas mitigation and market value of carbon credits in least developed countries, 2024–2050



Source: UNCTAD.

Notes: The simulation shows three scenarios where carbon credit prices for land-based mitigation increase to $100, $50 and $10, respectively, by 2050, following a quadratic growth path. For the $100 and $50 scenarios, the midpoints of $50 and $25, respectively, are assumed to be reached in 2035, while for the third scenario, it is assumed that $10 is reached in 2035.The simulation assumes a linear price-credit volume relationship. The starting point of the simulation is a carbon credit price of $7.20 per tCO_2e (the weighted average over-the-counter price of land-based carbon credits issued for LDC-hosted projects in the period 2020–2023) and a credited volume of 41 $MtCO_2e$ (the average annual volume of land-based carbon credits issued for LDC-hosted projects in the period 2020–2023). The market value corresponds to the implied market value of carbon credits generated from LDC-hosted mitigation projects.

context, it must also be noted that a further drop in prices for nature-based carbon credits is possible. This is not a hypothetical scenario, as over-the-counter (OTC) prices for forestry and land-use-based credits fell from $10.14 in 2022 to $9.72 in 2023 (Forest Trends' Ecosystem Marketplace, 2024), and the prices of exchange-traded nature-based credits are much lower than reported OTC prices. For instance, the average front-month price of nature-based credit futures traded on the exchange platform CBL in 2023 was $1.75.[16]

(c) Renewable energy and carbon markets in least developed countries

Electricity is a fundamental pillar of development. It powers industry, fuels economic growth, and provides the basis for essential services such as health care, education and communication (IEA, 2011; Panos et al., 2016). Without electricity, people – primarily women and girls – need to spend hours fetching water, clinics cannot store vaccines, schoolchildren cannot do homework at night, people cannot run competitive businesses and entrepreneurship cannot thrive. Access to electricity also has a range of gender-specific impacts, affecting women and men differently in terms of health, education and economic opportunities (ENERGIA et al., 2018). The critical importance of access to electricity access is anchored in Goal 7 of the Sustainable Development Goals, which calls for ensuring access to affordable, reliable, sustainable and modern energy for all. Carbon markets could contribute to the modernization and diversification of the energy mixes in LDCs by enabling the development and/or expansion of renewable energy technologies that are underdeveloped in LDCs, such as solar photovoltaic and wind energy.

While carbon markets currently play only a minor role in the energy sector of LDCs, there is potential for scaling up as there are both large investment needs and GHG mitigation potential. Over the period of 2018–2020, around 26 per cent of energy-related GHG emissions originated from the electricity sector in LDCs. At the same time, LDCs are among the countries with the lowest electrification rate and have a long way to go before 2030 to be able to reach Sustainable Development Goal 7 (box II.1). Recent progress in expanding access to electricity has not been met with proportional increases in capacity and production. Even at low access rates, household electricity consumption accounted for 44 per cent of total electricity consumption in the LDCs in 2021.[17] This high share is indicative of low levels of industrialization and, more generally, of low productive capacities (UNCTAD, 2017).

Carbon markets could contribute to diversification of the energy mixes in least developed countries

The need to expand access and the scope for future growth are highlighted by the fact that LDCs as a group accounted for only 2 per cent of the world's household electricity consumption in 2021, but has 14 per cent of the world's population. According to UNCTAD calculations undertaken for this chapter, LDCs have experienced a rapid surge in household electricity consumption in recent years. Since 2010, electricity consumption has expanded at an average annual rate of 8.5 per cent, outpacing the world's average annual consumption growth rate of 2.3 per cent over the same period.

Despite recent growth, household electricity consumption per capita in the LDCs remained low at 95.2 kilowatt-hours (kWh) in 2021, compared to the world average of 829 kWh. It is noteworthy that the Lao People's Democratic Republic, which has achieved universal access to electricity, had the highest per capita consumption of 308 kWh, while the lowest was in

Household electricity consumption per capita in least developed countries remains low

[16] Calculated as the average monthly closing price of CBL Nature-Based Global Emissions Offset futures.

[17] Electricity consumption and production figures in this section are from UNCTAD calculations based on data provided by the United Nations Statistics Division, Energy Statistics Database, available at http://data.un.org/Explorer.aspx; data for the Gambia, Liberia and Somalia are missing.

the Central African Republic, Chad and Sierra Leone, where it did not exceed 10 kWh that year (annex table 1.2).

Electricity production figures show a similar pattern. After stagnating, in per capita terms, through most of the 1990s, electricity production in LDCs has experienced robust growth since, nearly tripling, from 128 kWh per capita in 2000 to 351 kWh per capita in 2021. This increase can be attributed to the expansion of installed capacity, which rose from 0.03 kW per capita to 0.10 kW per capita between 2000 and 2021.[18] However, the efficiency of capacity utilization has seen a decline since the early 2000s, with the capacity factor dropping from around 53 per cent in 2000 to nearly 41 per cent in 2021.[19] The overall figures for electricity production conceal considerable heterogeneity among individual LDCs. Only 6 countries (Bangladesh, Cambodia, the Lao People's Democratic Republic, Mozambique, Tuvalu and Zambia) recorded electricity production exceeding 500 kWh per capita in 2021. Meanwhile, 21 countries fell within the range of 100 kWh to 500 kWh per capita, and 18 countries reported production below 100 kWh per capita, while the figure for 8 of them was even less than 50 kWh. Notably, the Lao People's Democratic Republic stands out as the sole country with production exceeding 1,000 kWh per capita, surging to 6,051 kWh in 2021.[20]

Least developed countries need to **expand access to electricity while also boosting capacity and production**

The recent expansion of electricity generation has been broad-based, with gross electricity output rising across most LDCs between 2010 and 2021. Exceptions to this positive trajectory were observed in the Central African Republic, Malawi and Yemen. The median compound annual growth rate for total electricity production in LDCs reached 6 per cent, with several countries experiencing double-digit growth rates. These included fossil fuel exporters such as Timor-Leste and other LDCs such as Benin, Cambodia, Ethiopia, Guinea, the Lao People's Democratic Republic, Nepal and Rwanda. Additionally, while the Central African Republic and Malawi experienced declining trends with compound annual growth rates of -0.9 per cent and -0.3 per cent, respectively, the most pronounced decline was observed in Yemen, where gross production of electricity fell by 8.5 per cent between 2010 and 2021. Meanwhile, installed capacity expanded significantly over the same period in almost all LDCs.

Impressive as this growth may seem, both capacity and production have failed to keep pace with the remarkable 184 per cent increase in the number of people gaining access to electricity in LDCs between 2010 and 2022. In fact, the average compound annual growth rates of both gross electricity production and capacity per person with access to electricity for all LDCs between 2000 and 2021 were negative, at -2 per cent.

This situation presents a classic case of the energy trilemma: security, affordability, and sustainability (World Energy Council, 2024). As access to electricity grows, so does its demand. However, if capacity and production lag, it can lead to energy insecurity, higher costs, and reliance on unsustainable sources. Therefore, LDCs need strategies that aim to expand access while also boosting capacity and production.

One important area for improvement is the updating of utility regulations. Modernizing these regulations can facilitate the transition towards access to sustainable energy and achieving Goal 7. A review

[18] UNCTAD calculations, based on data from by the United Nations Department of Economic and Social Affairs, Population Division, *World Population Prospects: The 2022 Revision* and the United States Energy Information Administration, International Energy Data.

[19] UNCTAD calculations, based on data from the United Nations Statistics Division, Energy Statistics Database, the United Nations Department of Economic and Social Affairs, Population Division, *World Population Prospects: The 2022 Revision*, and the United States Energy Information Administration, International Energy Data.

[20] The Lao People's Democratic Republic is among the few electricity exporters within the LDC group, owing mainly to its large hydropower production, including from the 1,285 MW Xayaburi plant on the Mekong River.

of international regulatory indicators on sustainable energy and its access shows there is significant room for improvement in LDCs. For instance, according to the 2021 Regulatory Indicators for Sustainable Energy (RISE),[21] the median energy access indicator, which measures the policies and regulations that support the expansion of reliable electricity services, is 49 for LDCs, which is significantly lower than the median score of 59 for ODEs. Moreover, the median renewable energy indicator, which measures the policies and regulatory support that countries have put in place to facilitate the integration of renewable energy sources into their energy mix, is 37 for LDCs compared with 54 for ODEs.

Box II.1
Access to electricity in the least developed countries

As recently as 2022, over 685 million people worldwide still lacked access to electricity, with 71 per cent of this population living in LDCs.[a] This is a highly disproportionate share, given that LDCs only accounted for about 14 per cent of the global population in 2022,[b] highlighting the need for effective solutions to address the electricity access deficit in these countries.

LDCs have made significant strides towards achieving universal access to electricity (figure II.9), with an average compound annual growth rate of 5 per cent since 2010. While some LDCs, such as the Lao People's Democratic Republic, Timor-Leste and Tuvalu, have achieved universal access to electricity, UNCTAD calculations show that even in 2022, 45 per cent of people residing in LDCs (or 496 million people) still lacked access to this basic human, social and economic necessity.

In 8 of the 45 LDCs, namely Burkina Faso, Burundi, the Central African Republic, Chad, the Democratic Republic of the Congo, Malawi, the Niger, and South Sudan, at least 78 per cent of the population lacked access to electricity, with countries such as Burundi and South Sudan surpassing the 90 per cent mark. This disparity is noteworthy, as this subgroup constitutes approximately one fifth of the LDC population and 37 per cent of the total LDC population lacking access to electricity.

UNCTAD projections indicate that at the current rate of progress the average electricity access rate in LDCs will only reach 73 per cent by 2030.[c] Moreover, the gap in electricity access rates between LDCs and ODEs is widening. For instance, based on current progress rates, LDCs will only reach the 2022 average electricity access rate of ODEs of 93 per cent by 2062 and will reach an average access rate of 95 per cent by 2066. These projections show that LDCs, together with development partners, need to significantly redouble their efforts in order to attain Goal 7.

Source: UNCTAD.

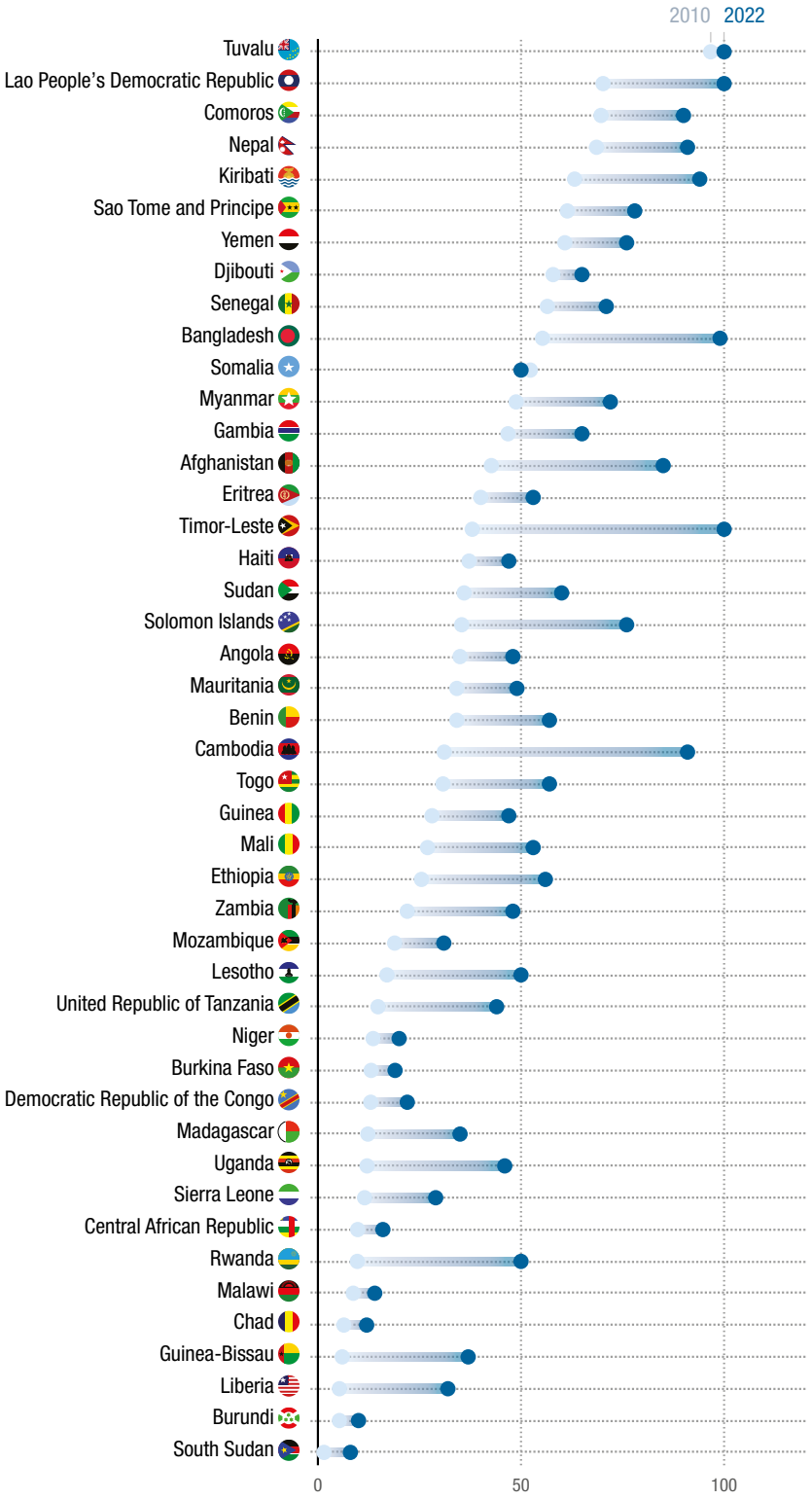
[a] UNCTAD calculations, based on the United Nations Department of Economic and Social Affairs Sustainable Development Goals Indicators Database (indicator 7.1.1), available at https://unstats.un.org/sdgs/dataportal/database.
[b] UNCTAD calculations, based the United Nations Department of Economic and Social Affairs, Population Division, *World Population Prospects: The 2022 Revision*.
[c] The projections are based on country-specific compound annual growth rates of SDG Indicator 7.1.1 observed for the period 2010 to 2022 (see annex table 1.3 for country-level projections).

[21] Based on RISE, a set of indicators developed by the World Bank to compare the policy and regulatory frameworks of countries in support of achieving Goal 7. The fourth edition of RISE captures data up to the end of 2021 and includes 30 indicators and 85 subindicators distributed across four pillars: electricity access, clean cooking, renewable energy and energy efficiency. Data are available for 36 of the 45 LDCs.

Figure II.9

Access to electricity in least developed countries remains a major challenge despite recent progress

Percentage of the population



Source: UNCTAD, based on data from the United Nations Sustainable Development Goal Indicators Database, available at https://unstats.un.org/sdgs/dataportal (accessed 5 June 2024).

The energy mix in LDCs is characterized by a high share of renewables (figure II.10), the average share being 60 per cent of their total final energy consumption (Sustainable Development Goal indicator 7.2.1) in 2021. Renewable power generation capacity is dominated by hydropower (table II.3), which accounts for 87 per cent of this category. In this regard, it is important to note that hydropower is vulnerable to climate change impacts such variations in rainfall, droughts and flooding, which can undermine its reliability and efficiency. Consequently, diversifying the renewable energy mix is crucial for enhancing systemic resilience and ensuring a stable energy supply. Low access to capital and financing is among the main obstacles to investments in renewable energy deployment. For instance, investment projects in the energy sector face higher financing costs and take longer to reach financial closure than in other developing economies (UNCTAD, 2023b).

There is considerable potential and political ambition to expand renewable energy in LDCs to meet their growing energy needs. Renewable energy can help improve access to electricity by increasing grid capacity, as can off-grid solutions in rural areas where the lack of access is particularly prevalent (UNCTAD, 2017). In their NDCs, the LDCs have committed to a combined 105 gigawatts (GW) of renewable installed capacity by 2030 (IRENA, 2023),[22] more than double the 47 GW installed in 2023 (IRENA, 2024). As the LDCs as a group already rely heavily on renewable energy in the power sector, where renewables accounted for a share of 48 per cent of installed capacity in 2023, the renewable energy plans included in their NDCs are paramount to increasing total installed electricity capacity by 59 per cent from 2023 to 2030. Of the additional 58 GW of renewable energy, 28 GW are to be built unconditionally and an additional 30 GW are conditional on external financial support, mainly for emerging technologies such as solar and wind (IRENA, 2023), the shares of which are currently very small within the renewable energy mix (table II.3).

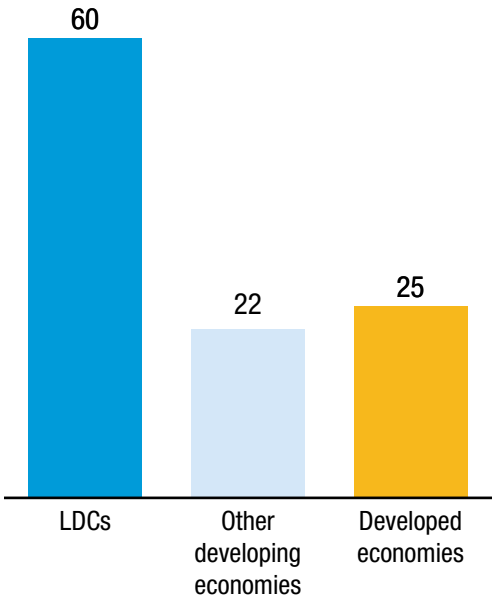
Large investments, underpinned by a massive scaling up of financial flows to the renewable energy sectors of LDCs, will be necessary to achieve these targets, particularly since recent data show that the LDCs received less than 1 per cent of total global investments in renewable energy in 2013–2020 (IRENA and CPI, 2023).

The energy mix in least developed countries contains a **high share of renewables**

Figure II.10

Least developed countries have a higher share of renewables in their energy mix than other country groups

Average share of renewable energy in total final energy consumption, 2021* (Percentage)



* Sustainable Development Goal indicator 7.2.1.

Source: UNCTAD calculations, based on data from the United Nations Sustainable Development Goal Indicators Database, available at https://unstats.un.org/sdgs/dataportal (accessed 9 May 2024).

[22] This figure includes Bhutan, which graduated from the LDC category in December 2023.

Table II.3
Hydropower accounts for the bulk of installed renewable power generation capacity in the least developed countries
Shares of renewable technologies in total renewable power generation capacity, 2023

Technology	Installed capacity (Megawatts)	Share in total (Percentage)
Hydropower (excl. pumped storage)	40 912	87.14
Solar energy	4 114	8.76
Bioenergy	1 204	2.57
Wind energy	713	1.52
Geothermal energy	7	0.02
Total	**46 950**	

Source: UNCTAD calculations, based on data in IRENA (2024).

2. Article 6: Opportunities and risks for least developed countries

While no final decisions on rules on Article 6 of the Paris Agreement were made at the twenty-eighth Conference of the Parties to UNFCCC (COP28) in 2023, previous COP decisions laid out a framework that was sufficient for countries to start operationalizing Article 6.2.[23] On 15 December 2023, the first ever internationally transferred mitigation outcome transaction under this article took place between Thailand and Switzerland.[24] Furthermore, although no new projects can be registered under Article 6.4 before detailed rules are decided by the Conference of the Parties that serves as the meeting of the Parties to the Paris Agreement, the projects that successfully transition from the Clean Development Mechanism to the Article 6.4 mechanism will lead to its de facto operationalization.

(a) Article 6.2 arrangements

As of June 2024, 82 arrangements under Article 6.2 were in place worldwide, including 14 in 9 LDCs (table II.4). In addition to these existing arrangements, numerous LDCs have expressed an interest in Article 6 cooperation in their NDCs or other policy documents. For instance, 29 of the 45 LDCs have stated their intention to use voluntary cooperation under that article in their NDCs.

LDCs, like most developing economies, are host countries of these arrangements, which is to say that they are on the supply side of the Article 6 carbon market, while the majority of buyers of internationally transferred mitigation outcomes are developed countries. From the buyers' perspective, the costs and benefits are clear: they acquire internationally transferred mitigation outcomes to be counted towards their NDCs and achieve emission reduction targets at a lower cost. This is because their domestic mitigation costs are higher than in host countries. In other words, they are reaping low-hanging fruits.

[23] See chapter 1 for a detailed description of Article 6 of the Paris Agreement.

[24] See https://unepccc.org/article-6-pipeline/#:~:text=On%2015%20December%202023%2C%20the,6.2%20of%20the%20Paris%20Agreement.

From the host country's perspective, the ramifications are less straightforward, as internationally transferred mitigation outcomes trigger a corresponding adjustment to the host country's emissions. Consequently, adjusted emissions reported by the host country are higher than actual emissions (figure II.11), while the opposite is the case for the buyer country. This raises several questions with regard to domestic climate policy in the host country.

First of all, mitigation projects underlying "exported" internationally transferred mitigation outcomes are no longer available for the host country. It is therefore important for LDCs to differentiate in their NDCs

Table II.4

The least developed countries are among the early movers under Article 6.2 of the Paris Agreement

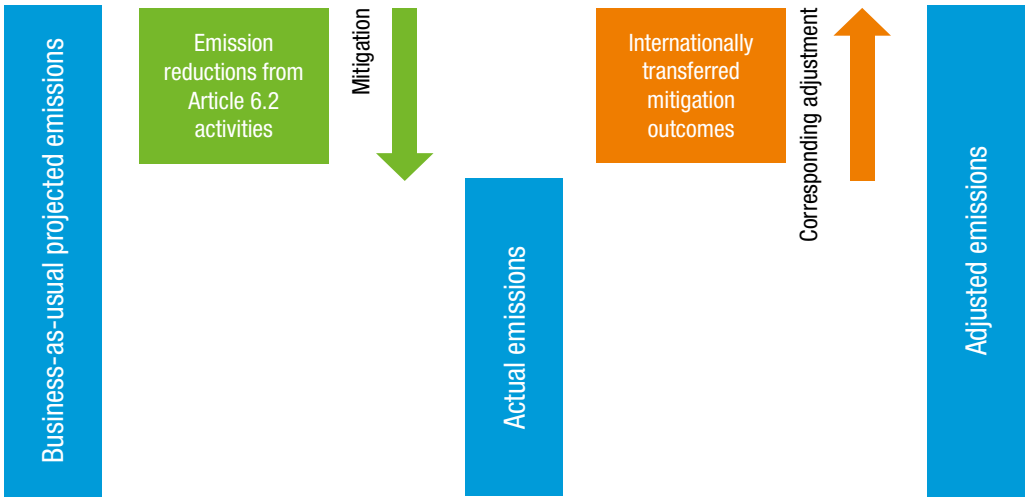
Article 6.2 arrangements with least developed country participation as of June 2024

LDC host	Buyer(s)
Bangladesh	Japan
Cambodia	Japan, Singapore
Ethiopia	Japan
Lao People's Democratic Republic	Japan, Republic of Korea
Malawi	Switzerland
Myanmar	Japan
Nepal	Sweden
Rwanda	Kuwait, Singapore
Senegal	Japan, Norway, Singapore, Switzerland

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

Figure II.11

The transfer of internationally transferred mitigation outcomes leads to upwards adjustment of an exporting country's emissions



Source: UNCTAD.

Buyers of internationally transferred mitigation outcomes focus on low-hanging fruit

between unconditional mitigation activities (those mitigation activities that host countries are committing to undertake on their own, without external support) and mitigation activities that can be included under Article 6 cooperative frameworks. This is no easy task and not generally a feature in the existing NDCs of LDCs. For instance, the updated NDC of Uganda (2022) clearly specifies quantified conditional and unconditional NDC targets for 2030. It also lists detailed mitigation measures by sector and quantifies their contribution to overall mitigation targets. However, its NDC does not provide a distinction between unconditional and conditional measures at the sectoral or subsectoral levels, so it is unclear how individual mitigation projects would be classified. Therefore, it might be helpful for LDCs to develop systems allowing them to distinguish between conditional and unconditional activities at the project level to ensure a clear separation between tradable and non-tradeable emission reductions and thus safeguard their ability to reach their own NDCs. Furthermore, for the preparation of future NDCs, LDCs will need to take into account the fact that only mitigation activities within the conditional scope of NDCs can be used to mobilize finance through the transfer of internationally transferred mitigation outcomes and plan their activities accordingly.

Second, where individual projects have different unit mitigation costs, there is a risk that buying countries will focus on cheaper mitigation projects (the low-hanging fruits), which could leave LDCs with the task of implementing the most expensive projects to reach their own NDC targets. This risk extends across NDC periods, and LDCs need to be aware that exporting internationally transferred mitigation outcomes in the current NDC period could lead to rising average abatement costs in future NDC periods. In other words, selling low-hanging fruits makes the pursuit of a policy of increasing mitigation ambition in the spirit of the Paris Agreement more expensive. This source of risk can be mitigated by ensuring that a fair share of emission reductions from Article 6.2 arrangements remains in LDCs. In this context, it is important that the principle of "equitable sharing of mitigation benefits between the participating Parties", as specified in Article 6.4 rules, modalities and procedures (UNFCCC, 2021), is also upheld in bilateral arrangements under Article 6.2.

Third, there is the risk of time inconsistency of internationally transferred mitigation outcome transactions. Given that LDCs can sell internationally transferred mitigation outcomes from mitigation projects only once, the question arises as to how to time and sequence mitigation projects within and between Article 6.2 arrangements. If the value of internationally transferred mitigation outcomes increases as climate policy is tightened around the world and marginal abatement costs in developed countries increase, it might be more beneficial from the perspective of a host country to wait rather than to sign off on mitigation projects and internationally transferred mitigation outcome transfers on less favourable terms.

Fourth, for LDCs that have engaged, or intend to engage, in Article 6.2 arrangements with multiple bilateral partners, the question of transaction costs needs to be assessed. As each bilateral agreement is negotiated individually, and has its own terms and conditions, the administrative burden associated with supervision and coordination increases with the number of bilateral partners. In this regard, developing national systems in LDCs and requiring bilateral partners to adapt to them could help limit transaction costs and administrative burdens of Article 6.2 arrangements.

Finally, another source of risk for host countries is that internationally transferred mitigation outcome buyer countries are generally developed countries (i.e. those that are also providers of climate finance). From the perspective of a buyer country, the possibility of receiving internationally transferred mitigation outcomes in return for investments in mitigation activities could create an incentive to redirect climate

finance flows towards Article 6.2 activities. There is some evidence that, in the past, there has been a relabelling of ODA funds towards climate finance (Miller et al., 2023). In this context, it is important to safeguard additionality of climate finance and ensure that there is no rechannelling of scarce climate finance flows towards Article 6.2 arrangements. Otherwise, it could result in further geographic concentration as well as a stronger focus on mitigation. However, it is adaptation finance that is a greater priority for LDCs as they are among the most climate-vulnerable countries in the world (UNCTAD, 2023a).

(b) The Article 6.4 mechanism

Detailed rules of the Article 6.4 mechanism are still under development. Nevertheless, the existing rules, modalities and procedures include provisions that are particularly relevant for the LDCs.

In line with the principle of common but differentiated responsibilities under the UNFCCC, there is a waiver of all administrative fees for LDCs, including for registration, inclusion of component project activities in a registered programme of activities, credit issuance, renewal and post-registration changes to project activities (UNFCCC, 2022a).

Another relevant feature of Article 6 rules, modalities and procedures for LDCs, in particular, which was adopted at COP26, is that suppressed demand should be recognized by methodologies under the mechanism. The concept of suppressed demand[25] was introduced under the Clean Development Mechanism with the aim of enabling the participation of countries with low historical and contemporaneous emissions levels, such as most LDCs. Suppressed demand exists, for example in areas that have in the past not been connected to a power grid, and where emissions from electricity use are low or zero. In such areas, the deployment of renewable energy solutions, such as renewable mini grids, might not lead to emission reduction compared to historical emissions. However, accounting for suppressed demand could increase the volume of creditable emission reductions under Article 6.4, which is particularly relevant for many LDCs, where the lack of access to energy of rural populations is alarmingly prevalent.[26] Suppressed demand could also play a role in new grid-connected renewable energy plants, which could lead to higher electricity consumption due to income and price effects (Spalding-Fecher, 2015). Also, in this case, accounting for suppressed demand could lead to higher volumes of creditable emission reductions.

In recommendations included in its annual report for 2023 (UNFCCC, 2023a), the Article 6.4 Supervisory Body specifies that suppressed demand will be recognized where the current level of "services provided to a population are insufficient to meet basic human needs (such as the minimum amount of electricity for lighting and for heating or cooling) owing to barriers, including low income or lack of infrastructure, and where the growth in emissions resulting from meeting such needs requires special consideration when assessing Article 6.4 baseline scenarios". The Supervisory Body will develop guidance as to how suppressed demand will be built into the mechanism, in particular in baseline setting, which is a crucial element for calculating Article 6.4 emission reduction amounts and, thus, the profitability or viability of individual mitigation projects. Including such latent demand increases the creditable amount for a given mitigation project. Thus, recognizing suppressed demand considerable potential in LDCs, where the basic human needs of large segments of their population are not being met, particularly in relevant infrastructure services such as power

[25] Suppressed demand refers to the concept of considering the latent, unmet demand for basic services in underdeveloped areas, which, when eventually met, would lead to higher emissions.

[26] The average rate of access to electricity in rural areas in the 41 LDCs for which data are available was 78 per cent in 2022.

supply (see section A.1.c. above, on renewable energy and carbon markets).

Suppressed demand is an important factor in many least developed countries

Rules relating to establishing additionality are another relevant issue for LDCs. According to Article 6.4 rules, modalities and procedures, the only activities eligible for crediting are those that "would not have occurred in the absence of the incentives from the mechanism, taking into account all relevant national policies, including legislation, and representing mitigation that exceeds any mitigation that is required by law or regulation, and taking a conservative approach that avoids locking in levels of emissions, technologies or carbon-intensive practices" (UNFCCC 2021). In this context, LDCs need to be aware that activities included under its unconditional NDC targets might not be considered additional, as they have already been committed to, and might therefore be ineligible for carbon crediting. Furthermore, the reference to avoiding lock-in of carbon-intensive practices could mean that new fossil-fuel-based installations, such as gas-fired power plants or fuel-switching activities in the industry, might not be creditable. While this category has not seen significant crediting activity for the LDCs under the Clean Development Mechanism, it could play a larger role in the future. For instance, Angola, Mozambique and Myanmar are natural gas producers and exporters but had not achieved universal electrification as of 2022.

When it comes to the modalities establishing additionality, Article 6.4 rules, modalities and procedures require a "robust assessment that shows the activity would not have occurred in the absence of the incentives from the mechanism". However, draft recommendations by the Supervisory Body of the Article 6.4 mechanism state that "simplified approaches for demonstration of additionality for least developed countries or small island developing States will be developed by the Supervisory Body when a request is made by a least developed country or small island developing State" (UNFCCC, 2023b). In this context, it is important that such simplified approaches are made available quickly to facilitate project planning and implementation in LDCs. Furthermore, the use of positive lists and automatic additionality, as was the case under the Clean Development Mechanism, could help lower barriers by limiting transaction costs and enhancing predictability for project developers. For instance, under the latest Clean Development Mechanism positive list, renewable-energy-based rural electrification activities by grid extension were automatically considered additional in LDCs (UNFCCC, 2022b).

B. Summary and policy considerations

Many LDCs seek to mobilize funds from carbon markets to complement their scarce climate finance flows and to fund development in key areas of the Sustainable Development Goals. However, so far, carbon markets have not unlocked sufficient financial resources or significant shares of LDC mitigation potential. Carbon credits issued by baseline and credit schemes in LDCs are highly concentrated within the LDC group and are sourced primarily from mitigation projects in sectors with limited structural transformation co-benefits and a heightened risk of market downturn. To mitigate market risks and strengthen the role of carbon markets for sustainable development and structural transformation in LDCs, a focus on high-quality and pro-development types of credit would be beneficial. Furthermore, LDCs need to formulate holistic and robust climate policy strategies that take into account the links between their NDCs and emissions trading under Article 6 of the Paris Agreement. Development partners should assist LDCs by scaling up support for capacity-building and ensuring that the principles of common but differentiated responsibilities and equitable sharing of benefits are upheld across all Article 6 activities. Finally, LDCs should apply a cautionary approach when estimating future financial flows from carbon markets and in their expectations of the potential of carbon markets to drive structural transformation.

Carbon markets are seen by many developing countries, including LDCs, as a vehicle to mobilize large-scale financial flows and drive investments that contribute to broader development objectives. For instance, the Africa Carbon Markets Initiative plans to massively expand Africa's participation in the voluntary carbon market, and thereby unlock $6 billion in revenue by 2030 and over $120 billion by 2050 (ACMI, 2022). Of the 45 LDCs, 29 have explicitly stated their willingness to participate in Article 6 activities in their NDCs.

The analysis in this chapter suggests that, so far, the value created in carbon markets from LDC-hosted mitigation activities has been small compared to other external finance flows to the LDCs, such as ODA and climate finance. And even these latter have been insufficient to meet the needs of LDCs (UNCTAD, 2023a). Specifically, in 2023, baseline and credit schemes in all LDCs combined generated an estimated market value of $403 million, which corresponds to about 1 per cent of net bilateral ODA flows of $37 billion from DAC members to the LDCs (OECD, 2024), or about 1.3 per cent of the $31 billion worth of FDI inflows to these countries (UNCTAD, 2024). This suggests that carbon markets have not made a significant contribution to sustainable development finance or to climate finance in LDCs.

Moreover, LDCs receive only a small share of the market value created by downstream carbon credit transactions, as brokers and other intermediaries extract significant shares of that market value. This is a key element to consider in assessing the potential financial benefits accruing to LDCs

from carbon markets. According to one study, while 90 per cent of intermediaries in the voluntary carbon market do not disclose their fees publicly, the average fee of the 10 per cent who have disclosed their fees was 15.5 per cent (Carbon Market Watch, 2023). The average published fee is likely to be an underestimation of the share of the total market value going to intermediaries because those who disclose their fees are likely to have the lowest fees, and intermediaries can increase the price of a carbon credit before applying the fee. For example, an intermediary could buy a credit from a project developer at $5, sell it to a company at $10 and apply a 15 per cent fee on the $10 selling price. In addition, carbon credits could be transacting through multiple intermediaries, hence increasing the share that remains with intermediaries. In this context, LDCs that participate in carbon markets would benefit from improved financial transparency in across carbon market value chains including the secondary market.

Data presented in this chapter also suggest that carbon markets have not unlocked significant shares of mitigation potentials in the LDCs. For example, during the period 2020–2023, baseline and credit schemes in the LDCs issued carbon credits corresponding to 2.4 per cent of the estimated cost-effective land-based mitigation potential in these countries.

The value created in carbon markets is small compared to official development assistance and foreign direct investment flows to the least developed countries

Part of the reason why carbon markets have not delivered financial flows on a larger scale, and have only unlocked a small percentage of the existing mitigation potential, is that market prices are far too low to create the incentives needed to broaden and deepen investment flows to LDCs. There is no obvious solution to this issue, and prices for the main credit types are unlikely to rise to the levels needed for carbon markets to have a meaningful impact in LDCs unless there is increased demand, including from compliance markets in developed countries. At present, ETS and carbon taxes do not offer significant entry points for LDC-sourced carbon credits generated in the voluntary carbon market or through the Article 6.4 mechanism, the successor to the Clean Development Mechanism. However, this situation may evolve, particularly if internationally transferred mitigation outcomes with specific properties, such as corresponding adjustments in host countries begin to see increased demand from compliance markets. The aviation industry could also play a larger role in the future as demand for CORSIA-eligible carbon credits is forecast to reach around 2.5 billion tons of CO_2 between 2021 and 2035 (ICAO, 2019).

The bulk of carbon credits issued by baseline and credit schemes is concentrated in a few LDCs and project types. Five countries account for more than two thirds of all credits issued by such schemes in the 45 LDCs. Moreover, 76 per cent of issued carbon credits are nature-based (largely from forestry projects) and household-based (primarily cookstoves projects). These figures indicate that, for the majority of LDCs and the majority of sectors, carbon markets have not had a major impact.

Carbon markets have not contributed substantially to a wider deployment of renewable energy technologies in LDCs for which these countries have considerable potential, coupled with political ambition, to expand access to energy in line with Goal 7. This is particularly the case for the voluntary carbon market, where only 2 per cent of issued carbon credits come from renewable energy projects in LDCs. While the share is much larger for the Clean Development Mechanism (41 per cent), the overall volume of certified emission reduction credits from renewable energy projects remains small. In this context, broader energy market conditions could play a role and LDCs could help promote investments in the deployment of renewable energy technologies by fostering a transparent, stable policy framework based on long-term, system-wide planning (UNCTAD, 2017).

Carbon markets have been volatile and subject to shocks in the past, and the market outlook is fraught with risks and

uncertainties. For instance, criticism of the integrity of carbon credits contributed to a staggering 61 per cent drop in the overall market value of the voluntary carbon market, from $1.87 billion in 2022 to $723 million in 2022 (Forest Trends' Ecosystem Marketplace, 2024). Regulatory and corporate decision-making in developed countries, beyond the reach of LDCs, can also fuel market instability. For example, the decision taken by the European Union to change the rules regarding the use of certified emission reduction credits in the European Union Emissions Trading System contributed to a collapse in demand and market prices (World Bank, 2014). At the same time, oversupply of allowances depressed permit prices in the European Union ETS, and thus of prices paid for eligible certified emission reduction credits. These regulatory factors had a disproportionate impact on LDCs, as they were latecomers to the Clean Development Mechanism (see section A.1.a.), and, although benefitting from an exception allowing access to LDC-sourced certified emission reduction credits during the third phase of the European Union ETS, almost all of LDC-sourced certified emission reduction credits (99.6 per cent) were issued after 1 January 2013 (i.e. after the prices of certified emission reduction credits and allowance traded on the European Union ETS had fallen).

Ultimately, demand for carbon credits in the voluntary carbon market is based on the willingness and ability of private sector actors to use carbon offsetting as part of their corporate sustainability strategies. This in turn depends on the credibility of claimed emission reductions. If consumers do not believe in the integrity of carbon credits, corporations will have no incentive to buy them. The risks associated with the credibility of corporate sustainability claims is highlighted by recent criticism of the integrity of forestry-based carbon credits, which has led to a decline in demand and prices as major corporations re-evaluate their offset programmes. Also, regulatory decisions can impact the demand side of the voluntary carbon market. The European Union's proposed Green Claims Directive (European Commission, 2023) is a case in point, as it would require, inter alia, that corporations report the use of offsets separately from emissions from their own operations and thereby lower the value of carbon credits in corporate sustainability management and communication. To mitigate such risks, focusing on high-integrity carbon credits could benefit LDCs, as buyers can, and do, distinguish between credit qualities.

Regarding Article 6 activities, there are several issues that LDCs need to consider. Mitigation projects underlying "exported" internationally transferred mitigation outcomes are no longer available to the host country, and if the emissions reductions from low-cost mitigation projects (low hanging fruit) are transferred to other countries, LDCs could be left with projects that have higher implementation costs for their own NDCs. It is therefore important to demarcate unconditional NDC activities (i.e. those activities which host countries have committed to undertake on their own, without external support), from mitigation activities that can be included under Article 6 cooperative frameworks. This also means that plans regarding Article 6 participation need to be considered carefully when the next editions of NDCs are formulated, as unconditional mitigation activities might not pass the additionality test under Article 6, thus excluding them from generating carbon credits. In essence, LDCs need to take a holistic view encompassing domestic climate policy and strategies when participating in international carbon markets.

Given carbon markets' modest performance to date and numerous market risks, LDCs should take a cautionary approach when estimating future financial flows from carbon markets and forming expectations about their potential to drive structural transformation. While the potential for increased demand for internationally transferred mitigation outcomes and high-integrity carbon credits exists, risks related to regulatory changes and other demand-

Carbon markets are volatile and subject to shocks, and the market outlook is fraught with risks and uncertainties

side shocks persist. Given these risks, a focus on tangible, positive sustainable development impacts might be preferable to a focus on uncertain financial flows.

At the international level, there are several entry points for development partners to enhance the performance and impact of carbon markets in LDCs. First, there needs to be greater support for capacity-building and technical assistance to enable more LDCs to participate in and benefit from the Article 6 mechanism. Also, upholding the basic principles of the UNFCCC and the Paris Agreement, including equitable benefit-sharing and common but differentiated responsibility in all cooperative frameworks with LDCs, is critical. Moreover, as Article 6 operationalization becomes more widespread, it is crucial that the specificities of LDCs are considered both in the design and practical application of rules, including for baseline setting and establishing additionality. With regard to the voluntary carbon market, enhancing transparency and integrity are critical factors for ensuring that carbon credits are based on real emission reductions, that credit prices provide strong investment signals and that a fair share of the value generated in carbon markets remains in the host countries of mitigation projects.

Least developed countries should be cautious when estimating financial flows from carbon markets

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Annex 1. Country-specific data on land-based mitigation potential, electricity and selected geographical features of least developed countries

Table 1.1
Land-based mitigation potential and issued credits in the least developed countries

Country	Annual cost-effective land-based mitigation potential 2020–2050 ($MtCO_2e$)	Average credit volume 2020–2023 ($MtCO_2e$)	Share of issued credits in potential (Percentage)
Afghanistan	33.46	0.00	0.00
Angola	89.26	0.02	0.02
Bangladesh	82.24	2.75	3.35
Benin	11.81	0.09	0.73
Burkina Faso	18.97	0.11	0.60
Burundi	5.58	0.47	8.51
Cambodia	67.85	10.27	15.14
Central African Republic	59.93	0.06	0.10
Chad	29.97	0.01	0.03
Comoros	0.15	0.00	0.00
Democratic Republic of the Congo	382.29	4.82	1.26
Djibouti	0.09	0.00	0.00
Eritrea	4.10	0.38	9.19
Ethiopia	81.75	2.56	3.13
Gambia	1.89	0.02	1.08
Guinea	22.14	0.00	0.00
Guinea-Bissau	3.22	0.08	2.35
Haiti	4.62	0.03	0.63
Kiribati	0.03	0.00	0.00
Lao People's Democratic Republic	64.41	0.19	0.30
Lesotho	1.70	0.04	2.25
Liberia	22.06	0.00	0.00
Madagascar	62.12	0.60	0.97
Malawi	15.93	4.63	29.07
Mali	30.66	0.12	0.39
Mauritania	6.54	0.00	0.00
Mozambique	67.91	0.44	0.65
Myanmar	168.75	0.64	0.38
Nepal	17.82	1.21	6.80
Niger	18.72	0.01	0.05
Rwanda	7.12	1.72	24.18
Sao Tome and Principe	0.01	0.00	0.00
Senegal	15.21	0.06	0.40
Sierra Leone	11.23	0.51	4.58
Solomon Islands	5.62	0.02	0.39
Somalia	15.58	0.41	2.61
South Sudan	32.35	0.00	0.00
Sudan	51.12	0.03	0.05
Timor-Leste	2.10	0.02	0.81
Togo	6.19	0.07	1.19
Tuvalu	0.00	0.00	0.00
Uganda	45.10	4.35	9.66
United Republic of Tanzania	122.51	1.46	1.19
Yemen	2.42	0.00	0.00
Zambia	101.77	2.84	2.79
LDCs total	**1 794.00**	**41.00**	**2.29**

Source: UNCTAD calculations, based on data from Forest Trends' Ecosystem Marketplace (2021, 2022, 2023, 2024), Roe et al. (2021), the registries of the Gold Standard, Verra, Plan Vivo and Climate Forward, UNEP CDM pipeline and UNFCCC (2024).

Table 1.2

Electricity access, production, capacity and household consumption per capita in the least developed countries

Country and group median	Access (Percentage of population) 2022	Gross production per capita (kWh) 2021	Capacity per capita (kW) 2021	Household consumption per capita (kWh) 2021
Afghanistan	85	35.14	0.01	85.40
Angola	48	427.22	0.21	248.80
Bangladesh	99	563.79	0.13	238.10
Benin	57	86.71	0.04	27.20
Burkina Faso	19	75.06	0.02	16.40
Burundi	10	20.91	0.01	11.30
Cambodia	91	612.37	0.19	236.70
Central African Republic	16	26.48	0.01	9.90
Chad	12	19.53	0.01	7.00
Comoros	90	165.40	0.04	80.60
Democratic Republic of the Congo	22	136.97	0.01	56.60
Djibouti	65	113.61	0.14	293.40
Eritrea	53	106.32	0.06	49.70
Ethiopia	56	129.18	0.04	48.70
Gambia	65	195.65	0.05	--
Guinea	47	221.30	0.09	66.20
Guinea-Bissau	37	39.74	0.01	23.80
Haiti	47	90.22	0.04	15.40
Kiribati	94	293.31	0.08	77.60
Lao People's Democratic Republic	100	6 051.21	1.55	308.10
Lesotho	50	233.18	0.03	142.90
Liberia	32	91.96	0.04	--
Madagascar	35	78.62	0.02	24.40
Malawi	14	98.29	0.04	33.20
Mali	53	181.21	0.05	64.20
Mauritania	49	295.66	0.15	113.30
Mozambique	31	588.05	0.08	49.70
Myanmar	72	410.33	0.13	147.40
Nepal	91	321.88	0.07	128.70
Niger	20	26.06	0.01	29.00
Rwanda	50	72.52	0.02	11.40
Sao Tome and Principe	78	487.66	0.13	143.40
Senegal	71	386.06	0.10	148.30
Sierra Leone	29	29.81	0.02	5.90
Solomon Islands	76	149.78	0.05	25.20
Somalia	50	22.44	0.01	--
South Sudan	8	54.20	0.01	22.20
Sudan	60	367.41	0.08	198.70
Timor-Leste	100	387.01	0.21	108.70
Togo	57	98.04	0.04	68.50
Tuvalu	100	787.22	--	277.80
Uganda	46	104.01	0.05	17.00
United Republic of Tanzania	44	136.30	0.03	50.10
Yemen	76	88.37	0.05	57.70
Zambia	48	909.89	0.17	229.90
Median LDCs	50	136.30	0.04	60.95
Median ODEs	100	2 454.31	0.58	605.97
Median developed countries	100	5 666.87	2.04	1 650.74

Sources: UNCTAD calculations, based on data from the Energy Statistics Database, the United Nations Statistics Division, World Population Prospects: The 2022 Revision; and the United States Energy Information Administration, International Energy Data.

Table 1.3

Electricity access projections for the least developed countries

(Percentage of population)

Country	Access			
	2030	2062	2065	2070
Afghanistan	100.00	100.00	100.00	100.00
Angola	58.30	100.00	100.00	100.00
Bangladesh	100.00	100.00	100.00	100.00
Benin	78.05	100.00	100.00	100.00
Burkina Faso	25.46	82.12	91.65	100.00
Burundi	14.78	70.53	81.66	100.00
Cambodia	100.00	100.00	100.00	100.00
Central African Republic	22.12	80.75	91.17	100.00
Chad	16.23	59.08	66.70	81.66
Comoros	100.00	100.00	100.00	100.00
Democratic Republic of the Congo	61.63	100.00	100.00	100.00
Djibouti	69.80	92.79	95.30	99.63
Eritrea	62.92	100.00	100.00	100.00
Ethiopia	90.87	100.00	100.00	100.00
Gambia	79.56	100.00	100.00	100.00
Guinea	64.50	100.00	100.00	100.00
Guinea-Bissau	100.00	100.00	100.00	100.00
Haiti	54.27	96.51	100.00	100.00
Kiribati	100.00	100.00	100.00	100.00
Lao People's Democratic Republic	100.00	100.00	100.00	100.00
Lesotho	97.12	100.00	100.00	100.00
Liberia	96.76	100.00	100.00	100.00
Madagascar	66.61	100.00	100.00	100.00
Malawi	20.61	96.86	100.00	100.00
Mali	80.27	100.00	100.00	100.00
Mauritania	61.14	100.00	100.00	100.00
Mozambique	42.03	100.00	100.00	100.00
Myanmar	91.47	100.00	100.00	100.00
Nepal	100.00	100.00	100.00	100.00
Niger	25.36	65.52	71.62	83.07
Rwanda	100.00	100.00	100.00	100.00
Sao Tome and Principe	90.38	100.00	100.00	100.00
Senegal	81.72	100.00	100.00	100.00
Sierra Leone	51.24	100.00	100.00	100.00
Solomon Islands	100.00	100.00	100.00	100.00
Somalia	48.64	43.54	43.09	42.35
South Sudan	10.06	32.18	35.91	43.12
Sudan	82.16	100.00	100.00	100.00
Timor-Leste	100.00	100.00	100.00	100.00
Togo	83.25	100.00	100.00	100.00
Tuvalu	100.00	100.00	100.00	100.00
Uganda	100.00	100.00	100.00	100.00
United Republic of Tanzania	86.03	100.00	100.00	100.00
Yemen	87.19	100.00	100.00	100.00
Zambia	77.58	100.00	100.00	100.00
LDCs, average	**70.66**	**93.77**	**95.05**	**96.66**

Sources: UNCTAD, based on data from the Sustainable Development Goal Indicators Database (indicator 7.1.1); and the United Nations Statistics Division, World Population Prospects: The 2022 Revision.

Table 1.4

Least developed countries: Selected geographical statistics

(Thousands of hectares)

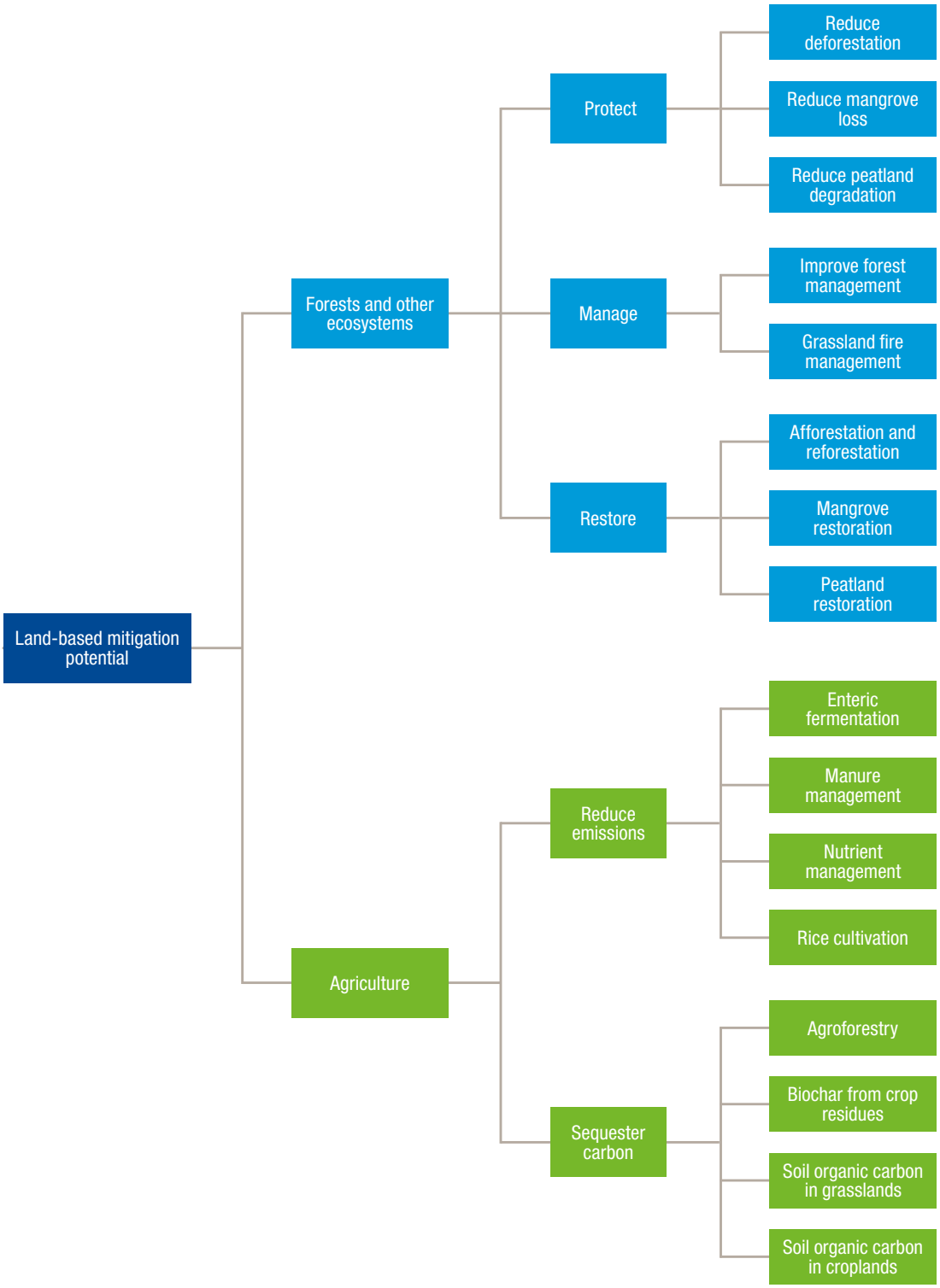
Country	Land area	Agricultural land	Arable land	Forest land	Planted forest	Primary forest
	2021	2021	2021	2021	2021	2017
Afghanistan	65 223.00	38 313.00	7 829.00	1 208.44	0.00	0.00
Angola	124 670.00	45 897.00	5 373.00	66 052.31	800.47	0.00
Bangladesh	13 017.00	10 068.00	8 110.00	1 883.40	158.07	411.00
Benin	11 276.00	3 950.00	2 800.00	3 085.15	24.67	0.00
Burkina Faso	27 360.00	12 740.00	6 100.00	6 166.40	182.53	0.00
Burundi	2 568.00	2 103.00	1 270.00	279.64	112.97	40.00
Cambodia	17 652.00	6 099.14	4 120.14	7 912.68	615.91	322.00
Central African Republic	62 298.00	4 910.00	1 800.00	22 273.00	2.00	1 988.00
Chad	125 920.00	50 338.00	5 300.00	4 201.33	20.10	0.00
Comoros	186.10	133.00	65.00	32.48	0.10	8.00
Democratic Republic of the Congo	226 705.00	33 898.00	13 680.00	125 053.86	57.70	102 686.00
Djibouti	2 318.00	1 703.90	3.00	5.87	0.27	0.00
Eritrea	12 104.08	7 592.00	690.00	1 052.10	44.73	0.00
Ethiopia	112 857.13	38 595.00	16 314.00	16 995.50	1 249.56	0.00
Gambia	1 012.00	634.00	440.00	236.93	1.78	0.80
Guinea	24 572.00	14 638.00	3 100.00	6 149.00	57.33	63.00
Guinea-Bissau	2 812.00	815.11	300.00	1 971.57	1.09	0.00
Haiti	2 756.00	1 795.00	1 005.00	344.19	32.00	0.00
Kiribati	81.00	34.00	2.00	1.18	--	0.00
Lao People's Democratic Republic	23 080.00	2 031.00	1 224.00	16 561.00	1 788.80	1 193.73
Lesotho	3 036.00	2 433.00	429.00	34.52	8.67	0.00
Liberia	9 632.00	1 923.04	500.00	7 587.18	27.90	175.00
Madagascar	58 180.00	40 895.00	3 000.00	12 416.60	312.00	2 993.00
Malawi	9 428.00	6 050.00	4 000.00	2 199.70	73.60	845.00
Mali	122 019.00	43 131.00	8 341.00	13 296.00	568.00	0.00
Mauritania	103 070.00	39 710.00	450.00	307.37	44.68	0.00
Mozambique	78 638.00	41 413.83	5 650.00	36 497.60	76.39	0.00
Myanmar	65 267.00	12 980.00	10 990.00	28 254.18	427.09	3 192.00
Nepal	14 335.00	4 121.00	2 113.70	5 962.03	220.60	526.00
Niger	126 670.00	46 595.00	17 700.00	1 067.28	125.00	220.00
Rwanda	2 467.00	2 004.46	1 268.40	277.00	151.00	7.00
Sao Tome and Principe	96.00	42.00	4.00	51.28	0.00	27.00
Senegal	19 253.00	9 511.00	3 830.00	8 028.16	32.00	1 508.00
Sierra Leone	7 218.00	3 949.00	1 584.00	2 515.15	21.98	85.20
Solomon Islands	2 799.00	120.00	23.00	2 522.24	24.03	1 105.40
Somalia	62 734.00	44 129.00	1 100.00	5 903.25	3.00	0.00
South Sudan	63 193.00	28 252.70	2 394.70	7 157.00	187.90	0.00
Sudan	186 800.00	112 664.84	20 994.84	18 187.39	130.00	1 344.70
Timor-Leste	1 487.00	341.40	111.50	919.70	0.00	0.00
Togo	5 439.00	3 820.00	2 650.00	1 206.31	62.04	0.00
Tuvalu	3.00	1.80	--	1.00	0.00	0.00
Uganda	20 052.00	14 415.00	6 900.00	2 296.64	475.00	0.00
United Republic of Tanzania	88 580.00	39 521.20	13 502.50	45 276.00	553.04	0.00
Yemen	52 797.00	23 452.00	1 158.00	549.00	0.00	0.00
Zambia	74 339.00	23 839.00	3 800.00	44 625.81	51.86	0.00
LDCs, total	**2 035 999.31**	**821 602.42**	**192 019.78**	**528 604.42**	**8 725.86**	**118 740.83**

Source: UNCTAD, based on data from the Food and Agriculture Organization of the United Nations, database, available at https://www.fao.org/faostat/en/ (accessed 1 July 2024).

Annex 2. Notes on methodology used to calculate land-based greenhouse gas mitigation in the least developed countries

This annex aims to clarify and provide detailed information on the data processing and extraction performed on the dataset contained in Roe et al. (2021). The initial step involved extracting cost-effective averages across 16 categories, which are divided into two primary sectors: (a) forests and other ecosystems and (b) agriculture. Figure B1 below details these categories and the corresponding data sources.

Figure 2.1
Categories of land-based mitigation measures



Source: UNCTAD, based on Roe et al. (2021).

Note: The original dataset from Roe et al. includes additional categories on bioenergy with carbon capture and storage and increased clean cookstoves to calculate the land-based mitigation potential. However, to avoid double counting when calculating this potential, these datasets are not shown separately in this flowchart. Instead, bioenergy with carbon capture and storage data is covered within the afforestation and reforestation category, while data on clean cookstoves is covered in the reduce deforestation category.

Land-based measures are grouped into two primary categories: GHG emission reduction and GHG removal. The classification specifies which measures, within the forest and agriculture sectors, contribute to either GHG reduction or GHG removal.

Activities aimed at reducing emissions are categorized as reduction measures, while those facilitating carbon sequestration fall under the removal category. For example, forest and other ecosystems protection initiatives are classified as reduction measures, while those geared towards restoration and reforestation are considered removal measures.

However, the management subsector straddles both categories with certain practices categorized as reduction (e.g. grassland and savannah fire management and forest management – global) and others as removal (e.g. forest management – tropics). Consequently, to prevent double counting for the "forest management total" indicator, which represents the average of both "tropics" and "global" indicators, adjustments are made to allocate 50 per cent weight to each indicator. The following table provides details on the calculation of both categories.

In order to present the cost-effective potential of each category, the subtotals of the included measures are calculated.

As illustrated in figure 2.1, the dataset covers one of the blue carbon ecosystems, namely mangroves. Other blue carbon ecosystems, including salt marshes and seagrass meadows, also store significant amounts of carbon and should be protected to avoid the release of GHGs. The quantities sequestered by these ecosystems are small compared to estimated land-based mitigation potentials. For instance, the global annual carbon sequestration of salt marshes and seagrass meadows is estimated at 57 $MtCO_2$ (Bertram et al., 2021), while the annual cost-effective land-based mitigation potential in LDCs alone is estimated to be 1,794 $MtCO_2$.

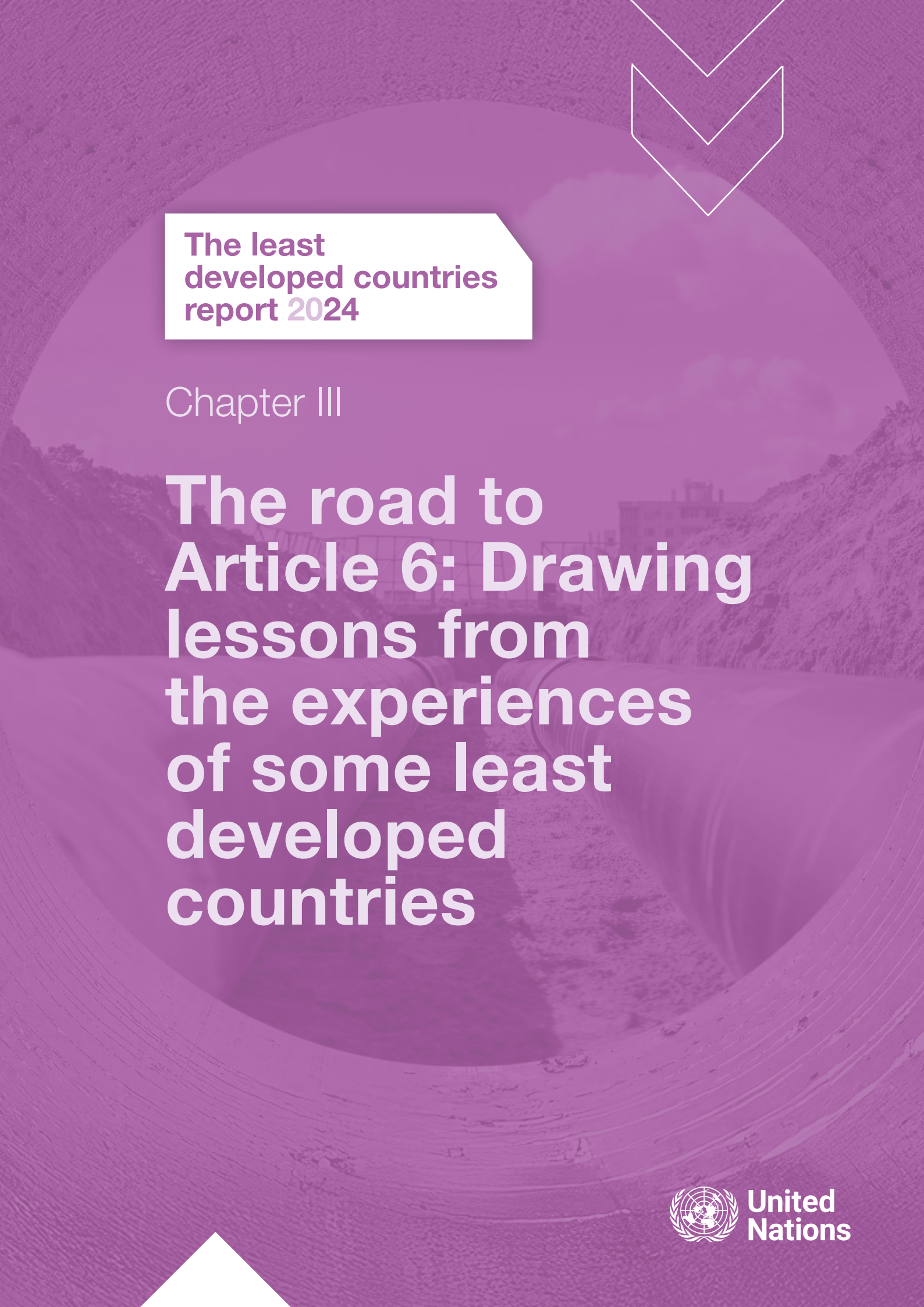
Table 2.1

Removal	Reduction
Agriculture (sequester carbon)	Agriculture (reduce emissions)
Total forest and other ecosystems (restore)	Total forest and other ecosystems (protect)
50 per cent of forest management – global	Grassland and savannah fire management
	50 per cent of forest management – tropics

The least developed countries report 2024

Chapter III

The road to Article 6: Drawing lessons from the experiences of some least developed countries



United Nations

Article 6 of the Paris Agreement transforms least developed countries (LDCs) and other developing countries from mere hosts of carbon offset projects into actors with commitments under their nationally determined contributions (NDCs). This new role, the different market- and non-market based vehicles and the variety of possible forms of cooperation and governance under the Paris Agreement present different conundrums for LDCs. While some countries have experience in international emission trading and market mechanisms under the Kyoto Protocol, there is much less experience among LDCs in bilateral cooperation. LDCs are likely to face significant challenges that could limit their options or place them at a disadvantage in the transition to an Article 6-compliant regime.

Not all LDCs have prior experience or expertise in engaging with carbon projects and markets, but enough do to allow some lessons to be drawn. The Paris Agreement represents a paradigm shift in the climate-related regulatory architecture with regard to implementation of the Kyoto Protocol. Consequently, it is necessary to gauge the contributions that the implementation of the Kyoto Protocol and the emergence of voluntary carbon markets has made to building capacity in LDCs to leverage those markets for development finance and other economic and social co-benefits. Insufficient regulatory frameworks and institutional capacities in LDCs present a significant impediment to maximizing any potential gains from the Article 6 mechanism currently being developed. Drawing lessons from the experiences of some LDCs to date could help mitigate the risk of persistent path dependencies.

Chapter III seeks to analyse the extent to which experience already gained in some LDCs from participation in compliance markets under the Kyoto Protocol Clean Development Mechanism – operational from 2005 until December 2020 – and in voluntary carbon markets could help smooth aspects of their transition to Article 6 compliance. The analysis also examines the range of sectors in which LDCs have been able to attract investments in carbon projects, and discusses lessons learned based on selected case studies. The case study analysis attempts to gather evidence and help assess whether carbon projects have complemented national development goals, as well as the nature of the role played by national authorities in carbon projects. Additionally, it examines claims concerning projects' co-benefits and their role in technology transfer in order to identify the projects' ability to generate value in terms of contributions to structural transformation and institutional capacity-building. The case studies also identify key stakeholders and relationships involved in this process.

A. Transferability of Kyoto Protocol know-how

From 2026 onwards, carbon project methodologies are required to be fully compliant with the new Article 6 mechanism

It has been argued that many Clean Development Mechanism approaches can be adjusted in ways that enable them to meet more stringent requirements of Article 6.4 methodology (Michaelowa et al., 2024). Should this be the case, the experience gained by some LDCs in implementing Kyoto Protocol activities and the lessons learned from their experience could translate into valuable capabilities and insights of relevance for their transition to the new Article 6 mechanism. Clean Development Mechanism projects were not automatically eligible to transition to the Article 6 mechanism in January 2021. This is because, recent research calls for a reassessment of the environmental integrity of Clean Development Mechanism methodologies (Michaelowa et al., 2024; World Bank, 2024; Christina, 2009). Moreover, there is a need to limit the volume of transitioned Clean Development Mechanism carbon credits because of the associated risk of undercutting ambitious global climate mitigation efforts. The Copenhagen Climate Centre of the United Nations Environment Programme (UNEP) estimates that eligible Clean Development Mechanism carbon projects represent the equivalent of up to 1.5 billion tons of carbon emission reduction claims potential for the period 2021–2025.[1] Correctly submitted transition requests, as at 24 March 2024, represented a total of about 900 million tons, most of which emanated from projects in Asia. Bangladesh is the only LDC among the top four countries accounting for over 60 per cent of the total reduction potential of transitioned Clean Development Mechanism projects.[2] Countries hosting Clean Development Mechanism carbon projects active on or after January 2021 were allowed to request that their projects transition to the Article 6.4 mechanism. The deadline for requesting transitions was 31 December 2023. Transitioning projects are permitted to continue to apply Clean Development Mechanism methodologies until 31 December 2025. From 2026 onwards (or the end of the approved project's current crediting period, whichever comes first), methodologies are required to be fully compliant with the new Article 6 mechanism.

Information on whether and for how many eligible projects countries requested a transition to Article 6 is presented in table III.1. Certified emission reductions from activities registered under Clean Development Mechanism on or after 1 January 2013 may be used towards NDCs until 2030. According to Michaelowa et al. (2021), this affected approximately 115 million unused certified emission reductions on the market by mid-2021.

Projects for which requests for transition were submitted were concentrated in the energy sector, encompassing a range of activity types, including electricity generation from solar power, hydropower and biomass, as well as the capture of fugitive gas from natural gas distribution networks, methane avoidance projects (domestic manure) and improvement of the efficiency of brick-producing kilns.

In addition, several LDCs are among developing countries that entered into preliminary bilateral agreements for international cooperation on Article 6 implementation (see table II.5). The predominance of Japan as an initiator of bilateral agreements is notable (see table II.4). Data to April 2024 show that Japan had signed bilateral agreements

[1] UNEPCCC (2024).

[2] See https://unepccc.org/wp-content/uploads/2024/02/a6-pipeline-cdm-transition.pdf.

Table III.1

Aggregate holdings of certified emissions reductions, and number of eligible projects for which transition to Article 6 requested by the participating least developed country

Country	Aggregate holdings in thousands of certified emission reductions	Transition requested (Number of projects)
Bangladesh	17 520	Yes (10)
Uganda	12 011	Yes (5)
Cambodia	9 702	Yes (2)
Myanmar	6 838	Yes (4)
Nepal	5 316	Yes (7)
Malawi	4 531	Yes (3)
Zambia	1 756	Yes (1)
Mozambique	1 210	Yes (2)
Rwanda	1 201	No
Ethiopia	1 098	Yes (3)
Mali	722	No
Madagascar	690	Yes (1)
Burundi	265	Yes (2)
Lesotho	204	No
Niger	97	No
Burkina Faso	60	Yes (1)

Source: UNCTAD calculations, based on data from the United Nations Environment Programme Copenhagen Climate Centre database, available at https://unepccc.org/cdm-ji-pipeline/ (accessed April 2024).

with 29 developing countries. In 2013, Japan pioneered bilateral cooperation under the Joint Crediting Mechanism as a project-based bilateral carbon offset mechanism.[3] According to the Asian Development Bank (ADB, 2019), the Joint Crediting Mechanism is the only example of a project-based international cooperative approach in existence and, as such, it is the clearest practical example of how Article 6.2 of the Paris Agreement could be implemented. Bangladesh and the Lao People's Democratic Republic registered Joint Crediting Mechanism projects in 2013; Cambodia, in 2014; and Myanmar, in 2015. These four Asian LDCs may therefore have benefited from a head start over other LDCs.

Of note with regard to Joint Crediting Mechanism projects is that they are mainly developed between a Japanese firm and a local counterpart in the Joint Crediting Mechanism partner country, with an emphasis on the transfer of low-carbon technologies (Murun and Tsukui, 2020).[4] Joint Crediting Mechanism may therefore be seen as a potentially attractive tool with which to facilitate the green transition and advance structural transformation for firms in LDCs that seek to integrate business expansion and sustainability actions. The potential for the Joint Crediting Mechanism to make direct contributions to furthering industrialization (Sustainable Development Goal 8) and supporting partner industries in LDCs to maintain their international competitiveness is illustrated by case study 3.1 in annex 3.

[3] See https://gec.jp/jcm/about/.

[4] For a complete list of Joint Crediting Mechanism projects see Overview of the Joint Crediting Mechanism available at https://gec.jp/jcm/about/.

B. The least developed countries and the Kyoto Protocol: Track record of involvement

1. Climate change mitigation actions under the Clean Development Mechanism

There was a shortfall of project activities in least developed countries under the Kyoto Protocol

Mitigation is not the priority in least developed countries

The first Clean Development Mechanism projects were registered in 2004, ahead of the Kyoto Protocol's first commitment period, 2008–2012 (Michaelowa et al., 2014), with developing countries in Asia taking the lead in the number of projects hosted. It became evident that there was a shortfall of projects in LDCs. By the start of the commitment period, only three LDC projects (one each in Bhutan, Uganda and the United Republic of Tanzania) had been registered under Clean Development Mechanism. Out of a total of 7,842 Clean Development Mechanism projects registered as at 31 December 2023, LDCs accounted for 1.8 per cent. If projects hosted by the three countries that are no longer in the LDC category are excluded, the 45 LDCs in 2024 accounted for only 1.5 per cent of total Clean Development Mechanism projects. As shown in figure III.1, the introduction in 2009 of the facility to group micro-level and small-scale carbon emission reduction activities under a single programme of activities helped boost the participation of LDCs in the implementation of the Kyoto Protocol, but this measure could not overcome the structural impediments that hindered LDC participation (box III.1). Overall, LDCs as a group had hosted 118 project activities and 98 programmes of activities by the end of the implementation of the Kyoto Protocol. Over the lifetime of the implementation of the Kyoto Protocol, LDCs registered a total of 217 Clean Development Mechanism projects, [5] the majority of which were implemented during the second commitment period in 2013–2020) (figures III.2 and III.3).

The low level of participation of LDCs in Clean Development Mechanism implementation should be balanced against the fact that adaptation is the priority in LDCs, while Clean Development Mechanism was a climate change mitigation mechanism under which additional factors affected the low level competitiveness of LDCs (box III.1).[6] Accordingly, given the recognition that all countries have a role to play in climate change mitigation, any analysis of the past and future performance of LDCs in carbon markets should not lose sight of this structural reality. Furthermore, Clean Development Mechanism rules required countries to set up a designated national

[5] This project count includes countries that have since graduated from the LDC category (Bhutan, Cabo Verde and Vanuatu). Under a programme of activities, it is possible to register an unlimited number of component project activities without undergoing the complete Clean Development Mechanism project cycle. The programmatic approach particularly benefits LDCs and regions. The programmes of activities are managed at the regional level, which allows particular regional policy goals to be effectively supported. Participants benefit from lower transaction costs, as well as reduced investment risks and uncertainties by accessing carbon finance through the programme of activities. Direct individual engagement in the Clean Development Mechanism process is not required and registration fees are not required to be paid for each component project activity included after registration of the programme of activities. Access is extended to smaller projects that would not be viable on a stand-alone basis. Monitoring and verification can be undertaken on a collective basis by utilizing a sampling approach.

[6] It is notable that even in larger developing countries, Clean Development Mechanism projects tended to be clustered in higher-income parts of a country, where industries, and consequently the most emissions, were located, and which had better institutional infrastructure (Fuhr and Lederer, 2009).

Box III.1:
Low level of participation by the least developed countries in the Clean Development Mechanism was foreseeable

The uneven distribution of Clean Development Mechanism projects across developing countries caused considerable concern before and during the implementation of the Kyoto Protocol. Despite its stated intention to promote sustainable development in developing countries, the Protocol did not prescribe any means of ensuring the equitable distribution and inclusiveness of Clean Development Mechanism projects across developing countries, including LDCs. Neither did it clarify how Clean Development Mechanism-derived economic benefits were to be equitably shared between participating Parties.

From the outset, LDCs were unlikely hosts of Clean Development Mechanism projects initiated by private developers, given that their priority was adaptation and not mitigation. Their stage of development implied the least aggregate potential for greenhouse gas (GHG) mitigation among developing countries. This, coupled with higher costs, and longer lead times for project development, meant they represented the least profitable option for both private project developers and developed-country Parties seeking to fulfil their commitments under the Kyoto Protocol. This disadvantage was compounded by high Clean Development Mechanism project registration costs, particularly for the smaller scale projects common in LDCs. Short commitment periods of five years were insufficient for economic transformation to significantly alter the low aggregate level of emissions at the national level in LDCs. In addition, LDCs had historical disadvantages in attracting foreign direct investment.

Measures aimed at addressing the uneven distribution of Clean Development Mechanism projects were later introduced. For example, the Nairobi Framework of Action, 2006, sought to improve the geographical spread of Clean Development Mechanism projects and the participation of underrepresented groups and regions of developing countries through capacity-building and the promotion of investment opportunities in such projects in the targeted countries. Another measure was the European Union granting of preferential access to certified emission reductions imports from Clean Development Mechanism projects in LDCs and small island developing States to the European carbon market, starting in January 2008. In addition, in 2005, the eleventh session of the Conference of the Parties to UNFCCC introduced an instrument that allowed the grouping of micro-level and small-scale CER-producing activities under a single programme of activities, thereby facilitating access for LDCs that had limited opportunities to develop larger scale projects. Loans for Clean Development Mechanism-related transaction costs were agreed by the fifteenth session of the Conference of the Parties in 2009.

Source: Lütken, 2011; Michaelowa et al., 2014; Winkelman and Moore, 2011.

Note: UNFCCC: United Nations Framework Convention on Climate Change. CER: certified emission reduction.

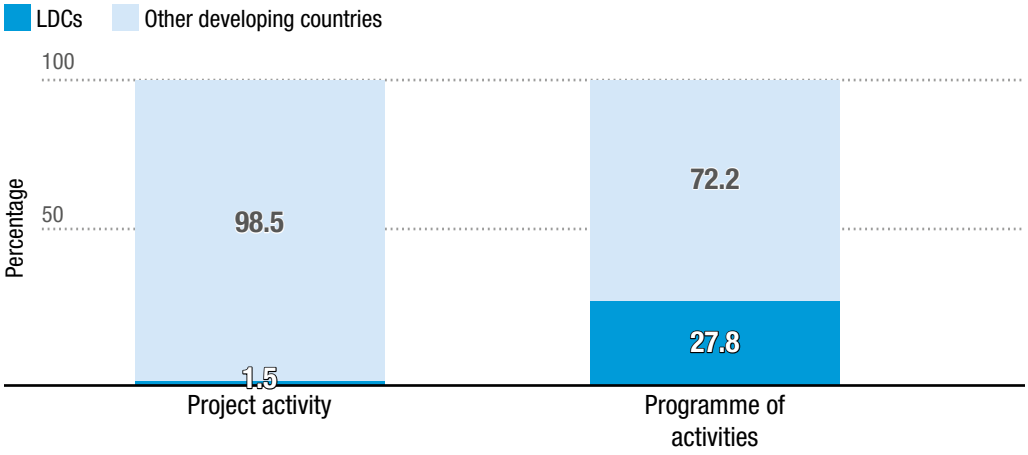
Five-year commitment periods were too short to significantly alter low aggregate emissions in least developed countries

authority to promote, attract and authorize carbon projects. Consequently, countries that did not have such an authority did not have projects. The speed at which LDCs set up such authorities varied, with a significant number of LDCs remaining without a Clean Development Mechanism project despite having a designated national authority (Michaelowa et al., 2014). Not unexpectedly, and similar to the issue concerning competitiveness as carbon project hosts, the varied response to the launch of Clean Development Mechanism was due to a combination of factors related to development priorities, competition among authorities for the role of designated national authority, low levels of institutional development and capabilities, the novelty of carbon projects and the Clean Development Mechanism compliance market, as well as difficulties in setting sustainable development rules (Michaelowa

et al., 2014; Byigero et al., 2010; Fuhr and Lederer, 2009; De Lopez et al., 2009). It is notable that LDCs were not the major beneficiaries of support for capacity-building under Clean Development Mechanism prior to the Nairobi Framework of Action; that form of support tended to be focused more on countries with the highest mitigation potential. The quality and type of capacity-building was also an issue, initially being mainly in the form of awareness-building workshops, followed by helping countries establish a designated national authority, until donors shifted interest to funding the development of actual carbon projects from 2006 onwards. Countries that received

Figure III.1

Shares of least developed countries and other developing countries in total registered projects, by project and programme of activities
(Percentage)

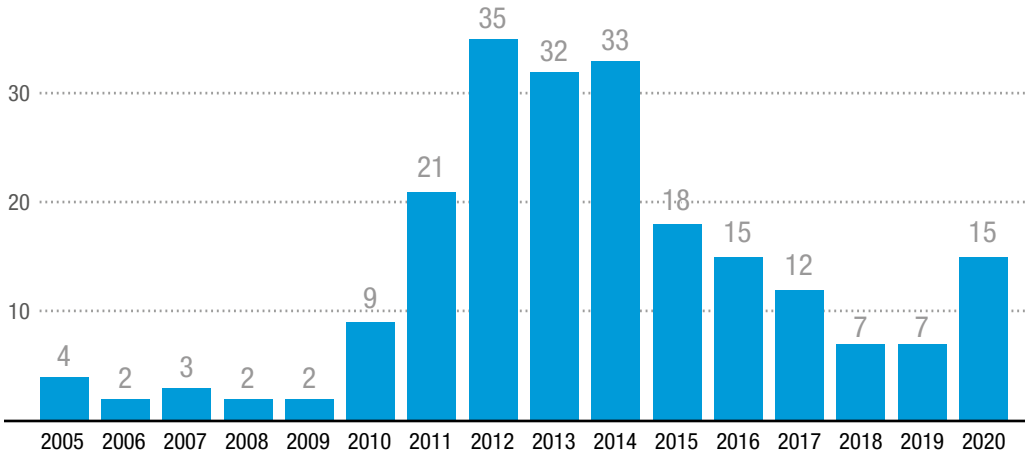


Source: UNCTAD calculations, based on data from the United Nations Environment Programme Copenhagen Climate Centre database, available at https://unepccc.org/cdm-ji-pipeline/ (accessed May 2024).

Note: Programmes of activities that span more than one country are counted for each participating country.

Figure III.2

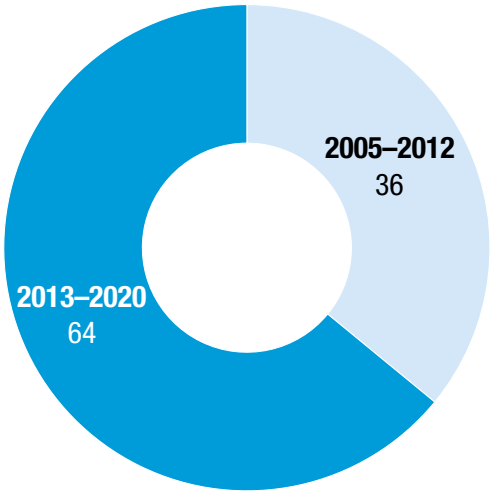
Projects in least developed countries registered under the Clean Development Mechanism, 2005–2020



Source: UNCTAD calculations, based on data from the United Nations Environment Programme Copenhagen Climate Centre database, available at https://unepccc.org/cdm-ji-pipeline/ (accessed May 2024).

Note: Programmes of activities that span more than one country are counted once.

Figure III.3
Clean Development Mechanism projects in least developed countries over the duration of the Kyoto Protocol
(Percentage)



Source: UNCTAD calculations, based on data from the United Nations Environment Programme Copenhagen Climate Centre database, available at https://unepccc.org/cdm-ji-pipeline/ (accessed May 2024).

Note: Programmes of activities that span more than one country are counted for each participating country.

institutional and project capacity-building assistance tended to be more successful in registering Clean Development Mechanism projects (Okubo and Michaelowa, 2009).

In addition, three major events influenced the trajectory of LDC participation in Clean Development Mechanism. The first was the generalized ban in 2003 on certified emission reductions imports from non-LDC projects registered after 2012, announced by the European Union.[7] The second was concerted capacity-building efforts, beginning in 2006, aimed in particular at boosting LDC participation in the implementation of the Kyoto Protocol (box III.1).[8] The third was the "carbon panic" in 2012, at the end of the first commitment period, when prices fell from a peak of €25 per ton of CO_2 (in 2008) to €0.05 (Kainou, 2022). Among factors that led to the loss of market confidence in the Clean Development Mechanism scheme were mitigation targets too modest to sustain strong incentives for private international investment, the decision by the European Union to prohibit the use of certified emission reductions in place of permits (except for certified emission reductions from LDC projects), the decision by Japan to not set numerical targets during the second commitment period of the Kyoto Protocol and the general shift in focus by governments to negotiating a new climate treaty that would replace the Kyoto Protocol (Kainou, 2022; *The Guardian*, 2012; UNFCCC, 2012).[9] The Clean Development Mechanism scheme was subsequently largely sustained by several developing countries and 14 individual states in the United States, which decided to allow the use of certified emission reductions credits under domestic environmental tax systems and emission credit trading systems (Kainou, 2022; *The Guardian,* 2012). The lagged impact of these three events is illustrated in figure III.4. From 2010

[7] See https://emissions-euets.com/cers-erus-market-as-from-2013.

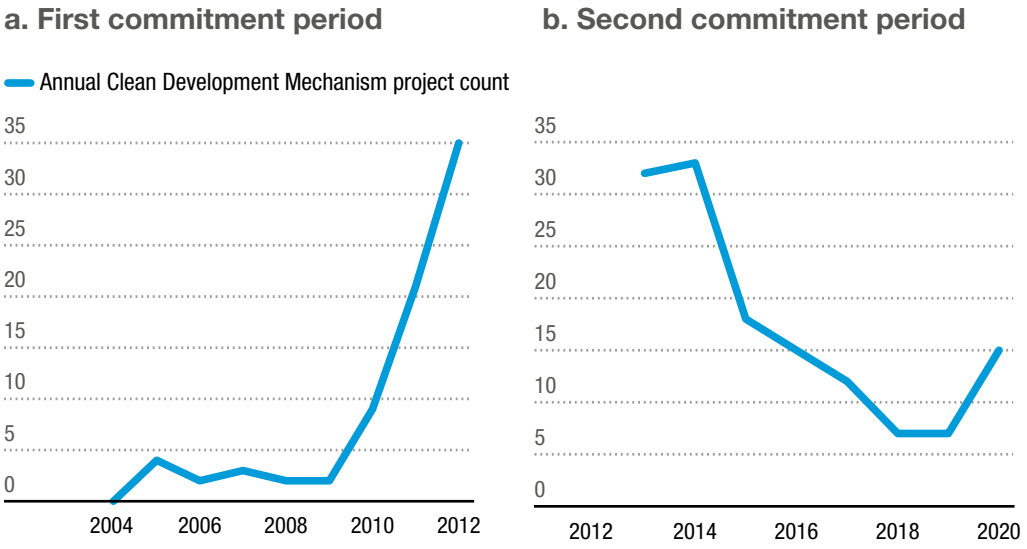
[8] In addition to initiatives under the UNFCCC, other examples include the Carbon Initiative for Development, which is a World Bank trust fund that mobilizes private finance for clean energy access in low-income countries, and the Asian Development Bank-administered Japan Fund for the Joint Crediting Mechanism. The first Clean Development Mechanism programme of activities of the former was registered in 2016 and agreements have since been signed to purchase emission reduction credits involving projects in Ethiopia, the Lao People's Democratic Republic, Madagascar, Mali, Rwanda, Senegal and Uganda (see https://www.ci-dev.org/programs).

[9] The primary driver for the rapid growth of Clean Development Mechanism was the demand for certified emission reductions from emitters that faced compliance obligations under, in particular, the European Union Emissions Trading System (the world's largest) and other smaller systems that allowed the use of certified emission reductions, such as those of Australia, Japan and New Zealand (UNFCCC, 2012). The decision by the European Union to curtail the use of certified emission reductions therefore had a major impact on Clean Development Mechanism. The significance of Japan to CDM may be seen in the purchase by Japanese firms of several hundred million certified emission reductions during the first commitment period of the Kyoto Protocol (see https://www.c2es.org/document/technological-innovation-sustainable-development-and-post-paris-voluntary-cooperation-a-closer-look-at-japans-joint-crediting-mechanism/).

Figure III.4

Trajectory of participation by least developed countries in the implementation of the Kyoto Protocol's first and second commitment periods

(2005–2020)



Source: UNCTAD calculations, based on data from the United Nations Environment Programme Copenhagen Climate Centre database, available at https://unepccc.org/cdm-ji-pipeline/ (accessed May 2024).

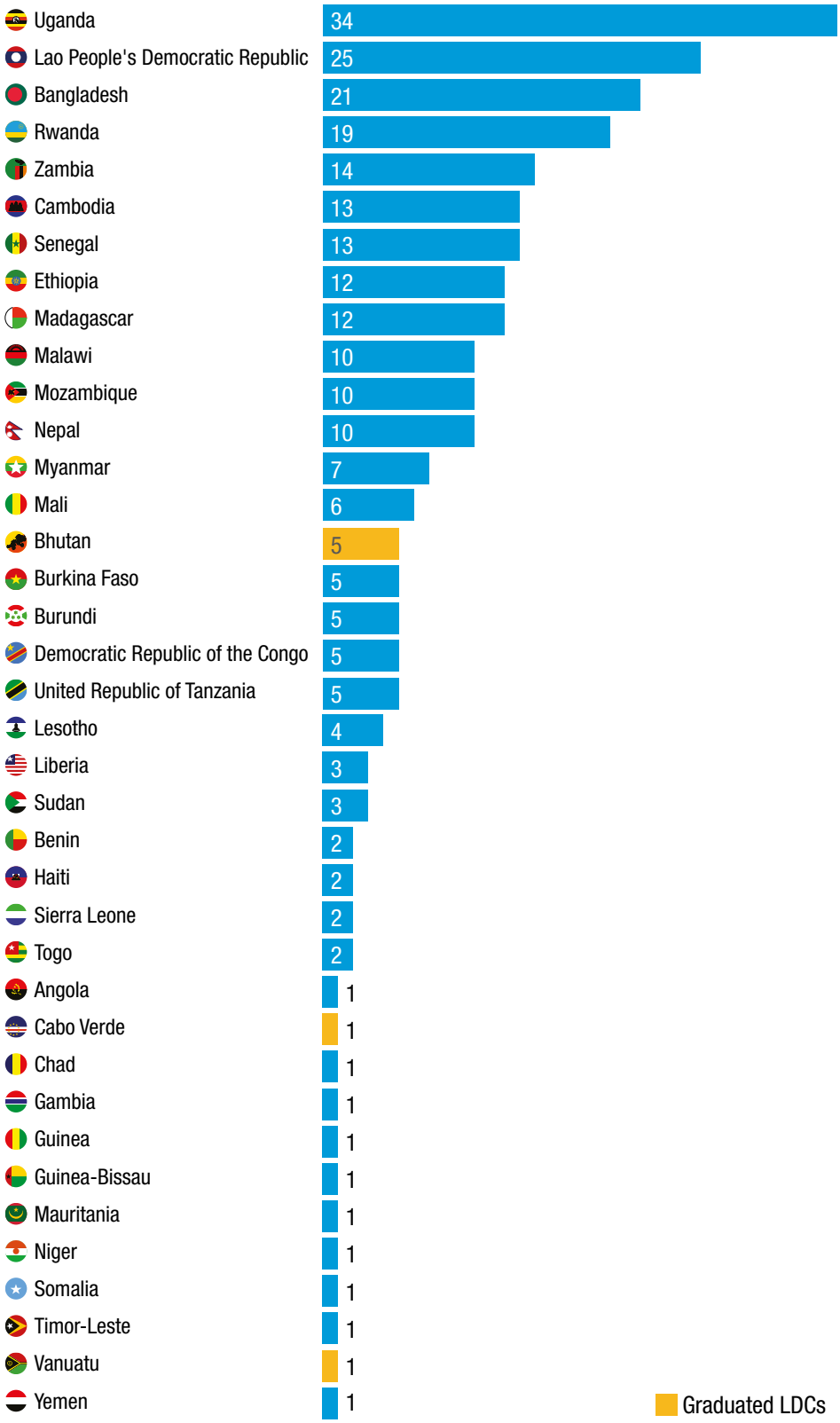
Note: Programmes of activities that span more than one country are counted once.

through 2014, it is likely that the momentum generated by various support measures aimed at boosting LDC participation since 2006 kept project registrations buoyant even after the carbon panic.

Of the 45 LDCs in 2024, 32 countries (71 per cent) have some experience in Clean Development Mechanism implementation, of which 17 countries (53 per cent) registered fewer than five projects each over the lifetime of the implementation of Article 12 of the Kyoto Protocol. Overall, 10 of the 45 LDCs (22 per cent) each registered one Clean Development Mechanism project (figure III.5).

Of the 10 countries that registered one project each, four countries (Chad, the Gambia, Mauritania and Somalia) registered during the first commitment period and six countries (Angola, Guinea, Guinea-Bissau, the Niger, Timor-Leste and Yemen) registered during the second commitment period. Guinea and Guinea-Bissau registered projects in 2020. The data show that Clean Development Mechanism implementation was concentrated in 12 LDCs that accounted for over 70 per cent of all projects in the 45 LDCs, indicating that 12 of the 45 LDCs may have some capabilities with regard to Clean Development Mechanism processes. No conclusions may be drawn about the depth of know-how acquired in the 12 countries on the design, development and verification of carbon projects and the workings of carbon markets. Notably, of the 12 countries in which implementation was concentrated, Uganda registered projects that were more evenly spread across both commitment periods. Factors contributing to the success of Uganda in attracting carbon projects are discussed in box III.2.

Figure III.5
Number of Clean Development Mechanism projects registered by each least developed country



Source: UNCTAD calculations, based on data from the United Nations Environment Programme Copenhagen Climate Centre database, available at https://unepccc.org/cdm-ji-pipeline/ (accessed May 2024).

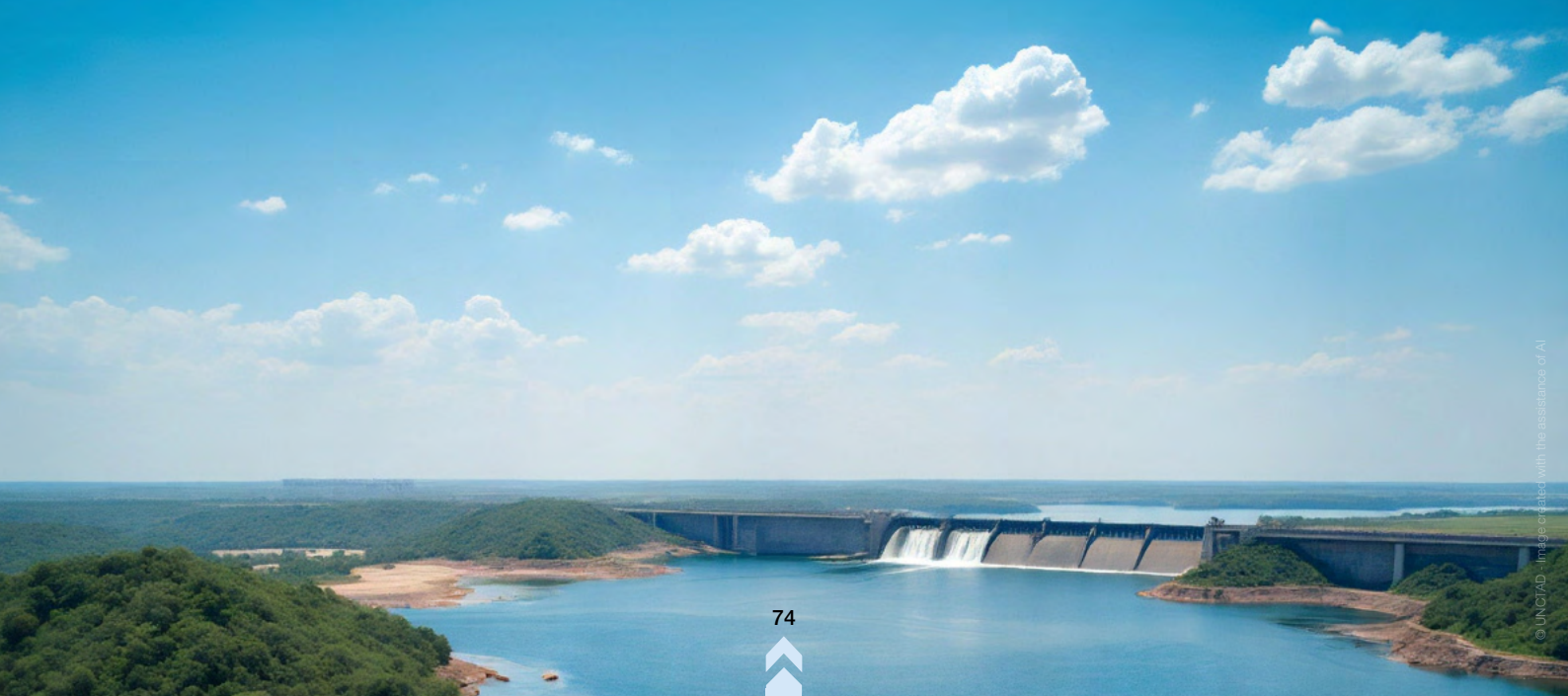
Note: Programmes of activities that span more than one country are counted for each participating country.

Box III.2:
Uganda: Success in attracting projects under the Clean Development Mechanism

1. **Supportive government policies** – Established in 2008, the Climate Change Unit (now known as the Climate Change Department) within the Ministry of Water and Environment, developed sustainable development criteria for Clean Development Mechanism projects covering environmental, social, economic and technology transfer-related areas.
2. **Establishment of a regional collaboration centre** – UNFCCC and the East African Development Bank established the centre in Uganda in 2013 with the aim of fostering the participation of African countries in Clean Development Mechanism. The centre provided hands-on support in the identification and design of Clean Development Mechanism projects, addressed issues raised by organizations that verified them and facilitated the lowering of transaction costs to governments, non-governmental organizations and businesses interested in developing Clean Development Mechanism projects.
3. **Technical assistance and capacity-building** – In 2013, Uganda received financial assistance of $2.6 million in investment from the Belgian Development Agency to become a Clean Development Mechanism hub. This initiative included training in monitoring, validation, verification and carbon credit transactions. Partnerships with organizations such as the German agency for international development cooperation and the Uganda Investment Authority in the period 2014–2017 enabled the provision of technical advice and support for potential climate finance projects, with the objective of enhancing the country's ability to formulate and finance Clean Development Mechanism projects.
4. **Programmes of activities** – The creation and advancement of these programmes enabled the bundling of multiple small-scale projects and shifted the focus to LDCs, thereby presenting new opportunities for countries such as Uganda. Small projects constitute 85 per cent of Clean Development Mechanism projects in Uganda.

These concerted efforts helped Uganda leverage Clean Development Mechanism and accelerate the identification of projects in eligible sectors.

Source: news.trust.org, 2013; Nakkazi, 2012; and Uganda Investment Authority, 2024.



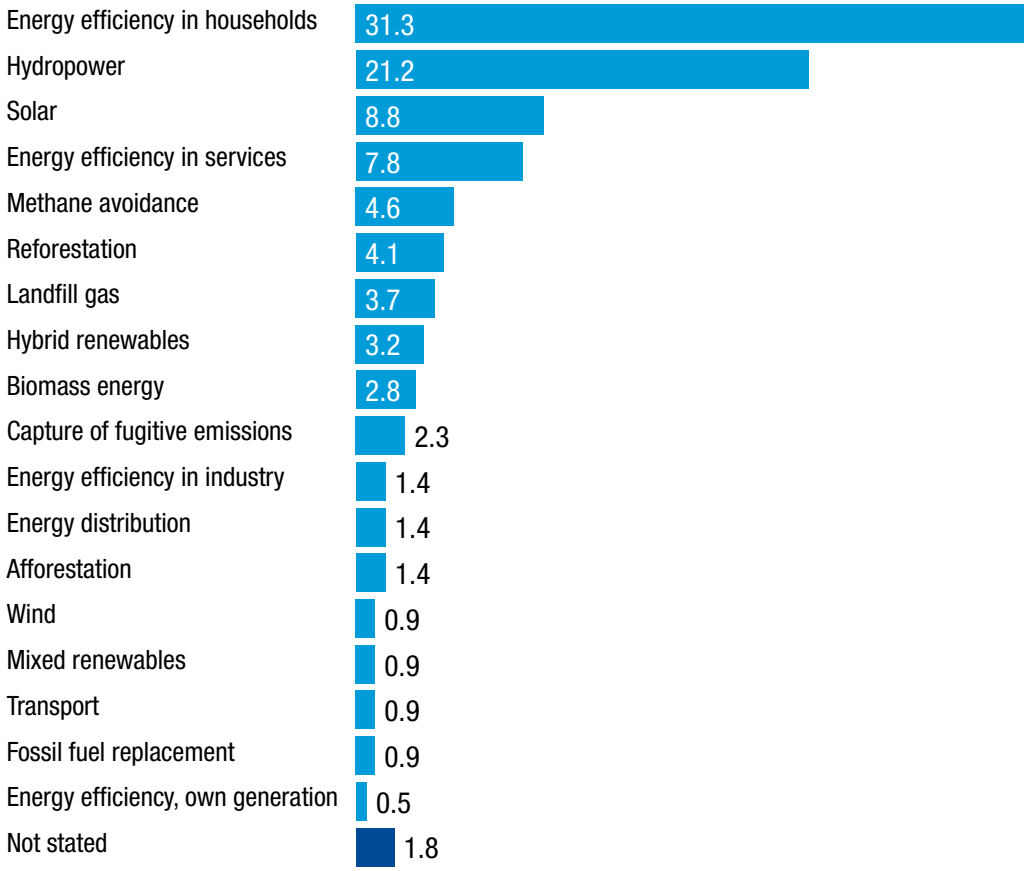
Uganda may therefore have benefited more than other LDCs if local participants in projects were given the opportunity to broaden engagement in Clean Development Mechanism projects and if domestic service providers and experts acquired skills and networks needed to increase their stakes in carbon project implementation.

Among the remaining top 12 countries, project registrations were concentrated during the second commitment period. This might still have provided an advantage if the projects benefited from project developers with a proven track record of project implementation or expertise in applying the most recent innovations in Clean Development Mechanism methodologies.

Projects in LDCs have tended to address mostly energy issues (figure III.6), with the energy portfolio accounting for 90 per cent of all Clean Development Mechanism projects (figure III.6).

Projects in least developed countries have tended to mostly address energy issues

Figure III.6
Clean Development Mechanism projects in least developed countries by project type



Source: UNCTAD calculations, based on data from the United Nations Environment Programme Copenhagen Climate Centre database, available at https://unepccc.org/cdm-ji-pipeline/ (accessed May 2024).

C. Insights from case studies of projects hosted by least developed countries

Insights from case studies of six carbon projects hosted by LDCs, one under Joint Crediting Mechanism, two under voluntary carbon market and three under Clean Development Mechanism, are presented in this section. The case studies and analytical frameworks are presented in annex 3. The empirical evidence gathered on the project activities focuses on the following six areas of enquiry: a summary description of the activity; contributions of the activity towards meeting the Sustainable Development Goals; the impact and effectiveness of efforts geared to technology transfer; evidence of institutional capacity-building; factors promoting project developer investment interests; and certified emission reductions revenues gained. Only large projects are analysed, in line with the focus of the present report on investigating the viability of carbon markets as a vehicle for raising development finance. Depending on the availability of relevant data, a variety of project types and sectors are covered; LDC host countries are randomly selected.

The insights presented focus on the outcomes and the conclusions that can be drawn at the level of LDCs, including the implications for new frameworks under the Paris Agreement based on past engagement by LDCs with carbon projects. The projects studied are as follows: installation of a high efficiency loom at a weaving factory in Bangladesh (Joint Crediting Mechanism); fuelwood saving with improved cookstoves in Cambodia (Clean Development Mechanism); the Mai Ndombe REDD+ forest conservation project in the Democratic Republic of the Congo (Voluntary Carbon Market); construction and operation of a 20-megawatt solar photovoltaic power plant in Ambatolampy, Madagascar (Clean Development Mechanism); construction and operation of Taiba N'Diaye Wind Farm in Senegal (Voluntary Carbon Market); and recovery of landfill gas at Mtoni Dumpsite in the United Republic of Tanzania (Clean Development Mechanism and.

All projects were authorized or approved by national authorities. The main data sources are the UNFCCC Clean Development Mechanism platform and relevant voluntary carbon market platforms. Data were drawn from official project design documents, designated operational entity verification documents and stakeholder surveys available from the official platforms, as well as project progress or evaluation reports available on project developer websites. Since Clean Development Mechanism rules do not require the formal reporting or verification of sustainable development impacts, the case studies rely on publicly available commentary by researchers and media reports of community stakeholder commentary for the independent corroboration of the socioeconomic impacts of the projects.[10]

1. Development finance

The case studies do not support a conclusion that carbon projects guarantee a net injection of foreign capital into host countries.

The case studies of Cambodia, Madagascar and Senegal show that project developers

[10] A designated operational entity is an independent auditor accredited by the Clean Development Mechnaism Executive Board to validate project proposals (see https://cdm.unfccc.int/DOE/list/index.html). A similar system of independent third-party auditors is used under voluntary carbon markets (see https://verra.org/validation-verification/#for-the-vcs-program).

can, to varying extents, rely on credit from the domestic financial sector. They also benefit from a mix of public finance and official development assistance (ODA), whether in terms of direct financing or guarantees. According to Lütken (2011), from the start, Clean Development Mechanism projects employed local equity and finance, with the result that domestic financial capability (deeper local capital markets and financial systems) displaced the attractiveness of foreign direct investment (FDI) as a driver of Clean Development Mechanism project development in developing countries. The projects studied suggest that LDCs may not be any different from other developing countries and show that UNFCCC-designed mechanisms failed to operationalize the principle of common but differentiated responsibilities under Clean Development Mechanism In this respect. The reliance of the international private sector on domestic financial sectors for sustainable finance rather than acting as a source of inflows of new capital may remain a concern for LDCs under the Paris Agreement if local financial sectors become the preferred source of climate financing. For example, the high-level expert group on scaling up sustainable finance in low- and middle-income countries calls for the European Commission to increase efforts to build robust and liquid capital markets in these countries for that purpose (HLEG, 2024).[11] This could entrench a situation in which global capital, instead of flowing from rich to poor countries, flows in the other direction (UNCTAD, 2020). In addition, the opacity of information on carbon credit revenues and benefit-sharing prevents a clear assessment of the ability of carbon credits to financially compensate for such leakages in climate financing in LDCs. However, that seems unlikely, given that, in some cases, project developers were awarded exclusive rights to carbon credits. LDCs would be particularly disadvantaged if the ultimate result was developing countries continuing to carry more than their fair share of the costs of the climate crisis, in terms of both impacts and financing mitigation under the Paris Agreement.

The case studies suggest that there are a variety of actors participating in carbon projects, including private equity funds. Globally, private equity is attracting attention as a significant driver of energy transition deals (George and Gupta, 2022). Most funds in 2022 and 2023 invested in wind, solar and supporting technologies.[12] However, global investment by private equity in renewables is incremental, and does not displace continued investments in traditional energy sources (*Value Add*, 2024). In particular, LDCs have not been the primary beneficiaries of the surge in renewable energy investments following the Paris Agreement. The International Energy Agency states that new policies in the United States, Europe and other developed jurisdictions make it more challenging for others to compete for private capital in clean energy (IEA, 2023). LDCs are also at a disadvantage because revenue streams from their energy transition projects are typically denominated in local currencies, which means that international investors using a foreign currency create a foreign exchange risk for themselves or for domestic borrowers. According to UNCTAD estimates for developing countries, the annual deficit in investment in the Sustainable Development Goals increased to $4 trillion in 2022, of which the energy sector accounted for $2.2 trillion (UNCTAD, 2023).

Domestic financial capability displaced FDI-attractiveness as a CDM project development-driver

Least developed countries are not the primary beneficiaries of the surge in renewable energy investments witnessed since the 2015 Paris Agreement

2. Sustainable development

The case studies suggest that co-benefits from Clean Development Mechanism and voluntary carbon market projects are uncertain. Carbon project co-benefits may

[11] The high-level expert group notes that for many countries, neither compliance markets nor voluntary markets may be the most suitable solution to help scale up sustainable finance flows towards nature protection and preservation.

[12] See https://carboncredits.com/private-equity-buys-in-renewable-energy-big-time-almost-15b.

also be ill-defined (i.e. overly ambitious, not quantified and not verified) in documents. Standard authorizations lodged by national designated authorities with the Clean Development Mechanism registry do not include information on the reasons why host countries validated carbon projects. Project verification reports tend to focus on emission mitigation effects. The reasons for the apparent lack of rigour regarding developmental impacts can be traced to Clean Development Mechanism rules, structural impediments in LDCs and private (external) project developers. Clean Development Mechanism rules do not define sustainable development. Developing countries were required to define sustainable development individually, whereas the contribution towards offsetting a developed country's emissions was assessed and verified at the international level. Consequently, the development of successful Clean Development Mechanism projects in developing countries required substantial efforts and expertise on the part of policymakers and designated national authorities. This expertise also needed to be linked to particular project ideas and all project steps, including identification, development and investment. Moreover, Clean Development Mechanism projects developed by the private sector were often in domains that traditionally had not been managed through private investment in developing countries, including forestry and conservation, and reliance on systems of periodic community and civil society engagement by project developers proved inadequate in enforcing accountability, preventing abuses and ensuring developmental impacts of the desired quality. It may take decades for developmental dynamics to become clear to policymakers, particularly in the area of forestry and conservation, which entails long implementation time frames. Given less-developed institutional capacities in LDCs, there was a steep learning curve in the task of differentiating between a market opportunity and developmental value added. Under bilateral approaches to implementing the Paris Agreement, for example, designated national authorities need to find a balance among a myriad of issues, including the priorities of partners to promote domestic firms and technology exports and national goals of enhancing technological capabilities and structural transformation, while also giving consideration to issues of technology lock-in.

It takes decades to fully understand the developmental dynamics of forestry and conservation projects

A review of approaches used by designated national authorities to define sustainable development criteria for Clean Development Mechanism projects shows that they differed in quality and complexity. Approaches generally fell into four broad categories, as follows: a general listing of criteria under categories such as social, economic and environmental (the most simple); a detailed listing describing criteria under each category, along with indicators; a scoring of indicators under each category; and additional special checks and procedures requiring supporting data to ensure criteria are met (the most rigorous). The existence of designated national authority expert groups under Clean Development Mechanism, and the sharing of experiences, might have led to some LDCs adopting more complex approaches; for example Bhutan and Uganda used the scoring method and Rwanda incorporated additional checks and procedures. However, the quality of development outcomes is necessarily conditioned by country-specific contexts and the presence of institutional capabilities needed to appropriately articulate indicators and effectively implement a country's chosen approach. In terms of the latter, among developing countries, LDCs are less well-placed in terms of ability to set terms for investors.

The high risk of a low level of developmental outcomes suggested by the case studies provides justification for incorporating stronger frameworks at the international level on developmental benefits under the new Article 6 mechanism. An evident area for consideration is benefit-sharing. There are also opportunities in planning for the safe and responsible disposal or

recycling of alternative energy innovations, which left unaddressed, alters the true sustainability profile of low-carbon technologies and exposes developing countries to novel waste streams, a similar phenomenon as that occurring as part of digitalization, as noted by UNCTAD (2024). It is important for measures aimed at boosting LDC participation to prioritize developmental impacts over commercial interests, or at least achieve an appropriate balance, by imposing higher standards of accountability on project developers.[13]

3. Learning effects

The case studies suggest that Clean Development Mechanism and voluntary carbon market implementation in LDCs may have had few and uncertain learning effects.

(a) Development co-benefits

Overall, the case studies suggest that the ability of carbon projects to deliver meaningful co-benefits is not certain.

All of the case studies show that the carbon projects hosted by LDCs have involved low-carbon technology transfer, which is also a goal in the Paris Agreement. In the case of grid-connected renewable electricity generation, the potential for furthering structural transformation in LDCs and positive socioeconomic knock-on effects is notable.[14]

Of concern is the lack of evidence that technology transfers went significantly beyond technology hardware, to include the development of skills and management systems. In Cambodia, the development of a domestic cookstove industry and supply chain involved more than the transfer of technology hardware, yet the results were mixed, and the sustainability of the industry is threatened by the pursuit of the national goal to expand electrification and the adoption by households of cleaner cooking fuels.

In a context where the majority of firms in LDCs are typically undercapitalized, the case study in Bangladesh serves to emphasize the high up-front capital costs of a low-carbon transition for individual firms. Long-term credit for investment and innovation underpins the technological upgrading required for the low-carbon transition. Research by UNCTAD shows that entrepreneurs with the necessary attributes for participation in global value chains still need to address credit constraints in LDCs (UNCTAD, 2018). According to the World Bank, around 50 per cent of formal small and medium-sized enterprises lack access to formal credit. Consequently, it is unlikely that many domestic firms in LDCs would be attractive partners for firms from Japan under Joint Crediting Mechanism. In Bangladesh, the domestic firm was relatively well-resourced and could easily borrow from the domestic financial sector, yet had to deal with high domestic interest rates of 14–16 per cent (Japan, 2017).

Low-carbon transition implies high and upfront capital costs for individual firms

Nevertheless, the Joint Crediting Mechanism case study presents an example of what is needed at the firm level to achieve the low-carbon transition and green structural transformation. It provides the justification for domestic policy interventions to support such a transition, not least because low-carbon technologies involve particular risks associated with rapid technological innovation. The intersection of technology and financing for sustainable production involves major challenges in achieving the low-carbon transition at the firm level in LDCs, and requires industrial policy interventions (UNCTAD, 2023). The challenge of access to credit for most firms in LDCs is compounded by the unfavourable

[13] It is notable that the twenty-eighth session of the Conference of the Parties did not adopt any decision on rules for carbon markets. See https://tessforum.org/latest/voluntary-carbon-markets-unfinished-business-from-cop28 and https://www.wri.org/insights/cop28-outcomes-next-steps#carbon-markets.

[14] In the two utility-scale renewable energy projects studied, power purchasing agreements played a role in attracting investment. In addition, Senegal has a policy on feed-in tariffs, including a dedicated law on renewable energy (Renewable Energy Law No. 2010-21).

macroeconomic impacts of current multiple global crises affecting these economies. With equipment and components mostly purchased in foreign currencies and financed by debt, LDC firms that depend on imports of capital goods also face risks associated with the volatility of exchange rates. The Joint Crediting Mechanism case study serves to highlight, as does the case study in the United Republic of Tanzania, how high transaction costs and inadequate infrastructure in LDCs impact carbon projects in the same way as they do other market-driven investments.

(b) Institutional capacity

With regard to building institutional capacity, the results of the case studies are mixed, including the following: protracted land reform in the Democratic Republic of the Congo; weaknesses at the level of the national utility offtaker in Madagascar; and weaknesses at the level of the Dar es Salaam municipality in the United Republic of Tanzania. The design of Clean Development Mechanism and voluntary carbon market, by default, relegated the national and local authorities in LDCs to an arm's-length relationship with carbon projects and developers, even in the case of projects such as the forest conservation project in the Democratic Republic of the Congo, for which the relevant ministry and the project developer signed a contract.

Project developers often fail to effectively address gender disparities within carbon projects

The case studies therefore serve to show that host countries may have lacked the capacity for strategic engagement with carbon projects, not only in terms of developmental impact but also in the areas of human rights and gender, where carbon projects have served to show weaknesses in institutional capacity (Asiyanbi and Lund, 2020; West et al., 2023). The case studies suggest that the governance function of checking and enforcing sustainable development criteria can largely be outsourced to the project developer, even if corporate social responsibility initiatives are agreed with host Governments or communities, as in Senegal. Moreover, particularly with regard to land-based climate solutions, dealing with land tenure issues requires an awareness of gender-based discrimination embedded in the ownership and administration of land. This awareness needs to be combined with historical, political and economic knowledge, which most external project developers may not have and may find too costly to acquire. With most land-based and conservation projects likely to be located in rural areas, the greatest impact will be felt largely by rural and Indigenous women, who play a significant role in agricultural production and forest management yet may be left behind in the implementation of carbon projects. Studies show that carbon projects and climate action tend to pay insufficient attention to gender issues due to what has been called "carbon tunnel vision", which gives precedence to emission reductions over social and environmental goals. For example, gender and women's empowerment, human rights and basic needs are either overlooked or simply tagged as relevant keywords in voluntary carbon market project documents by project developers (ASEAN LCEP, 2023; Soubeyran and Choudhary, 2023; Ampaire et al., 2020; ESCAP, 2017).

This suggests the need for a greater and leading role for host countries in carbon projects that have impacts on land tenure and land redistribution and to strengthen the link between the Paris Agreement and building regulatory institutional expertise in LDCs.

There is often insufficient knowledge about the local drivers of deforestation

The case study in the Democratic Republic of the Congo provides an example of lack of preparedness by a host country since it involved the holding of significant acreage by a single entity on a renewable long-term contract, without due consideration having been given to existence of conflicting systems of land tenure associated with as many as 250 different groups. Land tenure is a key issue in both climate change mitigation and adaptation, and can influence the success of carbon projects. Studies have not yet been conducted on the drivers

Box III.3:
The Democratic Republic of the Congo: Between a rock and a hard place

The Democratic Republic of the Congo, noted by the World Bank as a significant country in which to implement climate solutions, covers a land area equivalent to Western Europe. It hosts the world's largest tropical peatlands, the second largest river by volume and the second largest tropical forest. It has rich deposits of strategic minerals, including cobalt (with over 70 per cent of global cobalt), coltan, copper, lithium, nickel and rare earths.

The Democratic Republic of the Congo can have an essential role in dealing with global warming, yet development progress is lagging behind. Tensions between economic and conservation goals are likely to intensify, including because climate change is predicted to increase population movements in a context in which the high population growth rate (which is higher than that of LDCs as a group, of Africa and of the world); and armed conflicts in parts of the country could exacerbate tensions over resources. The Government has committed to protecting 30 per cent of the country as part of global climate actions, but has emphasized the right to use mineral resources, many of which are situated in or near carbon sinks, for economic growth. Since late-2020, the country has assigned 24 new conservation concessions.

Given the extraction and conservation nexus, the country faces multifaceted challenges. As noted by the United Nations Office on Drugs and Crime and World Bank, the risks associated with climate change are similar to those in other governance areas, with corruption risks often heightened. Human rights harms in both mineral extraction and nature conservation are additional concerns. In the Democratic Republic of the Congo, these have contributed to population displacement, gender discrimination, political instability and enduring poverty.

The Democratic Republic of Congo faces challenges with regard to the enforcement of laws requiring private concession holders to respect the environment and human rights, including granting forest-dependent communities more land management autonomy. Challenges in institutional oversight lead to the circumvention of laws by both mining and conservation activity developers.

According to estimates by the International Organization for Migration, in October 2023, over 6.9 million people were internally displaced in the country due to armed conflicts. The University of Oxford Forced Migration Review estimates that conservation-induced displacement affects nearly 17 million people (25 per cent of the population). In addition, the Integrated Food Security Phase Classification estimates that more than 26 million people faced acute food insecurity in 2022.

A delicate balancing act is required to ensure that the Democratic Republic of Congo can harness opportunities from the green transition, to achieve structural transformation and sustainable development and not experience a resource curse will require a delicate balancing act. In mineral-rich countries, the intensive mining for energy-transition mineral resources poses challenges of Dutch Disease linked to a high level of dependence on commodity exports, a lower level of competitiveness in non-commodity exports, and the mismanagement of commodity rents due to a lack of institutional capacity in commodity-exporting countries.

Source: Büscher and Davidov, 2016; IUCN, 2016; Ojewale, 2024; O'Leary Simpson and Zirhumana, 2020; Pallares, 2022; Titeca and Edmond, 2019; UNCTAD, 2023; IPC, 2022; World Bank, 2023; UNCTAD, 2021; Hache et al., 2023; UNODC and World Bank, 2024); UNDP Africa, 2021; IOM, 2023; Forced Migration Review, 2024; and United Nations data, available at https://data.un.org/ (accessed July 2024).

of deforestation and forest degradation at the local and provincial levels; therefore, consensus has not yet been reached on how to address the causes (Kengoum Djiegni et al., 2020). There is potential in the Democratic Republic of the Congo to earn significant rents from natural resources yet certain issues, if not addressed, could hinder sustainable development and structural transformation efforts (box III.3). Respecting environmental integrity and human rights, as stipulated in the Paris Agreement, hinges on the preparedness and capacity of domestic institutions to not repeat mistakes observed in past Clean Development Mechanism and voluntary carbon market carbon projects.

4. Key takeaway points

Overall, the case studies suggest that a focus by the development community on stopgap measures aimed at helping LDCs increase participation in carbon markets without taking into consideration existing structural impediments can be counterproductive. In considering whether LDCs should participate in the new Article 6 mechanism and determining what LDCs may gain from participation, it may be better to redirect focus on building safeguards into the design of the mechanism. Such safeguards should explicitly aim to resolve the issue of how to secure meaningful economic and social co-benefits for LDCs. The benefits delivered by the private sector to host governments and consumers have, to date, dominated the discourse on the virtues of carbon markets. The value proposition for LDC economies and citizens with regard toparticipation by LDCs in the new Article 6 mechanism deserves equal attention. This is an important way forward in operationalizing the principle of common but differentiated responsibilities.

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Annex 3.1
Carbon project case studies

Case study 3.1: Installation of a high-efficiency loom at a weaving factory, Bangladesh
Type: Joint Crediting Mechanism
Sector: Energy efficiency, factories

Analysis of project characteristics

ACTIVITY	On 19 March 2013, Bangladesh and Japan signed the Low Carbon Growth Partnership, and established a bilateral carbon offset crediting mechanism to promote the investment and deployment of low-carbon technologies, products, systems, services and infrastructure to achieve low-carbon growth in Bangladesh. The project, initiated by the Toyota Tsusho Corporation in partnership with Hamid Fabrics Limited, introduced advanced textile weaving technology at the latter's factory. The technology simultaneously achieves reduced energy consumption and increased productivity, compared to the less carbon-efficient Ishikawa rapier looms widely used in Bangladesh. The project's starting date was 24 June 2018, with an operational lifetime of seven years.
CO-BENEFITS STATED IN PROJECT DOCUMENT	***Reduce CO_2 emissions by promoting low-carbon technology transfer*** The project document estimated total emission reductions of 3,713 tons of carbon dioxide-equivalent (tCO_2e).
TECHNOLOGY TRANSFERED	Installation of 54 high-efficiency air jet looms equipped with energy-saving technologies. The air jet looms have 1.8 times greater productivity and 15 per cent greater energy efficiency than existing 120 rapier looms.
INSTITUTIONAL CAPACITY	The project was initiated by the Japanese company Toyota Tsusho, which was exploring potential projects in Bangladesh as part of a broader effort under Joint Crediting Mechanism to promote the transfer of low-carbon technologies to Bangladesh. A feasibility study was conducted for the project before it was financed as a Joint Crediting Mechanism project. Hamid Fabric Limited, a Bangladeshi company founded in 1996, is part of the Mahin Group (publicly listed in 2014). As part of an internal policy to enhance the productivity of its operations and achieve energy savings, the company planned to: • Engage a local engineering company to develop various plans related to the new technology installations, such as for loom placement, compressed air piping and electrical routes. • Engage experienced local contractors for construction works. • Establish and train an in-house team on the bilateral offset crediting mechanism, and prepare the team to interface with Toyota Tsusho and its local subsidiary. It is reported that the local factory conducts inspections on a daily, weekly and monthly basis to ensure regular maintenance of the capacity and performance of the installed technology, with related positive implications for improving the capabilities of company staff.
PROJECT FINANCING ARRANGEMENTS	• The initial investment was estimated at 393,000 yen • Financial support (less than half of the initial investment, as per Joint Crediting Mechanism rules) was provided by the Ministry of the Environment, Japan • Mahin Group planned to cover up to 30 per cent of the remaining investment amount through loans from local commercial banks
CARBON CREDIT REVENUES	Joint Crediting Mechanism has not issued credits against this project.

Sources: Murun and Tsukui, 2020; UNCTAD, 2018, 2020. See also Joint Crediting Mechanism, Bangladesh – Japan. Project BD003 Installation of High Efficiency Loom at Weaving Factory, available at https://www.jcm.go.jp/bd-jp/projects/38.

Summary of key lessons learned from case study 3.1

• **Relevance for national development**: The local firm in the case study operates in the textiles and clothing sector, the leading export sector and foreign exchange earner in Bangladesh.

• **Success match factors**: Firms that possess competitive drive and demonstrate a full understanding of the true costs of deploying low-carbon technologies, including costs associated with additional infrastructure investment, maintenance, and upskilling of the labour force, are poised to benefit from such projects.

• **Structural impediments in LDCs**: Constrained and unfavourable access to credit is a persistent problem for local firms in the manufacturing sector in LDCs (UNCTAD, 2018, 2020). The JCM case study serves as an important reminder that the majority of smaller and less resourced firms in LDCs may not be contenders for similar projects. The JCM package includes assistance for project development and technical training and seminars on JCM, while financial support is capped at below 50 per cent of the initial financial investment for the technology.

• **Low-carbon technology trade-offs**: Particularly in the manufacturing sector, low-carbon production technologies may correlate with automation. This is the case with the productivity-enhancing technology in the case study. The combination of cutting-edge automation and digitalization technologies in industrial production simultaneously delivers highly flexible, cost-efficient and more sustainable production.

Case study 3.2: Mtoni Dumpsite, United Republic of Tanzania
Market: Clean Development Mechanism
Sector: Energy, landfill gas

Analysis of project characteristics

ACTIVITY	The United Republic of Tanzania ratified the Kyoto Protocol in August 2002. The project was registered under Clean Development Mechanism on 2 June 2007, and became eligible to earn carbon credits for its contribution to reducing CO_2 emissions through the recovery of landfill gas and its conversion into electricity from 1 July 2007 to 30 June 2017. The first of only five Clean Development Mechanism-registered projects by the United Republic of Tanzania (see figure II.4), this project served as a demonstration project on clean technology. It was in compliance with the environmental goals stated in Environmental Management Act No. 20 of 2004, the Environmental Management (Solid Waste Management) Regulations of 2009 and the National Adaptation Programme of Action of 2007. The Mtoni Dumpsite was established in the early 1970s, and became a significant landfill site for waste disposal and management in the Temeke region of Dar es Salaam. Italian firm Consorzio Stabile Globus and the Dar es Salaam City Council signed a concession contract in March 2005, whereby the City Council granted to Consorzio Stabile Globus the right to capture, flare and produce energy over a 10-year period at the dumpsite. The project involved the recovery of landfill gas, which is a natural by-product of the decomposition of organic material in landfills (phase 1), and the generation of electricity for the national grid (phase 2). Gas extraction from the landfill began in March 2008, following the installation of a gas extraction and combustion plant. However, Consorzio Stabile Globus withdrew from the project early, in November 2015.
CO-BENEFITS STATED IN PROJECT DOCUMENT	**Enhance poverty reduction** Information about monitoring by the project or third-party verification of this co-benefit is not available. The closure of the dumpsite in 2007 disrupted the livelihoods of waste pickers who depended on the site. **Create employment opportunities in the community** Such projects often create jobs in construction, operation and maintenance. However, information on the number of jobs created by this project is not available. Information about monitoring by the project or third-party verification of this co-benefit is not available. **Reduce inflation/exchange rate risk affecting expected revenues and attractiveness for investors** Information is not available on how the project would meet this objective, confirming that this objective was targeted nor that the objective was met. **Enable the United Republic of Tanzania to generate electricity from landfill biogas (Sustainable Development Goal 11)** This objective could not be met because of the closure of the dumpsite in 2007. Flaring the gas rather than capturing it for productive use (i.e. generating electricity) represented an economic loss. Moreover, flaring poses a risk to public health and welfare, besides possibly contributing to climate change. **Provide financial and environmental additionality** As noted in the project design document, Mtoni Dumpsite had several known negative environmental impacts during its active years. The landfill gas recovery project sought to mitigate some of these impacts by eliminating odorous gases and mitigating methane-related health problems. Biogas collection also served to mitigate the risk of explosions within the landfill site and the instability of accumulated waste. However, with the limited success of the project and the subsequent abandonment of Mtoni Dumpsite at the end of the project, the dumpsite's negative environmental impacts persisted, including air pollution, water contamination, soil degradation and health risks for nearby residents.
TECHNOLOGY TRANSFER	**Transfer of technology and enhancement of stakeholder capabilities** Consorzio Stabile Globus benefited from the partnership with Biotecnogas, which had technical experience from engaging in similar projects in more than 50 landfill sites in Argentina, Brazil, Israel, Italy, Portugal and Spain. Evaluation reports verify that the imported technology was state-of-the-art, and was commonly used in similar plants in Europe at that time. In terms of skills transfer, the project document only mentions the training of two persons for maintenance, monitoring and control activities. Enable the United Republic of Tanzania to leapfrog to new sustainable and affordable technologies The project activity consisted of the installation, operation and maintenance of a landfill gas extraction and flaring system, including the installation of 45 vertical wells for storing captured gas, a secondary landfill gas transportation network needed to transport the gas from each of the wells to the regulation stations, three regulation stations each connected to 15 wells and a primary landfill gas transportation network for transporting the gas from the regulation stations to the extraction unit for extraction from waste. The extraction and combustion plant treated about 5,000 cubic metres of methane per day. Monitoring reports reveal many challenges affecting the project's ability to achieve expected emission reductions and provide effective technology transfer during implementation. These included: • Frequent instances of plant inactivity resulting in no emission reductions generated due to the lack of electricity supply from the national grid, including unexpected repairs due to national grid overvoltage, frequent equipment malfunctions impacting emission reductions or the monitoring of emissions, even when the plant could operate normally. • In some instances, the lack of accredited third-party experts necessitated changes in technology. The transformational potential of the technology (in terms of its potential for scale-up and diffusion) was thus limited by the prevailing structural weaknesses in the host country.
INSTITUTIONAL CAPACITY	The local authorities (Dar es Salaam City Council and the Division of Environment in the President's Office), collaborated with the project developers by granting the right to use the biogas produced by the landfill for a period of 10 years. Beyond that, there is little evidence of institutional capacity-building at the level of the City Council.

PROJECT FINANCING ARRANGEMENTS	• According to the project document, no public funding was provided by the Government of the United Republic of Tanzania. The investment by Consorzio Stabile Globus was estimated at around €2 million. • The project document states that the profitability of the investment will be based on the revenue from the sale of certified emission reductions. However, the sharing arrangement of certified emission reductions revenues is not disclosed. Beyond statements by the country's officials about the successful sale of certified emission reductions, details about the price and value of proceeds of certified emission reductions sales and information on buyers are not available.
CARBON CREDIT REVENUES	The project was conceptualized based on the landfill being operational for 10 years, until 2017, with total emission reductions initially estimated at 2,022,711 tCO2e (an average of 202,271 certified emission reductions per year). However, due to the unanticipated closure of the dumpsite in January 2007, actual emission reductions were substantially lower, reducing potential certified emission reductions revenues. Investments in electricity generation for the national grid (second phase of project) were consequently not made. The low amounts of landfill gas extracted were insufficient to generate adequate electricity even for the project's own use, which meant it had to rely on the uneven supply from the national grid. The project received four issuances of certified emission reductions over its crediting period, earning a total of 93,465 certified emission reductions between 1 July 2007 and 31 December 2012. These units were thereafter transferred to Verra and converted to verified carbon units in 2016. Of the 25,200 verified carbon units issued, 4,408 were retired in 2020.

Sources: Gaia, 2022; *Carbon Market Watch News*, 2011; United Republic of Tanzania *Daily News*, 2010, 2011; Palfreman, 2014; Shemdoe, 2010; Singh, 2023; Wang et al., 2023. United Nations Framework Convention on Climate Change, activity search: Project 0908, available at https://cdm.unfccc.int/Projects/DB/DNV-CUK1169853184.14/view and World Bank, Projects and operations, available at https://projects.worldbank.org/en/projects-operations/project-detail/P180298.

Summary of key lessons learned from case study 3.2

• **Developmental coherence**: The project aligned with the United Republic of Tanzania environmental goals and demonstrated the potential of clean technology in managing landfill emissions.

• **Challenges due to host-country level of infrastructure development**: The project faced operational challenges, including plant inactivity due to electricity supply shortages, which hindered emission reductions and the effectiveness of technology transfer.

• **Institutional capacity and skills transfer**: The project was necessitated by a lack of institutional capacity within local authorities to manage waste effectively, but as evidenced by the ongoing issues at the Pugu Dumpsite, it did not make a material contribution to closing that gap. Skills transfer was also limited.

• **Economic and social impact**: The project had mixed results in terms of poverty reduction, job creation and financial benefits. The closure of the dumpsite disrupted livelihoods, and there was a lack of verification of the stated co-benefits.

• **Sustainability and continuity**: The abandonment of the dumpsite and, subsequently, the project led to the persistence of negative environmental impacts, highlighting the lack of coherence between decisions taken by national authorities on the decommissioning of the dumpsite and the authorization of the carbon project. This may suggest that there was a lack of institutional capacity within local authorities to properly assess the factors underpinning the sustainability and profitability of carbon projects led by external private investors.

• **Investment and funding**: The project was funded by Consorzio Stabile Globus without public funding from the United Republic of Tanzania, relying on the sale of certified emission reductions for profitability. This demonstrates the potential of private financing as additional.

• **Benefit-sharing**: Information on the sharing of CERs is not available, hindering an assessment of carbon projects as a viable source of development finance for host Governments.

Overall, the project underscores the importance of robust monitoring, institutional support and sustainable practices to ensure the long-term success and positive impact of environmental initiatives. It also highlights the need for comprehensive skills transfer and capacity-building to maximize the benefits of technology transfer through such projects.

Case study 3.3: Ambatolampy 20-megawatt solar photovoltaic power plant, Madagascar
Market: Clean Development Mechanism
Sector: Energy industries; renewables/non-renewables

Analysis of project characteristics

ACTIVITY	Madagascar ratified the Kyoto Protocol on 24 September 2003 and the Paris Agreement on 21 September 2016. It submitted its second NDC on 29 January 2024. The project consists of the construction and operation of a greenfield solar photovoltaic power plant by Green Yellow Madagascar, a subsidiary of the Casino Group (a leading French food retailer). Commissioned in 2018, the power plant is located in Ambatolampy, south-east of Vakinankaratra region. Its establishment involved the setting up of photovoltaic panels to capture solar energy, convey such energy to the convertor station to produce electricity and thereafter export it to the national grid under a 25-year power purchasing agreement with State-owned utility Jirama. One of 10 Clean Development Mechanism projects implemented in Madagascar, the project supports the objective of Madagascar to increase the share of renewables in the national energy mix by 2030 and enhance energy security, as stated in the Madagascar intended NDCs submitted to UNFCCC in November 2015.
CO-BENEFITS STATED IN PROJECT DOCUMENT	**Greenhouse gas emission reduction** The Clean Development Mechanism project validation report confirms that the project will result in annual average GHG emission reductions or GHG removals estimated at 23,344 tCO2e (23,431 under Verra). The monitoring report submitted to Clean Development Mechanism for the period 1 June 2019 to 30 April 2020 states that the project achieved emission reductions amounting to 19,330 tCO2e. The first verification under Verra estimated actual reductions at 34,847 tCO_2e for the monitoring period 10 July 2018 to 30 April 2020. Apart from emission reductions, project participants did not monitor sustainable development co-benefits. **Development of renewable energy** The project is the first grid-connected solar photovoltaic power plant in the country. At the inception of the project, only about 20 per cent of households in Madagascar had access to electricity. Malagasy-installed electrical capacity in 2016 was dominated by thermal (75.9 per cent) and hydroelectricity (24 per cent) sources, with biomass, solar and wind collectively accounting for a negligible share. The New Energy Policy (2015–2030) set a target of 75 per cent hydroelectricity, 15 per cent thermal, 5 per cent solar photovoltaic and 5 per cent wind power by 2030. Increasing the share of renewable energy from 35 to 79 per cent of the national energy mix was the target in the Madagascar NDC. The New Energy Policy set the target of 80 per cent for renewables in the energy mix by 2030, compared to 1 per cent at the time of its drafting. **Employment opportunities** The project document envisaged contributions to local employment throughout its building and operations phases, with the workforce estimated at up to 80 workers at the peak of the construction phase and 10 workers in the operations phase. Indirect employment through the enhanced competitiveness of local industry from the availability of (cheaper) renewable energy and reduced fossil fuel imports were also expected. Independent research published in 2020 on the impacts of the project stated that the construction of the plant generated around 300 direct jobs and its operation created 17 positions (mostly elementary occupations), five of which were permanent. Various service providers also benefited. However, it had little impact in terms of fostering the development of income-generating activities, although there was some evidence of the enhanced competitiveness of local industry from the provision of electricity in previously unserved areas.
TECHNOLOGY TRANSFER	**Technology transfer** The project introduced solar photovoltaic technology manufactured by Jinko Solar (a Chinese manufacturer of photovoltaics and a developer of solar projects) in Madagascar, along with related methods and skills. In the first phase, 73,008 solar photovoltaic panels were installed, and capacity was doubled in the expansion phase. Axian, a Malagasy-owned conglomerate, agreed to acquire all of Green Yellow's solar assets in Madagascar (and in Burkina Faso) in February 2024. The conglomerate had already acquired a 51 per cent stake in the Ambatolampy solar plant in June 2020, following which Axian and Green Yellow financed the 20-megawatt production extension of the solar plant and the installation of a 5-megawatt back-up battery system in 2021.
INSTITUTIONAL CAPACITY	Jirama, the State-owned utility, was not listed as a project participant. The Government of Madagascar did not play a role beyond authorization of the project by the Clean Development Mechanism national designated authority. By virtue of its participation in the financing of the first phase of the project, the local commercial bank, Banque Malgache de L'ocean Indien, and the national industrial development bank, Bankin'ny Indostria Madagascar, are likely to have gained new institutional capacity in the area of financing renewables-related infrastructure, including joint financing arrangements with international banks in this area.

PROJECT FINANCING ARRANGEMENTS	Green Yellow is a French company founded in 2007. It is active in the development, funding and operation of infrastructure projects specializing in solar photovoltaic plants, energy efficiency and energy services. Initially, shareholders were Casino Group, Tikehau (global asset manager) and Bpi France (French public investment bank). At the start of the project in Madagascar, Casino Group held the majority stake in Green Yellow, but has since sold it to private equity firm, Ardian, and Bpi France. The initial investment of €25 million by Green Yellow benefited from credit provided by Société Générale and Guarant Co, along with Banque Malgache de L'ocean Indien and Bankin'ny Indostria Madagascar. The plant extension was backed by a €10 million credit facility from Guarant Co, African Guarantee Fund and Société Générale. The project was registered under Clean Development Mechanism on 3 May 2019, with a renewable crediting period from 1 June 2019 to 31 May 2026. It was also registered with Verra on 4 November 2020 for a renewable crediting period from 10 July 2018 to 9 July 2025. Under the power purchasing agreement, Jirama was to purchase each kilowatt of power at the rate of 480 ariary.
CERTIFIED EMISSION REDUCTIONS AND VERIFIED CARBON UNIT REVENUES	Jirama was not a project participant; thus, revenue-sharing was probably not envisaged. The joint project description and monitoring report filed under Verra by the Aera Group on behalf of Green Yellow states that "emissions reduction will be claimed under the VCS programme or the Clean Development Mechanism programme, never both". As at June 2024, Clean Development Mechanism had not received an issuance request from the project. Verra has issued a total of 59,073 verified carbon units, of which 38,140 were retired between September 2021 and May 2024 for the benefit of various buyers, including various private sector entities and the World Bank .

Sources: MEDB, 2018; MMWEH, 2018; Brunet et al., 2020. Also see https://financialpost.com/pmn/business-pmn/casino-said-to-weigh-sale-of-stake-in-renewables-firm-greenyellow; AXIAN (axian-group.com; Financing the extension of the largest solar plant in Madagascar and the Indian Ocean – GreenYellow; https://www.madagascar-tribune.com/Madagascar-se-dote-de-la-plus,23979.html; https://www4.unfccc.int/sites/submissions/INDC/Published%20Documents/Madagascar/1/Madagascar%20INDC%20Eng.pdf; and https://www.axian-group.com/en/2023/01/nea-axian-group-greenyellow-guarantco-african-guarantee-fund-and-societe-generale-closed-a-mga-47-1-billion-c-eur-10-million-credit-facility-to-support-the-debt-funding-of-the-largest-solar-po/17/.

Summary of key lessons learned from case study 3.3

- **Renewable energy development**: The project contributed significantly to the renewable energy goals of Madagascar, being the first grid-connected solar photovoltaic power plant in the country. It also supported the national objective to increase the share of renewables in the energy mix to 80 per cent by 2030.
- **Employment and economic impact**: Job creation was concentrated in the construction phase. Meanwhile, there is strong potential for significant gains in the competitiveness of local industry and possibly for considerable structural transformation, particularly since ownership of the project and its assets have been passed to a domestic enterprise.
- **Technology transfer**: The project introduced advanced solar photovoltaic technology in Madagascar, potentially setting a precedent for future renewable energy projects in the region.
- **Institutional capacity**: Local financial institutions likely gained experience in financing renewable infrastructure, although the State-owned utility Jirama did not play a direct role in the project. Capacity-building was possibly limited to enhancing capabilities in power-purchasing agreement negotiations, but not in carbon project development or knowledge.
- **Investment and financing:** The project was supported by a mix of international and local financing, demonstrating the viability of such projects in attracting diverse funding sources, but also the reality that foreign carbon project developers also seek to draw on domestic sources of finance.
- **Sustainability**: The project developers planned to responsibly manage defective or expired solar panels.
- **Benefit-sharing**: Information on the sharing of carbon credit revenues was not available, hindering an assessment of carbon projects as a viable source of development finance for host Governments.

This project illustrates the potential for renewable energy initiatives to contribute to sustainable development, economic growth and structural transformation in LDCs. It also highlights the role of multi-stakeholder involvement, and the need for continued support and quality control to ensure the long-term success of such projects.

Case study 3.4: Fuel-Wood Saving with Improved Cookstoves, Cambodia
Market: Verified Carbon Standard Programme
Sector: Energy demand

Analysis of project characteristics

ACTIVITY	Cambodia ratified the Kyoto Protocol on 22 August 2002 and the Paris Agreement on 6 February 2017. It submitted its updated (first) NDC at the end of 2020. Groupe Energies Renouvelables, Environnement et Solidarités (GERES), an international NGO, implemented the new Lao stove project between January 2008 and May 2013. The cookstove was estimated to use at least 22 per cent less charcoal than the traditional stoves commonly used in Cambodia at that time. The objective of the project was to promote the large-scale adoption of the improved cookstoves in urban areas in eight provinces: Kandal, Kompong Speu, Prey Veng, Takeo, Siem Reap, Battambang, Kampong Cham and Kompong Chhnang, as well as in the city of Phnom Penh, with a view to facilitating a nationwide shift from the inefficient use of fuelwood to the sustainable and efficient use of biomass. The main targets were charcoal-consuming households and charcoal-producing kilns in the selected provinces. The project activity was an extension of the Cambodian Fuelwood Saving Project launched by GERES in 1997 to protect forest resources in Cambodia by reducing fuelwood consumption in Phnom Penh plus the eight provinces. During phase I (1997–2001) of the project, GERES elaborated the stove design, trained producers and developed distribution networks in Kampong Chhnang province. During phase II (2002–2007), distribution and sale of the stoves was scaled up to encompass the other provinces. The project first introduced the new stove in Cambodia in 1999, supported by trainers from Thailand, where it was already being marketed under the name "Thai Bucket".
CO-BENEFITS STATED IN PROJECT DOCUMENT	**Avoidance of overexploitation of forests through reduced demand for wood and charcoal, thus reducing emissions from cooking** The project estimates that 1.6 billion tons of wood were saved during the 10 years of implementation. Figures for the period 2008–2013 are not available. **Reduced emissions of airborne particles and associated respiratory diseases** According to verification reports from Verra, the project prevented 1.7 billion tons of CO_2-e from entering the atmosphere during the period January 2008–May 2013. However, claims of health benefits are cannot be verified, given that health benefits are the most difficult impact to achieve without the widespread replacement of traditional stoves with clean, modern fuels, such as LPG and electricity, or renewables such as biogas. Accordingly, under the leadership of the National Council for Sustainable Development, Cambodia is working to accelerate the transition from biomass as a feature in the energy mix of households to modern energy, focused particularly on electricity for cooking. Cambodian households typically maintain a reserve of diverse fuel sources for reasons of fuel security. Research in 2019 showed that cooking with electricity remained at a nascent stage although access to electricity had spread to rural areas. Nevertheless, restrictions on movement during the COVID-19 pandemic prompted households to increase the use of electric cooking devices. **Savings in time (including for women) and expenses from reduced consumption of biomass** According to GERES, in 2013, the annual production of improved cookstoves reached nearly 450,000, with women representing 98 per cent of end-users (800,000 women). Figures for the period 2008–2013 are not available. GERES also noted that the literature on time savings suggests it was seldom significant. The common practice among households is to store multiple fuels, for many reasons, such as ensuring reliability of the primary fuel source or using different fuels depending on the type of food being cooked. This makes it difficult to make a firm estimate of the overall savings on expenditures on household fuel needs. There is a strong correlation between payment mechanisms and the adoption of the cookstoves. **Job creation** The project estimates that it created 550 jobs, enabled 331 entrepreneurs to join the cookstove supply chain and led to the economic empowerment of 350 women. Figures for the period 2008–2013 are not available.
TECHNOLOGY TRANSFER	The technology transferred was the new Lao stove. The materials used were heat-resistant clay, sand, ash or fire clay, with metal parts for external protection. Compared to the traditional stove, the new technology offered greater heat loss prevention, air circulation and combustion, resulting in less consumption of charcoal, and, consequently, fewer emissions of airborne particles. The technology portfolio was later expanded to include improved kilns and other innovations aimed at reducing firewood consumption. By early 2010, the stoves were produced by 32 local producers (5 in Battambang, 17 in Kampong Chhnang, 2 in Pursat, 1 in Siem Reap, 5 in Phnom Penh and 2 in Kampot), supported by 200 distributors and sold by 100,000 retailers across the country. According to GERES, the majority of stove producers reported having used their own capital as the initial investment into the business, with a low percentage reporting loans from banks, microfinance organizations or other private sources. Additional value added to the economy over the 10-year period 2003–2013 is estimated to have been $11 million. Figures for the period 2008–2013 are not available.

INSTITUTIONAL CAPACITY	GERES was established in 1976, and about 20 years later, began to initiate projects in Cambodia. It was instrumental in the inclusion of improved cookstoves in national policy. During the implementation of phase II of the Cambodian Fuelwood Saving Project, the Ministry of Energy, Mines and Industry became the regulatory authority for cookstoves, developing standards and overseeing laboratory testing. The first draft of the National Policy, Strategy and Action Plan on Energy Efficiency in Cambodia was issued in 2013. It articulated energy efficiency and goals linked to the use of biomass resources for the first time in national policy. GERES also initiated the establishment of the Improved Cookstove Producer and Distributor Association of Cambodia to foster the growth of the industry and maintain quality and market price stability. However, based on a cookstove market assessment qualitative study conducted in 2015, when the project ended and GERES was no longer supervising production, the quality of improved cookstoves deteriorated.
PROJECT FINANCING ARRANGEMENTS	The National Policy, Strategy and Action Plan on Energy Efficiency appointed GERES as the implementing agency for actions aimed at protecting national forest resources through the sustainable and efficient use of biomass for residential and industrial purposes. In this context, the project benefited from funding from the Global Environment Facility and the United Nations Development Programme during the period 2008–2013. The project document states that the sale of emission credits generated by the project on the voluntary market will provide the co-funding necessary to continue the project.
VERIFIED CARBON UNIT REVENUES	The project's crediting period under Verra was from 10 December 2004 to 9 December 2014, with estimated annual emission reductions of 192,600 tCO2e. In the period 2008–2013, the project benefited from six issuances totalling 1,700,315 verified carbon units. The financial details of such transactions are often not publicly disclosed. Consequently, the revenues from the sale of these credits are not publicly available.

Sources: Bansod and Shehata, 2022; GERES, 2009; MECS, 2021; Price et al., 2020. Also see https://registry.verra.org/app/projectDetail/VCS/181.

Summary of key lessons learned from case study 3.4

- **Development coherence**: The project predated national policy on household energy efficiency and strategies on climate change. It appears to have played a pivotal role in integrating improved cookstoves into national policy at the sectoral level, but national policy diverged at the macro level.
- **Claims of health and economic co-benefits**: The project claims to have reduced emissions of airborne particles, yet health benefits are uncertain in the absence of a complete transition to cleaner fuels. Economically, the project fostered growth in the cookstove industry by establishing a network of local producers, distributors and retailers, and thereby added value to the economy.
- **Institutional capacity**: Post-project assessments indicated a decline in cookstove quality, suggesting that gains in capacity development at the industrial and institutional levels were not sustainable.
- **Sustainable funding**: While the project's sale of emission credits on the voluntary carbon market helped fund its continuation, it was evidently not sufficient, having been supplemented by climate finance/official development assistance. This highlights the uncertainty of carbon credits as a single source of carbon project finance, and also raises concerns about additionality. According to the principle of additionality, a mitigation activity is additional if it would not have been implemented without the generation and sale of carbon credits. Additionality is a crucial aspect of the environmental integrity of carbon credits to be addressed under Article 6 of the Paris Agreement.
- **Benefit-sharing**: Information on the sharing of carbon credit revenues is not available, hindering an assessment of carbon projects as a viable source of development finance for host Governments.

These lessons underscore the importance of integrating carbon projects into the long-term national development vision, and pursuing comprehensive market development to achieve sustainable and impactful outcomes.

Case study 3.5: Taiba N'Diaye Wind Farm, Senegal
Market: Verified Carbon Standard Programme
Sector: Energy industry; renewables/non-renewables

Analysis of project characteristics

ACTIVITY	Senegal ratified the Kyoto Protocol on 20 July 2001 and the Paris Agreement on 21 September 2016. The country submitted its first NDC in December 2020. The wind farm site occupies a total area of 67 hectares in Tivaouane in the Thies region of western Senegal. The project developer is Lekela Power Holdings and the project is operated by Lekela's special purpose vehicle, Parc Eolien Taiba N'Diaye, in collaboration with Danish subcontractor Vestas. The power generated is sold to the national electricity utility company, Senelec, under a 20-year power purchase agreement signed by Lekela in 2016. Work on the project started in December 2018 following several feasibility studies. It is notable that environmental assessments carried out identified potentially significant adverse impacts from the project on fauna, and the loss and restoration of livelihoods for local people. The project is the first utility-scale wind energy project in Senegal. Commissioned in 2020, the project responds to Plan Senegal Emergent 2035, the Government's long-term development plan. The project aligned with the NDC of 2015 and the Sénégal Plan d'Actions National des Energies Renouvelables 2015–2020/2030, which set the target to increase the share of renewable energy in the national energy mix from 2 per cent in 2010, then to 15 and 30 per cent in 2020 and 2030, respectively.
CO-BENEFITS STATED IN PROJECT DOCUMENT	**Increasing the share of renewable energy in total final energy consumption** By December 2021, the project had increased generation capacity in Senegal by 15 per cent, benefiting 14 villages and around 628,513 households. More recently, the Government has committed to increasing the share of renewable energy to 40 per cent by 2030 through the Just Energy Transition Partnership. Using 2023 data from the International Energy Agency, UNCTAD calculations show that the project increased the share of renewable energy in total final energy consumption in Senegal by 7.66 per cent. **Reduction or removal of greenhouse gas emissions (Sustainable Development 13)** Around 70 per cent of electricity generation in Senegal relies on fossil fuels, with annual emissions estimated at around 12 million tons of CO_2e. The project is expected to reduce or remove an estimated 257,735 tCO_2e annually, amounting to a total reduction of over 2.4 million tCO_2e by December 2029. Calculations by UNCTAD suggest that the project achieves average annual emission reduction of approximately 2.1 per cent. In addition, as part of social responsibility, the project committed to planting 10,000 trees by 2026 to compensate for trees cut down for plant installation. During the first three years of operation, 5,000 trees were planted. **Quality education** In line with environmental assessments and community consultations, the project commitment includes a long-term socioeconomic investment plan of up to $20 million (at a rate of $1 million per year), which focuses on improving local infrastructure, education and vocational training to benefit the local Taiba N'Diaye community. In 2023, the project reported that it had provided a new school, launched a scholarship programme and rebuilt a community marketplace, and that a new information technology centre for schoolchildren was under construction. Monitoring reports do not report on the quality of education provided. **Job creation** The project document estimated the creation of over 600 jobs during the construction phase, with an additional 21 jobs created over the project's lifetime. It is notable that local communities expressed a number of concerns about the lack of transparency, accountability and inclusion of the community in the identification and implementation by the project developer of activities related to corporate social responsibility. They continue to have concerns about many aspects, including land compensation, gender-related impacts, the restoration of livelihoods and nuisance effects of the installations.
TECHNOLOGY TRANSFER	The technology transferred was wind energy technology, involving the installation of 46 Vestas wind turbines. The installation of 16 turbines, each of 3.45 megawatt (MW) capacity, was completed during the period December 2019–February 2020. An additional 14 turbines of 50 MW capacity were installed by the third quarter of 2020, followed by the installation of a final 16 turbines in the fourth quarter of 2020, achieving a total capacity of 158.7 MWs. Lekela Power Holdings committed to providing training to an unspecified number of local engineers and technicians to facilitate the sustainable operation and management of the wind power infrastructure. Local expertise was used in monitoring and verification processes. However, detailed information on the qualifications of local experts or the particular roles they play in the monitoring process is not available. The long-term sustainability of the technology and its adaptability to local conditions are not clearly addressed by the project, nor are plans for technology updates or improvements to ensure the farm remains state-of-the-art in the face of rapidly advancing renewable energy technologies.

INSTITUTIONAL CAPACITY	Lekela Power Holdings (sold in 2023 to Infinity Power, a joint venture between Infinity in Egypt and the State-owned renewable energy company, Masdar, United Arab Emirates) was a United Kingdom renewable energy development company established in 2015, which had prior experience from the West Bakr Wind Farm in Egypt and five large wind energy plants in South Africa when it started the project in Senegal. The project facilitated the development of the National Renewable Energy Action Plan of Senegal, which included targets on wind energy for the first time. The Ministry of Petroleum and Energy set new standards and oversaw project implementation and integration into the national grid.
PROJECT FINANCING ARRANGEMENTS	• According to the project document, no public funding was provided by the Government of Senegal. The total investment was approximately $342 million, jointly provided by Lekela Power Holdings (50 per cent), the United States Overseas Private Investment Corporation (up to $250 million, and $70 million in reinsurance) and the Denmark export credit agency EKF ($161 million guarantee). • The United States and Africa Clean Energy Financing Facility provided grant funding for a series of engineering studies, environmental assessments and technical assistance. • The project was registered with Verra on 25 January 2022, with a fixed crediting period from 9 December 2019 to 8 December 2029. • The Multilateral Investment Guarantee Agency supported the project by issuing a $149.80 million guarantee against the risks of expropriation, transfer restriction and inconvertibility, breach of contract and war and civil disturbance. • Lekela signed a grant agreement with the United States Development Finance Corporation to finance a feasibility study for a 100 MW capacity extension of the wind farm in December 2021.
VERIFIED CARBON UNIT REVENUES	Between 2022 and 2024, the project benefited from eight issuances totalling 751,672 verified carbon units. The revenues generated from the sale of these credits are typically not disclosed publicly.

Sources: HPR Ankh Consultants, 2015; Stead, 2023; IEA, 2024. See also https://www.miga.org/press-release/miga-supports-construction-largest-wind-farm-west-africa; Power Africa, Senegal's First Utility-Scale Wind Farm Provides Big Lift for Local Communities, available at https://powerafrica.medium.com/senegals-first-utility-scale-wind-farm-provides-big-lift-for-local-communities-98f8d227635a; Aera Group, Support Senegal's First Utility-Scale Wind Farm, available at https://aera-group.fr/project/support-senegals-first-utility-scale-wind-farm/; International Energy Agency, *Emissions Factors 2023,* available at https://www.iea.org/data-and-statistics/data-product/emissions-factors-2023; Our World in Data, CO_2 emissions in Senegal, available at https://ourworldindata.org/co2/country/senegal (accessed 4 June 2024); and Verra, Project Detail: Taiba N'Diaye Wind Farm, VCS/2588, available at https://registry.verra.org/app/projectDetail/VCS/2588 (accessed 4 June 2024).

Summary of key lessons learned from case study 3.5

• **Development coherence**: The wind farm contributes to the Government's Plan Senegal Emergent 2035. It has increased generation capacity in Senegal by 15 per cent.

• **Job creation and community impact**: Job creation is concentrated in the construction phase. There are community concerns regarding the lack of transparency and inclusion, highlighting the importance of community engagement in such projects.

• **Technology transfer**: The installation of Vestas wind turbines represents a significant transfer of wind energy technology to Senegal, but there is little evidence of skills transfer. In terms of institutional capacity, the project influenced the development of the National Renewable Energy Action Plan and set new standards for wind energy

• **Sustainability concerns**: The long-term sustainability and adaptability of the technology to local conditions, as well as plans for updates or improvements, are not clearly addressed, indicating the need for ongoing attention to technological advancements.

• **Benefit-sharing**: Information on the sharing of CERs is not available, hindering an assessment of carbon projects as a viable source of development finance for host Governments.

These lessons highlight the importance of integrating renewable energy projects into national development plans, ensuring community involvement and maintaining a focus on long-term sustainability and technological adaptability.

Case study 3.6: Mai Ndombe REDD+ Project, Democratic Republic of the Congo
Market: Voluntary Carbon Market, Verified Carbon Standard Programme
Sector: Agriculture, forestry and other land uses

Analysis of project characteristics

ACTIVITY	The Democratic Republic of the Congo ratified the Kyoto Protocol on 23 March 2005 and the Paris Agreement on 13 December 2017. It submitted its updated NDC on 28 December 2021. The Mai Ndombe project was initially jointly operated by Wildlife Works Carbon and Ecosystem Restoration Associates as a conservation concession. Wildlife Works subsequently acquired Ecosystem Restoration Associates' 50 per cent stake in the project in October 2013. The project objective is to protect Mai Ndome forestlands from destructive logging practices, which it attributes to logging companies, and from unsustainable fuelwood extraction and slash-and-burn agriculture, which it attributes to local communities. The Ministry of Environment, Conservation of Nature and Tourism assigned the company exclusive rights to carbon credits for 25 years through a memorandum of understanding signed in March 2011 (the official start date of the project). In August 2011, the Ministry assigned to Ecosystem Restoration Associates two logging concessions through a 25-year (renewable) forest conservation contract associated with 299,640 hectares of forest area surrounding Mai Ndome Lake. The conservation concession contains over 3.5 million cubic metres of merchantable hardwood. A *cahier de charge* (social responsibility commitment) was integrated into the Forest Conservation Concession Contract.
CO-BENEFITS STATED IN PROJECT DOCUMENT	**Cahier de charge** As part of the social responsibility commitment of the project revenue generated from the sale of carbon credits would be used to build a minimum of 20 schools and five health-care centres, repair and extend two secondary hospitals, assist the transportation of agricultural and other products to off-concession markets, provide a network of rural canteens, improve agricultural production techniques and recruit employees from local communities. According to Wildlife Works' marketing information for the project, the project constructed 10 fish ponds and introduced new cassava strains to improve food security. It also created over 300 local jobs, including employing former poachers as eco-guardians. In addition, the project reports that 12 schools were built or renovated, and one hospital and 18 mobile clinics were established. **Reduce carbon dioxide emissions within the project area by stopping planned legal and illegal forest deforestation and degradation** The total emission reductions were initially estimated at 175,820,011 tCO_2e (an average of 5,671,613 verified carbon units per year). According to Everland, which markets carbon offset credits for Wildlife Works, the project has already achieved emission reductions amounting to 44,779,359 tCO2e. However, Verra official stakeholder surveys (comment period 30 November–30 December 2022) have highlighted significant forest loss in recent years. These comments are corroborated by research in 2018, which suggests that project interventions may have catalysed further forest loss due to inadequate enforcement and support for alternative livelihoods. An assessment by the University of California, United States, of Mai Ndome project (own-developed) methodologies in 2023 further alleges that the methodologies generate credits that represent a small fraction of the claimed climate-related benefit. **Improve security of land tenure for local communities and establish effective governance structures** Overall, recent independent research on project activities for promoting sustainable development in forest communities suggest that they fall well below expectations, with insufficient effort to clarify and strengthen the security of land tenure for local communities, leaving them vulnerable to land speculation and migration. Studies have shown that REDD initiatives tend to underestimate the complexity of land tenure issues. The enactment of the 1973 land law brought all land in the Democratic Republic of the Congo under the ownership of the State, but the lack of recognition of customary tenure has led to a persistent situation of parallel systems that often collide. Until 2022, access to and use of land were governed through a multitude of systems, practices and institutional frameworks, including the statutory land system, customary systems (associated with as many as 250 ethnic groups) and a variety of informal land governance practices. Efforts to resolve land tenure issues began in 2012, and on 15 April 2022, the National Land Policy of the Democratic Republic of the Congo was approved by the Council of Ministers, following a protracted process of land reform. The new land tenure policy is particularly strong on aspects related to community and Indigenous rights.
TECHNOLOGY TRANSFER	There is no mention of technology transfer as a core component of the project. It focuses primarily on reducing emissions from deforestation and forest degradation, promoting sustainable land management and improving local livelihoods.
INSTITUTIONAL CAPACITY	Wildlife Works Carbon is an American REDD project development and management company established in 2009; it previously operated as Wildlife Works, managing the Rukinga Wildlife Sanctuary in Kenya. Ecosystem Restoration Associates is a Canadian company involved in forest restoration and conservation-oriented carbon offset projects. The Democratic Republic of the Congo adopted a National REDD+ Strategy in 2012, and subsequently instituted the Mai-Ndombe Emission Reductions Programme (2017–2022). This programme was selected by the World Bank Forest Carbon Partnership Facility Carbon Fund in December 2016. However, research in 2020 showed that local government capacity to oversee jurisdictional REDD+ programmes was lacking, although "REDD readiness" activities have been conducted for some years. Although the project established local development committees to manage and oversee project activities, which are intended to ensure community participation and benefit-sharing, the representation and effectiveness of these committees have been questioned, particularly with regard to marginalized groups such as women and Indigenous peoples.

PROJECT FINANCING ARRANGEMENTS	• ERA holds exclusive rights to carbon credits for 25 years (renewable for up to 30 years) • The project document states that Wildlife Works Carbon is sufficiently capitalized to ensure completion of the project.
VERIFIED CARBON UNIT REVENUE	The project was registered under Verra on 6 April 2020, and is eligible to earn carbon credits from 14 March 2011 to 13 March 2041. According to information submitted by Wildlife Works Carbon to news outlets, the national Government receives a "substantial portion of the project income to ensure that REDD+ represents a financially competitive alternative to logging [the Democratic Republic of the] Congo's rich forests". However, this information contradicts the exclusive rights to carbon credits assigned to Ecosystem Restoration Associates through a 2011 Forest Conservation Contract. Also stated was that the local community received a "substantial portion of VER proceeds that go towards community elected projects". The Mai Ndombe REDD+ Project has, to date, benefited from seven issuances amounting to a total of 31,345,970 verified carbon units.

Sources: Gauthier, 2018; Haya et al., 2023; Koh et al., 2024; Berk and Lungungu, 2020; Everland and Wildlife Works, 2022; Nyamwoga, 2014. See also Institute for Global Environmental Strategies (IGES), REDD+ Database, Democratic Republic of the Congo: Mai Ndombe REDD Project, available at https://redd-database.iges.or.jp/detail_id=56.html (accessed 7 June 2024); Global Land Tool Network, Democratic Republic of the Congo adopts national land policy, available at Global Land Tool Network; 3BL CSRWire, Wildlife Works Acquires JV Partner's Interest in Mai Ndombe, Congo Basin's First and Largest REDD+ Project, available at CSRWire; World Bank Group, Fact Sheet: Mai Ndombe Redd+ Initiative in the Democratic Republic of the Congo, available at Fact Sheet; Wildlife Works, Mai Ndombe Democratic Republic of the Congo, available at https://www.wildlifeworks.com/redd-projects/mai-ndombe (accessed June 2024); and Everland, Mai Ndombe REDD+ Project Wildlife Works Democratic Republic of the Congo, available at https://everland.earth/projects/mai-ndombe/ (accessed June 2024).

Summary of key lessons learned from case study 3.6

• **Emission reduction**: While the project has reported significant reductions in CO_2 emissions, there are concerns about the effectiveness of these measures and the accuracy of the reported climate-related benefits.

• **Security of land tenure**: Efforts to improve the security of land tenure have been insufficient, leaving local communities vulnerable. The complexity of land tenure issues, including the recognition of customary rights, remains a challenge.

• **Institutional capacity**: The project has revealed gaps in local government capacity to manage REDD+ programmes effectively, despite the establishment of local development committees.

• **Project incentives**: Exclusive rights to carbon credits and a long contract duration are key components of the project's framework.

• **Benefit sharing:** The project has generated a substantial number of verified carbon units, but the details of revenue distribution are not fully transparent, and the share transferred to communities is unclear.

Overall, the Mai Ndombe project highlights the importance of addressing the complexities associated with land tenure and problems related to building institutional capacity, as well as the need to maintain transparency in revenue and benefit-sharing for the success of conservation initiatives.

Annex 3.2
Template for case studies

Project details

ACTIVITY	**General description of project** • Project name, size, sector, start and end date • Clean Development Mechanism, Joint Crediting Mechanism or voluntary carbon market • Information on project developer and host Government involvement • Objective (emission abatement or carbon removal) and mitigation potential • Factors considered by host Government when selecting/authorizing project
SUSTAINABLE DEVELOPMENT GOALS OUTCOMES	**Claims of Sustainable Development Goals/co-benefit outcomes** • What are the claims? • Existence of ex-ante assessment of Sustainable Development Goals/co-benefit potential of project and risks • Existence of Sustainable Development Goals/co-benefit monitoring • Existence of third-party verification of Sustainable Development Goals/co-benefit • Complaints, if any, lodged against project (e.g. community rights abuses)
TECHNOLOGY TRANSFER	**Claims of technology transfer** • What are the claims? • To whom was technology transferred? • Extent to which transferred technology is transformational (new technology, green technology, contribution to structural transformation, potential of scale-up and diffusion) • Use of local expertise in project activities, such as monitoring/verification processes
INSTITUTIONAL CAPACITY	**Evidence of institutional capacity-building** • Does project developer have prior experience in carbon projects? • Revision/updating of domestic policy and regulations required (e.g. new laws) • Use/involvement of local expertise (existence of trained national consultants) in monitoring of Sustainable Development Goals and mitigation • Involvement of local private sector in technology transfer • Relationship of project to NDC/environmental policy and sector-level goals
PROJECT INCENTIVES FRAMEWORK	**Financing and distribution of economic benefits** • How was project funded? • Share of domestic financing • Existence of additional streams of income (e.g. sales of electricity or cookstoves) • Role of microfinance (e.g. in case of sale of cookstoves to households)
CERTIFIED EMISSION REDUCTIONS REVENUES	**Price and demand for certified emission reductions** • Volume of certified emission reductions • Buyers of certified emission reductions • Status of domestic demand for certified emission reductions • Benefit sharing arrangements with host Government

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Chapter IV

Carbon markets and their implications for domestic policies and institutions

United Nations

This chapter examines how the least developed countries (LDCs) can mobilize their institutions to implement Article 6, paragraphs 2, 4 and 8 of the Paris Agreement. Carbon markets are complex, and the international architecture implied by the Agreement is a challenge for countries that have not yet developed the domestic policies and capacities necessary for their implementation. Improving institutional quality, formulating flexible and adaptative policy frameworks and developing the appropriate skills and capabilities in LDCs will be essential in leveraging Article 6 mechanisms under the Agreement. To this end, LDCs should take advantage of the facilitations offered through various mechanisms of the Agreement, assess their readiness for implementation and address gaps in policies, institutions, regulations, finance, technology and infrastructure.

A. Introduction

The Paris Agreement is a complex international agreement on climate change that has not only expanded the global ambition on greenhouse gas (GHG) mitigation targets, but also increased States' roles and functions geared to implementing the treaty (Bernstein and Hoffmann, 2018; Allan et al., 2023). It requires countries to play a more active role in voluntary cooperation involving internationally transferred mitigation outcomes (Article 6, paragraph 2), as well as in international carbon trading under the supervision of an international oversight body (Article 6, paragraph 4). Voluntary cooperation among countries extends to non-market approaches that are critical for upscaling the means of implementing mitigation and adaptation actions, including the provision of support in terms of finance, technology transfer and capacity-building among Parties (Article 6, paragraph 8).

As noted in chapter II, carbon markets fall into two categories: government-regulated schemes (compliance markets) that operate by setting limits on total emissions and issuing tradable permits to regulated entities; and self-regulating voluntary markets in which private actors purchase carbon credits for the purpose of meeting voluntary mitigation commitments. Under certain conditions, voluntary carbon markets may overlap with compliance markets that accept credits from voluntary schemes. The two market structures entail different costs for emitters depending on government policy. A compliance market implies that the Government takes direct control of emissions of regulated entities, whereas private actors shape the operational frameworks in voluntary markets. Since the Clean Development Mechanism of the Kyoto Protocol, LDCs have participated in carbon trading mainly through voluntary carbon markets as suppliers of carbon credits (chapter III).

This chapter examines how LDCs can mobilize their institutions to implement Article 6, paragraphs 2, 4 and 8 of the Paris Agreement. The chapter reviews the institutional landscape in LDCs vis-à-vis the organizational requirements of carbon trading in either compliance or voluntary markets, or voluntary

cooperative mechanisms proposed in Article 6, paragraphs 2 and 8 of the Agreement. The central question is the extent to which LDCs have the institutions and capacities required to allow them to benefit from Article 6 mechanisms.

The rest of the chapter is organized as follows. Section B first discusses the fundamental role of institutions in policy formulation as it relates to carbon markets. It then explains the mechanisms through which institutions can influence climate action through carbon markets. Section C discusses the institutional arrangements at the global level, as envisaged in Article 6 of the Paris Agreement, and the rules, modalities and procedures established by the Conference of the Parties (COP) serving as the meeting of the Parties to the Paris Agreement (CMA). It also discusses their implications for institutional development in LDCs that are actively seeking to participate in the Article 6 mechanisms. Section D concludes by discussing the challenges and opportunities for LDCs in implementing Article 6. It focuses on the institutional and regulatory capacities of LDCs for carbon trading, and offers insights into possible strategies that LDCs could deploy in response to the ongoing CMA negotiations on the implementation of Article 6. It also highlights non-market approaches (Article 6, paragraph 8) and how LDCs could leverage additional international support to engage more effectively in Article 6 mechanisms.

B. Institutions and carbon markets

Institutions are key to delivering strong, responsive climate action and inclusive development, matched by tangible progress on internationally agreed goals such as the 2030 Agenda for Sustainable Development and the Doha Programme of Action for the Least Developed Countries for the Decade 2022–2031. The Paris Agreement represents a direct call on States, regardless of any financial or institutional capacity limitations, to play wider and far-reaching roles in global carbon mitigation. It is assumed that Parties to the Agreement have strong policies, quality regulatory frameworks, skilled human resources, and effective and robust institutions with the capacities to coordinate various government ministries, agencies and other stakeholders in implementing the Agreement.

This section discusses the fundamental role of the State in policy formulation as it relates to carbon markets, and how this role could be used to influence climate action. It analyses institutional approaches at the national, regional and global levels to draw lessons from various carbon market models.

1. The context and market roles

The link between economic activities that drive emissions and the layers of bureaucratic systems that exercise State functions to control their domestic and transboundary impacts creates a complex set of demands on State institutions and non-State stakeholders. Carbon markets were primarily conceived as governance mechanisms to control emissions, but the emergence of voluntary standards and carbon crediting schemes operating outside compliance systems has changed their institutional dynamics, including their design and how they operate. The different designs have different implications for policies and institutions. Moreover, the dynamic relationships of the various actors in carbon markets have different effects on the environment, and on the distribution of costs and benefits to the public. These differences have important implications for environmental integrity and for public policy effectiveness, as explained below.

Institutions are the means by which societies operate, including the rules governing how transactions are conducted between individuals, groups and the State (Dovers and Hezri, 2010). Institutions may also imply all factors that govern the performance of an economy, including the political, educational, cultural and legal systems that ensure equity and the protection of human rights (including the right to property) (Coase, 2004). In this sense, they are systems that structure social interactions to make them predictable by constraining and enabling certain behaviours (Hodgson, 2006). Given that human beings are at the centre of societal interactions, institutions set the rules that govern and shape those interactions, whether social, political or economic (Lin and Nugent, 1995). By focusing on roles and functions, institutions refer to high-level national, regional and global entities that are mandated to facilitate government efforts in a particular policy direction. They are policymaking and regulatory entities that coordinate government engagement with stakeholders, to galvanize support for government actions with regard to specific development themes. The governance of climate mitigation policies, for instance, needs wider participation and support from stakeholders because of the trade-offs that may render policy reforms moot if stakeholders are opposed to the economic, social and environmental implications of environmental policies.

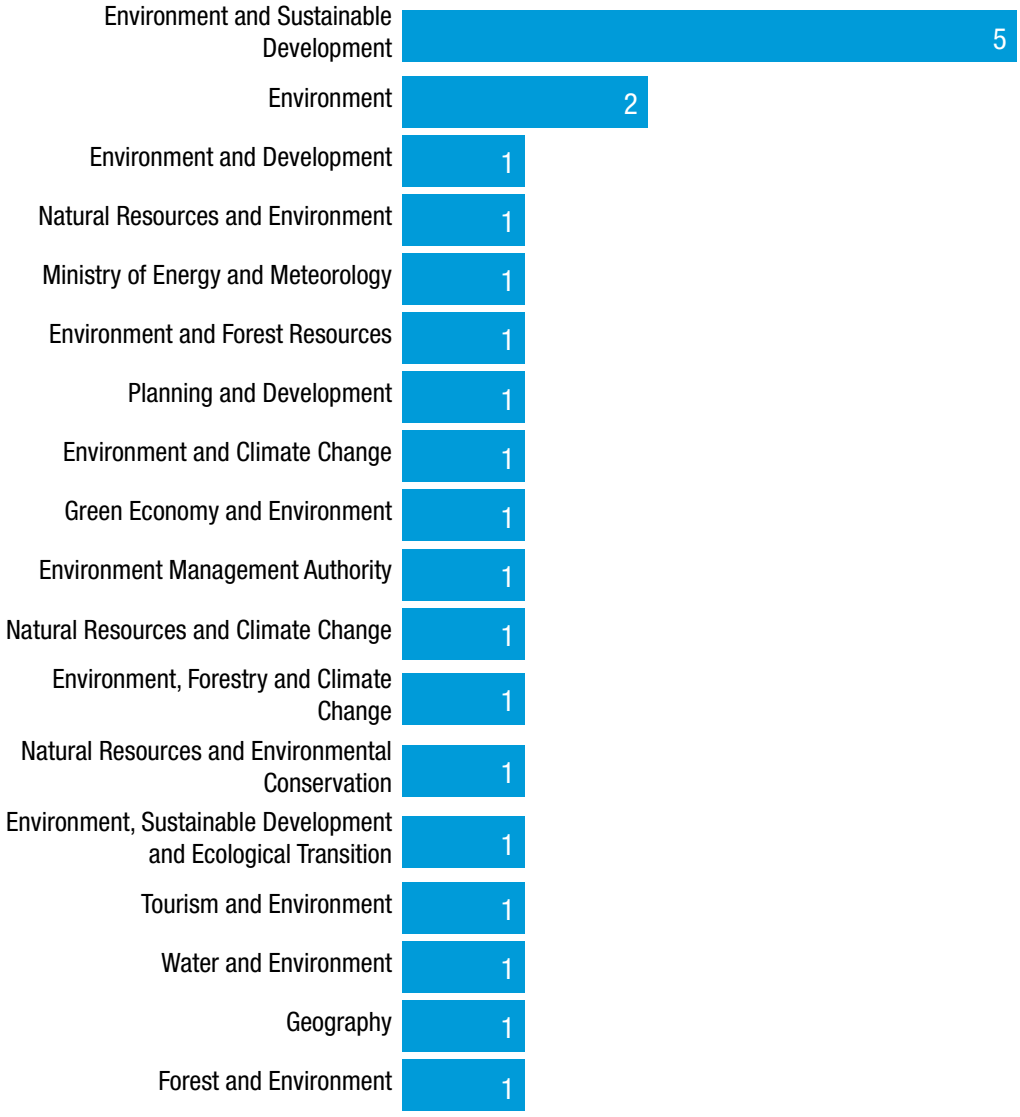
Mandates and purpose are key to the sustenance of institutions, particularly those that play coordinating roles across various functions of government. Climate change as a cross-cutting developmental issue requires an integrated approach for deepening intersectoral collaboration and minimizing trade-offs, to ensure coherence and consistency among sectoral policies, particularly those anchoring national sustainable development priorities (United Nations, 2015a). The Paris Agreement has a host of institutional arrangements for each mechanism it proposes, including under Article 6. The reporting arrangements under Article 6.4 (the Paris Agreement crediting mechanism) require a designated national authority that communicates with the secretariat of the United Nations Framework Convention on Climate Change (UNFCCC) and the Article 6.4 Supervisory Body on approved activities[1] with regard to the sectors in which approved activities will be carried out and the GHG accounting methodology, including baseline approaches and crediting periods under the mechanism. An analysis of the designated national authorities submitted to the UNFCCC secretariat by 23 LDCs as of May 2024 shows that 19 have designated the ministries in charge of the environment as the national authority (figure IV.1). The role of the designated national authority in domestic policy formulation and implementation is critical to implementation of the Paris Agreement. That authority is also best placed to assess and recommend nationwide capacity needs for implementing national priorities, as well as actions in fulfilment of the country's obligations under the Agreement. Therefore, it should not only be involved with the ministry in charge of the environment, but also with the finance, trade and planning ministries.

Markets are unlikely to be concerned with the reduction of GHG emissions without government interventions aimed at correcting the externalities associated with anthropogenic emissions (MacKenzie, 2009). Dedicated government entities are required to mobilize market-based tools and instruments necessary to control market failures, such as localized pollution, and global-level issues such as emissions. As explained in chapter II, there are two main ways in which carbon market institutions are formed. The first is through State regulation, whereby the Government builds and operationalizes a compliance carbon market through a policy and regulatory framework. The second is through social institutions,

How carbon markets fulfill their original role – a mechanism to control GHG emissions – depends on the institutions that regulate them

[1] The international carbon crediting mechanism under Article 6.4 is placed under the Supervisory Body, currently composed of 12 members from among the Parties to the Paris Agreement.

Figure IV.1
Most countries cited their ministry in charge of the Environment and Sustainable Development as their designated national authority



Source: UNCTAD secretariat calculations, based on data from UNFCCC, available at https://unfccc.int/process-and-meetings/the-paris-agreement/article-64-mechanism/national-authorities (accessed May 2024).

including public and private organizations that form coalitions on the common aims of reducing emissions and maximizing positive sustainable development impacts from environmental projects (Knox-Hayes, 2009, 2010). The two carbon market models present different organizational complexities and risks, and the trade-offs could be significant for developing countries that have little experience with market-based policy instruments for addressing climate change.

The next two subsections discuss the implications of the various carbon market models for institutional development. In a compliance market (subsection 2), the carbon market institution is a regulations-oriented social construction that exercises control over societal emissions. Attention is paid to policy design, the institutional landscape and the rules and regulations that are critical to achieving the objective of the State in reducing carbon emissions.

On the other side are the independent standards of non-governmental organizations (NGOs) and private sector institutions that administer voluntary carbon markets (subsection 3). In some limited cases, transactions in voluntary markets overlap with national or regional regulatory frameworks. However, a large share of the transactions in voluntary markets is conducted through self-regulation. These markets tend to have more transactions because their orientation is more relational or symbolic, based on fluid partnerships between stakeholders, and they emphasize the development of standards in mitigating emissions. The emergence of fragmented independent standards is a feature of these markets (Hamilton et al., 2008).

2. Compliance carbon markets

Data to June 2024 show that LDCs have not yet implemented compliance carbon markets. Some LDCs have introduced measures that may eventually lead to the broader application of market-based policy instruments on carbon emissions. For example, Senegal assessed the feasibility of carbon pricing in 2018, but consultations with stakeholders showed the need for further studies in the design of carbon taxes. In Bangladesh, the long-term development plan, Mujib Climate Prosperity Plan Decade 2030, was scheduled to introduce carbon pricing and tax dividends in 2024. These measures should complement two initiatives already launched in Bangladesh in 2022 under the long-term plan: a green exports programme and a national carbon finance coordination hub. Further, the country intends to integrate with international carbon markets by 2030 and commit the resources from carbon trade to financing locally led adaptation and loss and damage activities (Bangladesh, 2021).

Many developing countries have experience with the Clean Development Mechanism under the Kyoto Protocol (chapter III), the predecessor to the Article 6.4 mechanism. However, developing countries were under no obligation to reduce emissions under the Protocol. Under the Paris Agreement, all Parties have committed to pursuing domestic mitigation measures (Article 4, paragraph 2), including through the use of market mechanisms (Article 6.4). To increase domestic policy control over emissions, countries need to elaborate institutions, policies and regulations that fit their national circumstances. The examples from other developing economies in table 4.I show that institutional quality and flexible and adaptative policy frameworks, as well as skills and capacity, are key to effective emission mitigation.

(a) What does it take to establish a compliance carbon market?

(i) Policies and regulatory frameworks

For carbon markets to be adaptable to national contexts, policymakers need to have control over carbon policies, including carbon pricing and mechanisms for carbon trading. There are multiple approaches to reducing emissions, including command and control mechanisms, as well as market-based instruments that offer more flexibility and efficiency (Krupnick and Parry, 2012). An emission trading system is developed primarily for compliance with domestic environmental laws that require particular entities to meet GHG emission targets. Most of the revenue from carbon trading is generated through emission trading systems (ETS), but there are only 36 such systems operational, and these are in upper middle- and high-income countries (World Bank, 2024).

Environmental laws are central to the institutional set-up of compliance carbon markets. Typically, the regulations specify materials, emissions and types of waste, the sectors or sources that will be regulated, and the administrative arrangements (Narassimhan et al., 2018). The regulations also assign roles to specific

State authorities for the smooth operation of the market and application of the law. The Government's responsibilities include legislating and enforcing the law, developing relevant policies, technical standards and mandates under the law and establishing procedures for allocating quotas for emissions and the transfer of carbon credits, among others. The choice of an allocation mechanism and complementary carbon policies is not simple; it entails trade-offs and extra costs for governments, as baseline data on emissions need to be established, as well as the means for the monitoring and verification of emissions.

Table IV.1 presents examples of compliance carbon markets from selected developing countries. The performance of an emission trading system against the attributes associated with their designs, including environmental and wider economic impacts is not assessed. The examples are chosen for illustrative purposes only, and include emission trading systems of advanced developing jurisdictions that have placed large volumes of emissions under regulatory control, resulting in significant revenues (e.g. Kazakhstan and Shanghai), and others that have introduced carbon taxes in compliance settings (e.g. Mexico, South Africa and Uruguay). These jurisdictions cannot be compared with LDCs in terms of emission intensities, although their total emissions from fossil fuels and the manufacture of cement are somewhat closer to the combined totals for LDCs. For example, two countries each emitted about 18 per cent more than all LDCs combined and one country emitted about 40 per cent less than all the LDCs combined in 2018–2020.[2]

Since 2000, Kazakhstan, an upper middle-income developing country has used abundant mineral resources, consisting mainly of oil and gas, to support market-oriented domestic reforms. The efficacy of domestic policies is boosted by government expenditure on building regulatory and institutional capacity, as well as the technical capacity of the civil service. For example, Article 94-7 of the Environmental Code of Kazakhstan No. 212 of 2007 established a market mechanism for reducing emissions and the absorption of GHGs. In addition, chapter 9 of the law specified the allocation of quotas for emissions to operators of fixed installations and identified the regulated sectors. The law also set the parameters for carbon emissions trading and the procedures for monitoring emissions (Kazakhstan, 2007).[3] The legislation required fixed installations where emissions exceeded the equivalent of 20,000 tons of carbon dioxide (CO_2) per year in the oil and gas sectors, electricity, mining, metallurgical and chemicals sectors and in the production of construction materials such as cement, lime, gypsum and bricks. In the new environmental code issued in 2021, the threshold of emissions for which a mandatory permit was required was reduced to 1,000 tons for entities that must also meet technological standards, implement measures to improve energy efficiency and provide data to the Government for monitoring emissions (Kazakhstan, 2021).

Kazakhstan launched the pilot phase of its emission trading system in 2013 and the second phase was in 2014–2015. These phases were critical to revealing complex technical and operational challenges. The system was temporarily suspended in 2016–2017 to address the challenges, including domestic reporting requirements, benchmarks for allocating quotas and other issues that delayed its full implementation. The initial impact of the Kazakhstan emission trading system was to increase emissions from economic activities placed under regulatory control and the mandating of technological standards for some sectors.

[2] This comparison is based on national-level data from the World Bank World Development Indicators database and does not include Shanghai, which is a subnational ETS.

[3] The legislation defines an installation as a stationary source of GHG emissions or a group of stationary sources linked together by a single technological process and located on the same industrial site (Kazakhstan, 2007).

Table IV.1
Examples of compliance carbon markets in selected developing countries

Institution/ market name	Type	Year implemented	Jurisdiction covered	Country	Jurisdiction emissions covered	Price per ton of CO_2-equivalent as on 1 April 2024	Government revenue*
Kazakhstan ETS	National ETS	2013	Kazakhstan	Kazakhstan	46 (or 0.27 per cent of global emissions)	KZT 504 ($1.12)	KZT 0 ($0) (2021)
Mexico carbon tax	National tax	2014	Mexico	Mexico	44 (or 0.61 per cent of global emissions)	MXN 68.37 ($3.79)	MXN 4 306 million ($217 million)
South Africa carbon tax	National tax	2019	South Africa	South Africa	80 (or 0.84 per cent of global emissions)	ZAR 159 ($8.93)	ZAR 1 689 million ($115 million)
Shanghai pilot ETS	Subnational - City ETS	2013	Shanghai	China	36 (or 0.21 per cent of global emissions)	CNY 59.90 ($8.72)	CNY 141 million ($22 million)
Uruguay carbon tax	National tax	2022	Uruguay	Uruguay	11.2 (or 0.01per cent of global emissions)	YUY 6 024 ($155.87)	YUY 10 482 million ($255 million)

Source: World Bank, State and Trends of Carbon Pricing Dashboard, available at https://carbonpricingdashboard.worldbank.org/ (accessed May 2024).

Note: Latest available year or the reference year in parentheses. CNY – Chinese renminbi, KZT – Kazakhstani tenge, MXN – Mexican peso, ZAR – South African rand, UYU – Uruguayan peso. ETS, emissions trading scheme/system.

The promulgation of the new environmental code of 2021 sought to address many of the challenges, including the removal of distortions caused by subsidies to fossil fuels and a greater focus on the energy sector (power plants, oil and gas operators). Altering the structure of the primary energy supply by increasing investments in renewables could lower the cost of the transition to a low-carbon economy (Zhakiyev et al., 2023). Complementary policies may also be required to reduce the socioeconomic impacts of the withdrawal of subsidies and the introduction of stringent environmental performance and efficiency standards in the power sector.

(ii) Allocating emission allowances and cascaded limits on emissions

A system for allocating allowances is an important policy choice in implementing an emission trading system. The choice has implications for the cap and the effectiveness of an environmental policy.[4] Covered entities react to the cap based on the initial allocation and the cost of obtaining additional allowances (ICAP, 2023). The cap is a carbon price signal, and, ideally, it should be set based on what is feasible within the environmental performance capacities of the regulated

[4] The cap is the quantitative limit on the total amount of GHGs that regulated entities must not exceed under the scope of the environmental regulation or policy.

entities or the sector. If the initial allocation is set above what the entities require at current production technology and abatement capacity levels, they will have no incentive to reduce emissions. Sectors that fall under the cap could face international competitiveness risks from the carbon price (or tax). Therefore, the design of the policy is critical in countries with emissions mainly from trade-exposed sectors such as metals, cement and other raw materials.

Implementing an emission trading system mostly starts with the free allocation of allowances and a transition period during which existing entities are expected to shift from their use of carbon-intensive technologies and processes. This is the case of the Kazakhstan (box IV.1) and Shanghai emission trading systems. The transition period may be used by the regulator to establish the necessary infrastructure for the emission trading system, including exchange platforms and data collection methods, as well as capacity-building among participants. A transition period may also serve as a cushion to protect pre-existing installations from new entrants that might have better production technologies, or from imports from countries that do not regulate emissions. The success of the policies depends on alternative, low-carbon technologies being accessible and at a low cost. Trade-exposed sectors or industries may require exemptions or support during the transition period to allow them to build their capacity to reduce emissions with existing technologies or shift to more efficient technologies.

Benchmarking and grandparenting are the two main methods for determining the volume of the initial free allocation of emissions. Benchmarks are established for each product or sector, and the benchmark values are multiplied by the current or previous production levels of the eligible entities to determine their quotas for the relevant capped period (ICAP, 2023). Although benchmarking rewards best practices and efficient producers, the system may impose a higher cost on economies that are dominated by unsophisticated technologies. Historical emissions may be indicative of future emissions in the sense that larger emitters may require an allocation of allowances that closely matches the share of their previous emissions. Grandparenting takes this notion into account by setting historical emission baselines against which free allowances may be allocated (Knight, 2013). By allocating a greater share of allowances to larger emitters, grandparenting lowers the marginal cost of abatement for larger emitters, but penalizes efficient producers and those that invested in abatement technologies prior to the introduction of emission policies (ICAP, 2023).

The freely allocated allowances can be transferred between entities through trade. An entity can either sell extra allowances or buy additional allowances from an authorized carbon market operator who ensures that the total allocation of emission allowances for each period is not exceeded.[5] Instead of allocating allowances free of charge, the regulator may opt to directly auction the available allowances to eligible entities. Provided the auction is conducted in an open, transparent and non-discriminatory manner, the process may be a means to efficiently allocate allowances to the entities that need them the most. Auctions may enhance the discovery of the true price of carbon emissions, particularly if there are many participants and trading is conducted in a competitive manner. A regulator may also choose an auction to generate revenue, which could be reinvested through spending on environmental protection, adaptation and mitigation. It may be necessary for emission trading system operators to pilot different designs, to gain experience with

[5] When setting the emission cap, the regulator considers the maximum GHG emissions within its emissions target. An absolute cap ensures that the allocated permits do not exceed the upper limit. The cap may also be set in relation to a baseline of historical emissions or projected future emissions, both of which map the trajectory of emissions according to the regulator's choice.

Box IV.1
The Kazakhstan emissions trading system

The Kazakhstan emission trading system was launched in 2013 in a pilot phase as a cap-and-trade system covering CO_2 emissions of large emitters in oil and gas, electricity, mining and construction materials. Full enforcement of regulations and trading in the Kazakhstan emission trading system started in 2014, but the system was temporarily suspended in 2016–2017 to address operational issues and reform allocation rules. Operations resumed on 1 January 2018, with new regulations governing the emission trading system operations, and the establishment of a system for the monitoring, reporting and verification of emissions. During the period 2018–2020, the entities covered had the option of receiving free allowances based on their historical emissions or benchmarks. The implementing authority, Zhasyl Damu JSC, responsible for the registry and reserve management, set aside 11.5 million allowances in a reserve for new entrants and for capacity changes for installations that chose allocation using benchmarks. Since 2021, product-based benchmarking has been used under the emission trading system, which rewards the most efficient entities by granting them the allowances they need for boosting their production levels.

The short durations of the emission trading system pilot phases might indicate a commitment by the authorities to implement it without further delays, but stronger engagement with the various stakeholders may be necessary for political buy-in. In addition, multiple benchmarking standards for allocating emission permits and the prohibition of cost pass-throughs to consumers undermine the incentives for energy producers to upgrade or replace outdated technologies.

Since the goal of the emission trading system is to reduce emissions, the Government, through the implementing authority, adjusts the cap in each implementation period to enforce emission reductions. During the period 2018–2020, it achieved a cap of 485.9 metric tons of CO_2 ($MtCO_2$) per year, on average. A new national allocation plan for 2022–2025 was approved in July 2022 and set a cap of 163.7 $MtCO_2$ for 2023.

Sources: Howie P and Atakhanova Z (2022). ICAP (2022). Kazakhstan Emissions Trading System. Available at https://icapcarbonaction.com/system/files/ets_pdfs/icap-etsmap-factsheet-46.pdf; World Bank, State and Trends of Carbon Pricing Dashboard, available at https://carbonpricingdashboard.worldbank.org/.

rules, procedures and other administrative elements, including monitoring, reporting and verification systems, which are critical for the enforcement of obligations of covered entities.

It is indispensable to establish rules, infrastructure and policies for conducting auctions for the system to succeed. For example, the initial rules for the European Union emission trading system established guidelines for auctioning emission allowances, which were sold in either a 2-day or 5-day futures electronic sales contract. The rules prescribed the procedures for submitting and withdrawing bids, lots (minimum volume of allowances available for bidding), persons eligible to bid, timing and frequency of auctions and how the clearing price and the tied bids would be determined, along with other administrative directives. Since the European Union emission trading system is a regional (supranational) market set-up, the rules also provide for the appointment of an auction platform for joint implementation among its member countries, but the members are also free to appoint auctioneers of their own choice, provided the auction meets conditions set in the regulations (European Commission, 2010). The rules were amended in 2023 to cover new elements, such as extending the scope of the emission trading system to maritime transport and introducing new and separate emission trading system for buildings, road transport and industrial activities not covered by the existing emission trading system. Other changes also became necessary with the aim of aligning the operations with European Union directives (European Commission, 2023).

A regulator's role extends beyond setting rules, procedures and modalities, to establishing baselines, and monitoring, reporting and verification systems

Instead of issuing allowances and setting a cap on carbon emissions, a regulator may opt to implement a system that directly rewards producers that reduce their emissions beyond their obligations. The baseline and credit system relies on a baseline that can be tailored to reflect historical emission levels or performance standards for a product or sector. Once the baseline is established, future emissions are expected to fall below the baseline if covered entities implement abatement projects or emission reduction strategies. When actual emissions fall below the baseline, producers can earn credits that they can sell to other producers who need them (Australia, 2014). For environmental integrity, producers who exceed their baseline emissions could be made to pay a penalty or acquire credits from within the jurisdiction, subject to the limit set according to the baseline. The emission reduction credits are accepted by the regulator and sold as equivalents to allowances. The environmental safeguard in a "baseline and credit" system works only under limited scenarios. Conditions may include a credit offsetting system that is national or subnational, and the credits are subjected to verification of the carbon emission reduction or removal against a baseline or historical emission level. Verification requires an authorized/accredited entity to objectively assess the emission reduction/removal against the baseline using standard methodologies.

Monitoring, reporting and verification processes require the State to develop a robust data collection method and devise strategies for its improvement on an ongoing basis. Such data are useful for improving emission trading system standards and integrity. Under the Kazakhstan emission trading system, monitoring and verification are State functions conducted through a network of stationary and mobile observation points, laboratories and centres of observation of physical and chemical processes occurring at industrial installations that are considered sources of emissions, pollution and waste (Kazakhstan, 2007). The State also operates a system of registries for carbon emission allowances or carbon credits. The registries are databases for tracking accounts of regulated entities; they collect data on all transactions related to government-issued credits/permits, stockholdings of credits/allowances, transfer of credits/allowances to other parties in carbon trading, acquisition of credits/allowances from emission trading

system, reservation of credits/allowances and cancellation and withdrawal from circulation of either credits or allowances.[6]

(iii) Infrastructure for trading and settlement of claims

The design of the emission trading platform and the market infrastructure for conducting such trading are also critical to the success of compliance systems. Compliance carbon markets are exclusive markets buttressed by environmental policies and regulations and shielded from outside influences by restrictions, such as limiting carbon trade among eligible regulated participants (Ibikunle et al., 2016). The Shanghai emission trading system was the first to pilot the spot trading of allowances in China. It is a subnational compliance market covering industrial and non-industrial sectors such as buildings, aviation and shipping (sectors that account for more than half of the city's emissions). The Shanghai Environment and Energy Exchange oversees transactions under the Shanghai emission trading system. Compliance entities are responsible for reporting their direct and indirect emissions from power and heat consumption at a business entity level. In October and November 2022, the Shanghai Environment and Energy Exchange auctioned 2 668 835 allowances for a total of RMB 191.49 million ($27.03 million) (ICAP, 2022).

Emission allowances can be converted into financial instruments and traded under financial market rules. When exchanges are involved in carbon trading, their arbitrage role involves the transfer of commercial and environmental risks from regulated entities in compliance carbon markets to investors in the financial market on the expectation by environmental policymakers that such transactions could lead to a reduction in carbon emissions (Chen and Wu, 2023). Trading can take the form of spot trading or options and/or futures contracts based on the underlying emission allowances or certified emission reductions. In the European Union, carbon products transacted through exchanges are subject to the regulations of the secondary markets on which they are traded and to European Union regulations, which include emission allowances, or derivatives thereof (European Commission, 2014).

(iv) Complementary policies

Compliance regimes may also apply other market-based instruments, such as carbon taxes, performance standards and other market-based incentives, depending on national policy goals and other considerations. Since carbon taxes are exogenously specified, the price of carbon is relatively stable, and the distribution of costs and benefits can be easily established (Goulder and Schein, 2013). Combined with a cap-and-trade system, a carbon tax may be used as a price adjustment mechanism for entities whose emission performance exceeds certain thresholds, or as a measure to cover activities that are outside the cap-and-trade system.

Under both a carbon tax and cap-and-trade, the covered entities are required to provide data on actual emissions for use in calculating tax obligations or emission allowances. The regulatory burden increases with data requirements, particularly when the number of compliance entities is high, or for complex industrial processes involving multiple fixed installations scattered across a wide geographic area. The regulator has the option to absorb the cost of the monitoring and verification of emissions, or pass it on to producers through a carbon tax or a price-adjustment mechanism. For example, Mexico and South Africa have national carbon taxes covering a significant share of their emissions, which yielded revenues of $217 million and $115 million, respectively, in 2023. Uruguay implemented a carbon tax in 2022, covering 11.2 per

[6] Reserved, cancelled and withdrawn credits/allowances are usually inaccessible by regulated entities, either because the exchange between regulated entities has used up the allowance, or the cap has been used up or as a mechanism for adjusting the carbon price.

cent of the jurisdiction's emissions, yielding a revenue of $255 million (table IV.1).

In South Africa, the carbon tax is inflation-indexed and is set to increase with the consumer price index. The tax is economy-wide and covers all activities, including energy industries, mineral industries, manufacturing and construction, transport and metal industries (South Africa, 2019). In the first implementation phase, many sectors benefited from tax-free allowances ranging from 60 to 95 per cent. These included basic tax-free allowances for fossil fuel combustion emissions and for process emissions, a fugitive emissions allowance, a trade exposure allowance, a performance allowance for companies that reduce emission intensities in their activities, a carbon budget allowance and an offsets allowance. The Minister of Finance sets emission intensity benchmarks for sectoral performance, determines the amount of trade exposure allowances and sets rules governing carbon credits.

Carbon tax revenue is usually not the main motive for environmental policy, as new taxes may negatively interact with existing taxes and cause distortions in the economy. It is good practice to introduce carbon taxes as part of a broader reform to improve the efficiency of the tax system. Since environmental tax revenues are part of the fiscal pool, the regulator can choose between spending the revenue on further efforts to reduce carbon emissions, such as subsidizing renewable energy and strengthening the institutional and regulatory frameworks for implementing the environmental policies; or redirecting the revenue to social services, such as education, health, water and sanitation, to benefit communities that are not responsible for emissions (Carl and Fedor, 2016). Other environmental taxes are increasingly being used as policy measures to address climate change. They include taxes on energy, including fuel for transport, taxes on pollution, taxes on resource extraction and taxes on transportation. For example, in 2020, Senegal earned 1.9 per cent of its gross domestic product (GDP) from taxes on energy, including fuel for transport, followed by Uganda, at 1.6 per cent of GDP (table IV.2).

3. Voluntary carbon markets

Voluntary carbon markets are markets in which buyers of carbon credits generally participate without any obligation to offset or reduce carbon emissions. The key actor in such a market is the crediting standards body, which issues certificates to projects for carbon credits generated. The other actors are project developers, validation and verification bodies, market intermediaries and market participants, who may be end-buyers or intermediaries (Akon, 2023). Project developers initiate and implement carbon removal or carbon avoidance/reduction activities that yield verifiable carbon credits. The developer earns profits from the direct economic benefits of the project and from sales of carbon credits. The standard setters in voluntary carbon markets define the requirements for the certification of carbon projects and the methodologies for carbon crediting. Buyers of carbon credits may transact directly with project developers or through market operators (usually brokers, traders and intermediaries) in organized, over-the-counter markets (spot sales). Intermediaries are also active in secondary markets, where they offer futures and options sales contracts on the underlying carbon credits in their portfolios. In both spot and futures contracts, the market participants can be individual end-buyers, corporates, compliance entities, financial institutions and intermediaries that buy and sell credits.

LDCs have been active participants in voluntary carbon markets since the Kyoto Protocol as suppliers of carbon credits, but their participation is marginal both in terms of projects implemented and the volume of credits sold. The Clean Development Mechanism may, at times, have been used as a way for industrialized

Table IV.2

Revenue from energy taxes (including fuel for transport), as a percentage of gross domestic product, in least developing countries implementing environmental policies, 2016–2020

Country	2016	2017	2018	2019	2020
Senegal	2.3	1.4	1.3	1.3	1.9
Uganda	1.5	1.6	1.7	1.7	1.6
Sierra Leone	0.7	1.5	1.1	1.6	1.3
Burkina Faso	1.0	1.1	1.1	1.1	1.0
Lesotho	0.0	0.2	0.2	0.1	1.0
Togo	1.0	1.0	1.2	0.7	0.8
Rwanda	0.9	0.8	0.8	0.8	0.7
Mauritania	0.7	0.7	0.9	0.8	0.7
Mali	1.2	1.0	0.5	0.4	0.6
Chad	0.0	0.0	0.3	0.3	0.4
Niger	0.2	0.2	0.3	0.2	0.2
Democratic Republic of the Congo	0.4	0.1	0.1	0.1	0.1
Madagascar	1.1	1.1	1.4	1.6	

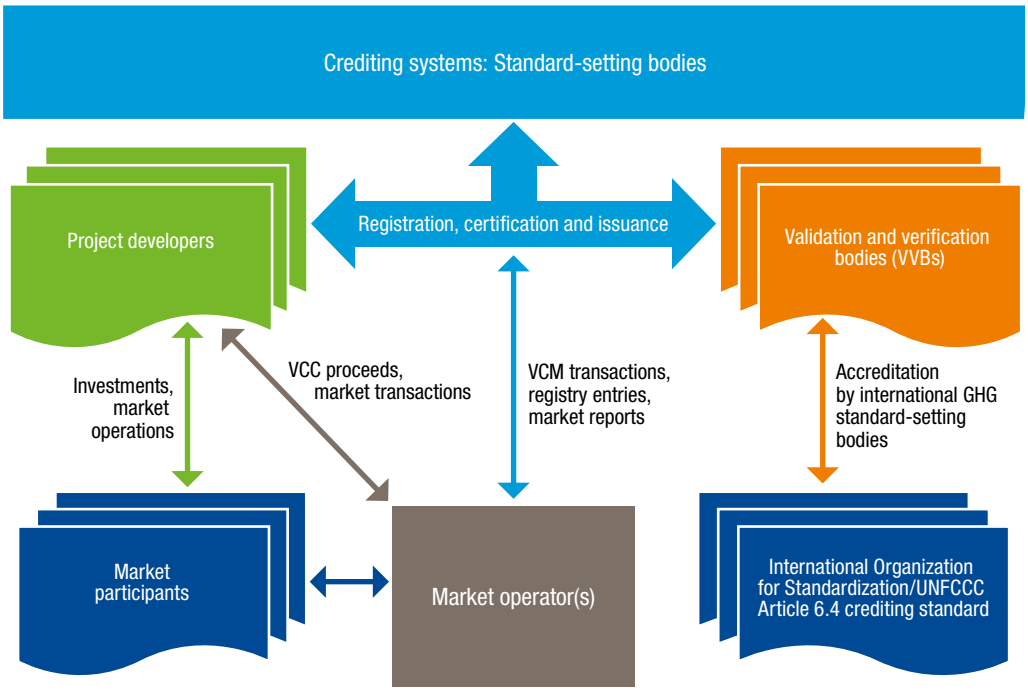
Source: World Bank, State and Trends of Carbon Pricing Dashboard, available at https://carbonpricingdashboard.worldbank.org/ (accessed May 2024).

countries to increase carbon emissions (Richman, 2003). Lessons learned during its implementation could therefore be valuable for LDCs as they transition to the international crediting mechanism under the Paris Agreement (chapters II and III).

The transactions between the major actors in voluntary carbon markets are key to understanding the institutional architecture of such markets. The schematic representation of the key market actors in figure IV.2 broadly illustrates their roles. Of note is the overarching role of independent standard-setting bodies that administer the crediting systems in such markets. The proliferation of such bodies has contributed to the widespread fragmentation of voluntary carbon markets, which, along with the opacity of their transactions and concerns about the lack of additionality[7] and the consequential impact of projects, undermines their reputation (Kreibich and Hermwille, 2021). There is also a perceived lack of accredited validation and verification bodies, particularly in LDCs, which increases concerns about the lack of transparent governance and the credibility of the markets (Howard et al., 2015). Owing to the voluntary nature of transactions conducted in the markets, they are of questionable value to compliance regimes and global mitigation efforts. However, with greater transparency in the technical operations of voluntary carbon markets, convergence in standards may be achieved over time, which would enable the markets to play a more dynamic role in accelerating progress towards meeting net-zero targets.

[7] A project is additional if it would have taken place even in the absence of the expected revenue from carbon credits. In this context, environmental integrity is achieved based on genuine emission reductions or removals above and beyond the baseline scenario.

Figure IV.2
The voluntary carbon market system



Source: UNCTAD.

Note: GHG, greenhouse gas; VCC, voluntary carbon credit; VCM, voluntary carbon market.

(a) Institutional frameworks of voluntary carbon markets

The non-mandatory nature of voluntary carbon markets means that transactions are independent of legally binding mitigation targets on the demand side of the market (i.e. market participants buy carbon credits on a voluntary basis). When the demand arising from voluntary market participants is greater than the demand from those that face mandatory caps on emissions, there will be no pressure on carbon prices, as it means that the supply of carbon credits is greater than the cap. The non-rivalry situation in voluntary carbon markets is due to the overlapping of mandatory and voluntary markets, allowing for the fungibility of carbon credits across multiple jurisdictions, regardless of the sectors of mitigation activities. A more stringent global mitigation framework, such as the one proposed under Article 6.4, may lessen the non-capped participation and create the conditions for more accurate carbon pricing (Kreibich and Hermwille, 2021). Negotiators were unable to conclude an agreement on Articles 6.2 and 6.4 at CMA 5 due to disagreements relating to the appropriate design of the two mechanisms under the Paris Agreement. Further guidance and rules on Articles 6.2 and 6.4 will have long-term implications for the transparency and alignment of carbon markets, with potential knock-on effects on the ambition of countries' nationally determined contributions (NDCs) and on equity-related initiatives (e.g. common but differentiated responsibilities, carbon credits replacing climate finance), as well as other issues under UNFCCC negotiations. Many Parties, including some LDCs, may opt for the acceleration of Article 6 implementation, yet the outcomes of these negotiations will have far-reaching impacts that need to be carefully considered in preparations for COP 29 in 2024 and beyond.

Normally, standard setters operate registries that track the registration, issuance, sales and cancellation of carbon credits. For efficiency, intermediaries may manage registries on behalf of the standards bodies, thereby smoothing transactions between buyers and sellers through their brokerage role. For example, Rabobank is an issuer of certificates that also operates a registry for project developers, as well as acting as an intermediary or broker (Akon, 2023).[8] The operator has registered several projects that have sold credits internationally from Uganda and the United Republic of Tanzania (table IV.3).

The standards body specifies the certification process that it recognizes, including the methodology for the crediting and the accreditation of entities in charge of monitoring, as well as verification of the quality and validity of credits. Transparency in reporting and third-party verification are crucial for maintaining trust and ensuring that each credit is used only once and then retired. The concern with multiple standards is that methodologies are not harmonized across voluntary carbon markets, which raises questions about the credibility and quality of credits (Kreibich and Hermwille, 2021). On the demand side, the non-compliance element induces price volatility, as most participants face non-binding net-zero targets. In contrast, the binding carbon budgets in compliance schemes usually lead to a higher price of carbon ex ante (if the regulator sets the price) or ex post (if the regulator sets a cap on emissions). Some compliance jurisdictions allow regulated entities to obtain credits from voluntary markets, subject to conditions such as quantitative limits, domiciles of projects and eligible sectors.

The certification of carbon projects is conducted by validation and verification bodies, which are accredited entities that audit carbon projects to determine their eligibility to earn carbon credits based on the methodologies of the standard under which a project is registered. Although the validation and verification bodies may be independent from the standard setter, it is important to note that accreditation or approval by a third-party auditor is the standard setter's prerogative. Private certification trends were originally associated with the aim of filling gaps in environmental governance or weaknesses in environmental policies (Andonova and Sun, 2019). In contrast, the Paris Agreement has made the certification of designated operational entities an important step in operationalizing the Article 6.4 mechanism. This process clearly distinguishes State-led and non-State mitigation mechanisms, and in effect, voluntary carbon markets need to align their business models with the provisions of the Paris Agreement in order to participate in the Article 6.4 mechanism.

The governance features of crediting standards are central to ensuring environmental integrity and the accountability of major actors in carbon trade. However, the multiplicity of underlying methodologies and crediting approaches of different standard-setting bodies raises issues regarding environmental integrity. This, in turn, makes it difficult to achieve alignment between bottom-up and top-down carbon market governance mechanisms (Allen and Overy, 2024; Kreibich and Hermwille, 2021). The Paris Agreement represents a paradigm shift in that the rules for implementing Article 6 mechanisms have driven public governance into private-led domains, for the increased oversight of international carbon transactions. This could have the effect of reducing the global supply of credits from uncapped jurisdictions and creating overlaps between voluntary and compliance regimes, leading to greater alignment to achieve net-zero targets sooner under the Paris Agreement. In this regard, the procedural requirement for a host country to issue an authorization

[8] Rabobank and the certifier, Plan Vivo, have co-developed their protocols and methodologies to streamline the certification process under their Acorn framework, which is targeted at small-scale agroforestry projects (see https://acorn.rabobank.com/en/registry/.

Table IV.3
Rabobank carbon credits retired from selected projects in the United Republic of Tanzania and Uganda

Issuance date	Country	Project	Certifier	Number of credits	Buyer
20 December 2023	United Republic of Tanzania	Kaderes Peasants Development Plc	Plan Vivo	1 161	Nationale Postcode Loterij
04 December 2023	United Republic of Tanzania	Kaderes Peasants Development Plc	Plan Vivo	17 484	Microsoft Corporation
19 September 2023	United Republic of Tanzania	Kaderes Peasants Development Plc	Plan Vivo	1 500	Bobo's Oat Bars
24 April 2023	United Republic of Tanzania	Kaderes Peasants Development Plc	Plan Vivo	20 895	Microsoft Corporation
18 April 2023	United Republic of Tanzania	Kaderes Peasants Development Plc	Plan Vivo	500	Luigi Lavazza S.p.A.
09 November 2022	United Republic of Tanzania	Kaderes Peasants Development Plc	Plan Vivo	5 000	Bain & Company
13 December 2022	United Republic of Tanzania	Kaderes Peasants Development Plc	Plan Vivo	6 000	Standard Chartered
02 December 2021	United Republic of Tanzania	Kaderes Peasants Development Plc	Plan Vivo	5 877	Standard Chartered
20 December 2023	Uganda	Solidaridad ECA Uganda	Plan Vivo	7 086	Nationale Postcode Loterij
04 December 2023	Uganda	Solidaridad ECA Uganda	Plan Vivo	4 407	Microsoft Corporation
29 September 2023	Uganda	Solidaridad ECA Uganda	Plan Vivo	117	Stichting Solidaridad Nederland
24 April 2023	Uganda	Solidaridad ECA Uganda	Plan Vivo	7 337	Microsoft Corporation
02 December 2021	Uganda	Solidaridad ECA Uganda	Plan Vivo	1 771	Standard Chartered

Source: Rabobank Carbon Registry, available at https://acorn.rabobank.com/en/registry/ (accessed May 2024).

for Article 6.4 projects is critical to enable Governments to apply domestic policies and regulations, as well as relevant international provisions (rules, procedures and modalities of Article 6) (Ahonen et al., 2022).

Strict adherence to approved accounting methods is necessary to avoid double counting, particularly when the possibility of multiple claims to mitigation outcomes arise. Such situations are common in voluntary carbon markets, because investors and individuals from abroad may participate in the carbon market value chain as project developers, brokers or other roles. Although standard setters have adopted approaches to reduce or eliminate the risk of double counting, there may be a need for government oversight of these approaches to ensure that environmental integrity is maintained. This might involve steps to achieve data consistency across multiple registries, adjustment to national registries for international transactions and reporting to the Article 6 Supervisory Body, as envisaged under the Article 6.4 mechanism. The independent standards distinguish between four areas that are at different levels of alignment with the Article 6.4 mechanism, namely NDC use of credits generated outside the scope of a host country's NDC;

NDC use of credits generated within a host country, with adjustments to the accounts; emission reduction units counted towards NDC but not used for offsetting; and non-compliance credits used for offsetting within a host country but not counted towards NDC (Kreibich and Hermwille, 2021).

Normally, voluntary carbon market actors would not voluntarily divulge full information as part of government oversight processes. There are suggestions that government interference in carbon markets may hinder growth in voluntary markets by burdening private actors with reporting requirements on discretionary activities (Lane and Newell, 2016; Battocletti et al., 2024). On the other hand, some business entities and individuals buy carbon credits from voluntary carbon markets to improve their environmental performance and boost their corporate social responsibility. The private sector's motives for engaging in voluntary carbon markets may be driven by factors other than offsetting carbon emissions and/or achieving net-zero targets. Considerations of cost effectiveness may drive companies to treat carbon credits as a way to meet carbon mitigation commitments at lower cost, rather than investing in projects that embody their corporate values in environmental sustainability and promote well-being through tangible positive sustainable development impacts (Lou et al., 2023).

There are also concerns about benefit-sharing arrangements between project developers and other stakeholders (usually, Indigenous people or local communities involved in nature-based projects) participating in the project directly or affected by its implementation. Most projects do not have arrangements for benefit-sharing over and above payments for results or work carried out during the implementation of projects (Dufrasne, 2023). An absence of benefit-sharing arrangements could lead to project developers or their intermediaries claiming unfair shares of carbon credit sales revenues that should normally be allocated to local communities, workers and other stakeholders in host countries. These situations could give rise to unfavourable perceptions towards carbon markets and, in some cases, to reversals, with communities withdrawing their support for projects (Dufrasne, 2023; Healy et al., 2023).

Some voluntary carbon markets incorporate good practices, such as the Plan Vivo requirement to direct at least 60 per cent of project benefits to local communities.[9] The Integrity Council for the Voluntary Carbon Market lists the disclosure of benefit-sharing arrangements as part of its core carbon principles.[10] Emphasizing benefit-sharing and protecting human rights may initially slow down the development of carbon markets because of the need for additional safeguards and stakeholder engagement. However, these factors are critical to assuring the long-term legitimacy and sustainability of those markets. Ensuring fair benefits and protecting rights can build trust and support from local communities, leading to more successful and sustainable projects (Healy et al., 2023). From a financial perspective, markets that prioritize human rights and benefit-sharing can attract more investors who are increasingly focusing on environmental, social and governance-related (ESG) criteria. Projects that fail to address these issues may damage reputations and create potential conflicts, which can discourage future investment and participation (Martiny et al., 2024; Healy et al., 2023).

Most stakeholder grievances are addressed internally within the markets' institutional arrangements, although there are shortcomings even under standards that have in-built grievance resolution mechanisms. Grievances relate to accessibility, transparency, predictability, independence, adequacy and safeguards. The implications of the shortcomings under some standards are manifold. Primarily,

[9] See https://www.planvivo.org/pvcs.

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

they make it difficult for people impacted by carbon-credit–generating activities to access remedies and for such remedies to be sufficient to address the harm. This in turn can influence the position of the local communities that are affected by carbon market activities vis-à-vis the project itself and the project proponents, as well as carbon markets more generally. There is a need for contingency plans and safeguards to ensure that communities are not left feeling disadvantaged by the negative impacts of carbon market projects. In LDCs, access to official legal recourse may be more limited than in other countries due to low levels of institutional capacity at the national level for implementing redress processes, or aggrieved person(s) may lack the financial means to access such processes. In order to promote a positive attitude towards carbon market projects among local communities, it is therefore essential that instruments are available to limit the damage that can be caused by carbon market activities, and that a grievance resolution mechanism is in place. Government oversight of projects could ensure that approved projects have a built-in benefit-sharing arrangement and grievance resolution mechanism. In addition, project proponents need to be more transparent and accountable when certified credits are exchanged in carbon trading.

Alignment of voluntary carbon market standards with the Article 6 international carbon crediting mechanisms could strengthen environmental integrity, and improve accountability in carbon trade

The new international crediting mechanism (Article 6.4) largely replicates the Clean Development Mechanism, but with better State-led oversight. The transfer of carbon credits, whether for domestic use or for international mitigation purposes, should trigger reporting requirements in the carbon registries of the Parties or countries involved. For this to happen, the national authority needs to to play a more visible role in project approval processes.

Article 6 rules for the authorization and registration of carbon projects could apply to voluntary carbon market transactions that are exposed to double counting risks (Kreibich and Hermwille, 2021). Recognizing the need for an increased State role presents an opportunity for developing countries to build capacity in regulating, monitoring, certifying and registering climate projects, and for policymaking in an area of significant international interest. The host countries need to determine the institutional arrangements applicable to carbon projects, and how they treat the projects under the Article 6 mechanisms. Without domestic policy and State control, corporate actors and private certification schemes will continue to exert control over project development and determine how benefits are allocated to stakeholders.

Voluntary carbon markets are criticized for the lack of transparency in their financial transactions involving carbon credits (Carbon Market Watch, 2023). The opacity in voluntary carbon markets might also be indicative of asymmetries in information, capacity, technical skills and the use of carbon credits. Governments could adopt measures to ensure that projects are genuinely additional, and that they are in line with national priorities and at appropriate scales of investment (Mendelsohn et al., 2021). LDCs intending to participate in Article 6 mechanisms may have to commit significant resources, both at the beginning of the process for developing the necessary institutions and capabilities and during the process, to further refine policy and institutional frameworks. The choice between compliance and non-compliance mechanisms may also require an in-depth assessment of the respective costs and benefits, including the sociopolitical and environmental implications.

C. International governance of greenhouse gas emissions

In amplifying the international community's role in addressing the challenges associated with climate change, the Paris Agreement has expanded the scope for Governments to exercise more control over carbon trading (Kuyper et al., 2018; Knoll, 2015). As noted in section B, the new international mechanism for international cooperation on mitigation (Articles 6.2 and 6.4) assumes that Parties are actively involved in providing oversight of the implementation of projects, and that they have the capacity to vet, approve and monitor projects that contribute to mitigation and have other positive impacts on sustainable development. Similarly, by entering into bilateral cooperation agreements, countries exercise discretion to meet international obligations under Article 6.2. However, the effectiveness of voluntary cooperation arrangements depends on the balance of influence between the cooperating partners, as well as their common but differentiated responsibilities. The latter accords due consideration to the historical nature of the accumulation of anthropogenic emissions, the progression towards global mitigation targets and the differentiated costs of abatement between developed and developing countries.

CMA establishes the rules, procedures and modalities for implementing the Paris Agreement. The rules place strict conditions on Parties registering carbon crediting projects. This section focuses on how countries are coordinating and cooperating to implement the Article 6 mechanisms. Since the mechanisms are geared towards assisting countries in meeting their mitigation targets, as expressed in NDCs, subsection 1 examines how LDCs intend to use the mechanisms to achieve NDCs. Subsection 2 reviews the institutional requirements for countries to implement Article 6.2 and highlights areas that are still under discussion in the CMA. Finally, subsection 3 focuses on the broader application of the Paris Agreement in voluntary carbon markets and discusses the implications of the rules, modalities and procedures that have emerged.

1. Nationally determined contributions

NDCs are an international mechanism under the Paris Agreement (Article 4, paragraph 2) for communicating national mitigation measures that contribute to achieving the global target of reducing anthropogenic emissions. Parties to the Paris Agreement are required to submit NDCs every five years, regardless of implementation time frames (Doukas et al., 2018). New and updated NDCs are expected to be submitted in 2025, 2030 and beyond. Article 4, paragraph 2 calls on Parties to submit progressively ambitious mitigation targets in each round compared with previous NDCs. Steps have been taken in improving international cooperation on reducing emissions, yet it remains unclear how the periodic pledging of mitigation targets will translate into real-time mitigation at the global level. For instance, updated NDCs, for the five-year period beginning in 2025, are assumed to have taken into account the first global stocktake and new mechanisms in their mitigation targets.

NDCs indicate the domestic mitigation measures that each reporting party intends to implement to achieve the objectives of the communicated contributions. This is unlike the Kyoto Protocol, which placed binding commitments only on annex I countries (industrialized countries), with non-annex I countries (developing countries) obliged to develop and periodically update national inventories of GHGs by sources and sinks (Larson et al., 2008). The flexibility offered

by the NDC process allows countries the discretion to fashion their mitigation options in line with national priorities, although the communicated ambitions may not reflect the actual capacity of the countries to implement their national targets and the repercussions from missing those targets (Röser et al., 2020; Kuyper et al., 2018). A review of the updated mitigation targets in NDCs shows that for the implementation period 2025–2030, countries increased mitigation efforts, but the collective mitigations may not reflect the highest possible national/regional/global mitigations, even when common but differentiated responsibilities and respective capacities are taken into consideration.[11] However, all Parties are expected to promote integrity, transparency, accuracy, completeness, comparability and consistency in NDCs (Article 4, paragraph 13; and Articles 13 and 15).

It is assumed that the process of preparing NDCs contributes positively to climate change policymaking, and that the mitigation targets indicated in NDCs reflect national circumstances, as well gaps in resources and capacity to achieve the targets (Röser et al., 2020). National climate change policies differ in design, technical detail and policy instruments that reflect their political, social and economic contexts. Thus, any two groups of countries could be following different development pathways. The risk for developing countries is that their present level of development may dictate the future orientation of their policies, institutions and structures. This path dependency in policymaking is conditioned by many factors, including the availability of resources, the quality of existing policies, past government decisions in the thematic area, the state of available technology and the capacity to implement incremental changes (Hanger-Kopp et al., 2022). The future development pathways for developing countries should be strongly linked to structural changes, with a renewed focus on green growth policies, investment, productive technologies and trade.

The process of preparing NDCs typically involves setting mitigation targets and reorienting climate policies towards achieving those targets. Developing countries that have less experience with setting a climate change mitigation agenda faced challenges in the initial rounds of preparing NDCs. It is suggested that the voluntary reporting obligations during the Kyoto Protocol era may have contributed to the weak state of national inventories of GHG emissions and to challenges in preparing long-term climate strategies, including low emission development strategies (Röser et al., 2020).

An analysis of NDCs submitted by LDCs shows that 32 of the 45 LDCs intend to use carbon markets; of these, 27 are exploring opportunities for cooperation under the Article 6.4 mechanism[12] and 39 explicitly state that NDCs are conditional on receiving international support in the form of financial assistance, technology transfer and capacity-building, among others. The financial requirements for LDCs to implement NDCs up to 2030 are estimated to amount to $1.48 trillion. More than half of the financial requirements are among countries that have expressed interest in using carbon markets (table IV.4). Twenty-seven LDCs intend to use cooperative approaches (Article 6.4), but many may not have the enabling institutional framework to effectively participate in them.

[11] Most LDCs indicated 2025 and 2030 targets in updated NDCs for 2020. It is critical, for LDCs and other countries, to harmonize implementation periods and align their mitigation contributions to meeting the target of restricting global warming to 1.5 degrees Celsius above pre-industrial levels.

[12] All 45 LDCs have submitted at least one NDC since 2015. Since most LDCs submitted them for the second round in 2020, new and updated NDCs are expected in 2025.

Table IV.4

Least developed countries' financial requirements to implement the nationally determined contributions up to 2030 (billions of dollars)

	Does the country intend to use carbon markets?	
Country	**No**	**Yes**
Central African Republic	445.2	0.0
Ethiopia	0.0	316.0
South Sudan	0.0	100.0
Democratic Republic of the Congo	0.0	71.8
Bangladesh	0.0	57.4
Somalia	0.0	48.5
Mauritania	0.0	46.6
Malawi	0.0	46.3
Angola	0.0	44.1
Uganda	0.0	28.1
Nepal	0.0	25.0
Madagascar	0.0	24.4
Haiti	0.0	22.0
Chad	0.0	21.2
United Republic of Tanzania	0.0	19.2
Afghanistan	17.4	0.0
Guinea	0.0	16.8
Zambia	0.0	15.0
Senegal	0.0	13.1
Mali	11.0	0.0
Benin	10.5	0.0
Niger	9.9	0.0
Eritrea	8.9	0.0
Sudan	0.0	8.2
Cambodia	0.0	7.8
Mozambique	0.0	7.6
Rwanda	0.0	5.7
Djibouti	5.5	0.0
Togo	0.0	5.5
Lao People's Democratic Republic	0.0	4.8
Burkina Faso	4.1	0.0
Sierra Leone	0.0	2.8
Burundi	1.5	0.0
Comoros	1.3	0.0
Myanmar	0.0	1.2
Guinea-Bissau	0.0	0.7
Lesotho	0.6	0.0
Liberia	0.0	0.5
Solomon Islands	0.0	0.1
Gambia	0.0	0.1
Tuvalu	0.1	0.0
Total	516.0	960.5

Source: UNCTAD calculations, based on the nationally determined contributions of the respective countries.

2. Voluntary cooperation under Article 6, paragraph 2

Article 6, paragraphs 1, 2 and 3 of the Paris Agreement sets the conditions under which Parties can engage in voluntary cooperative approaches that involve internationally transferred mitigation outcomes, which, as of 2021, can count towards NDCs. These are measured using robust accounting rules and tracked in the international registry, while also reflected in the registries of the Parties, to ensure environmental integrity.

International cooperation is promoted to achieve higher levels of global mitigation. In this context, Article 6.2 applies to Parties that have submitted NDCs and have put in place institutional arrangements for authorizing and tracking the use of internationally transferred mitigation outcomes towards achieving NDCs. Although Parties have discretion regarding their emission reduction activities and the arrangements for their cooperation, the accounting approaches chosen by the Parties and the outcomes must be reported in line with the enhanced transparency framework under Article 13 and the rules and principles for NDC accounting under Article 4. Implementation of the voluntary mechanism under Article 6.2 requires a lead ministry or a national agency or institution to be designated as the national authority responsible for policy development and coordination on the environment and climate change (figure IV.3). The State's roles and functions assigned to the agency, as stipulated in Article 6, involve the authorization of projects for mitigation outcomes and communicating to relevant stakeholders on the adjustment of registries upon the transfer of internationally transferred mitigation outcomes.

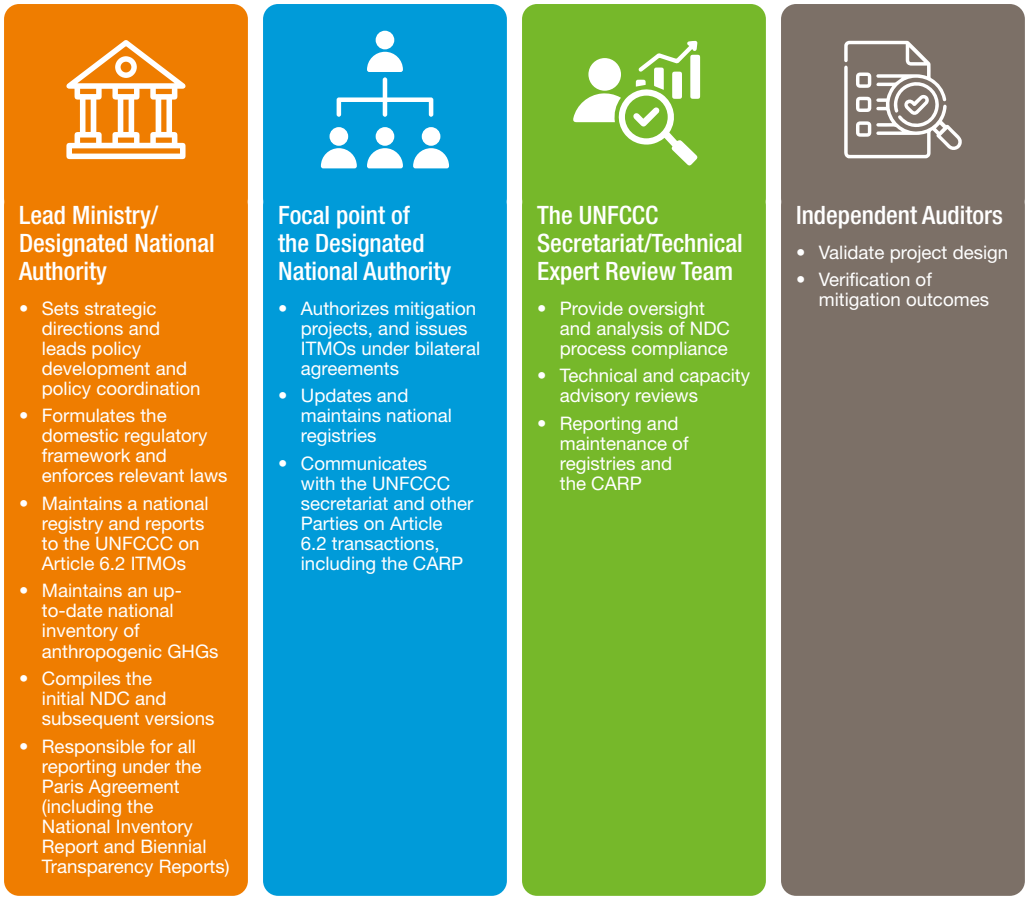
(a) Designating national authorities

All Parties, including developing countries, are responsible for designating an institution, agency or official that can authorize the use and transfer of internationally transferred mitigation outcomes. Multiple institutional arrangements for bilateral and multilateral cooperation may pose a challenge to developing countries if they need to operate highly decentralized structures to meet the requirements of developed-country partners. LDCs need robust, adequately resourced and efficient institutional arrangements to oversee international transactions in carbon markets. It might be a good practice to use the same designated national authority for the Article 6.4 mechanism for all transactions under Article 6 in order to allow for greater oversight and consistent application of the relevant national policies and domestic regulations. The designated national authority may combine the role of policymaking and policy coordination with the formulation of rules, modalities and procedures for the authorization of projects for both Articles 6.2 and 6.4 mechanisms. Such arrangements can help countries build experience and capacity, and map out support requirements for implementing the Paris Agreement.

(b) Registries and reporting arrangements

The overarching rules under Article 6.2 were set at COP 26 (UNFCCC, 2021b) and COP 27 (UNFCCC, 2022b). However, numerous outstanding issues have yet to be negotiated, notably concerning arrangements to authorize internationally transferred mitigation outcomes, reporting and review, and the overall transparency of the system. Decision 2/CMA.3, annex paragraphs 18–24, details accounting, reporting and review arrangements, including the requirements for participating Parties to submit an initial report (table IV.5), as well as annual information and periodic reports. They also include metrics and methods for applying corresponding adjustments and quantifying mitigation information and the sectors, sources and GHGs covered by NDCs, as well as the time periods covered. The information submitted to the UNFCCC secretariat is reviewed by the Article 6 technical expert

Figure IV.3
Institutional arrangements for Article 6 participation



Source: UNCTAD.

Note: CARP, Centralized Accounting and Reporting Platform; GHGs, greenhouse gases; ITMOs, internationally transferred mitigation outcomes; NDC, nationally determined contribution.

review team as part of the enhanced transparency framework process.

Parties intending to cooperate under Article 6.2 are required to submit their most recent national inventory report as part of their biennial transparency report, the first of which is due by 31 December 2024. LDCs have the discretion to not submit a biennial transparency report according to Article 13 (paragraph 2 and 12); however, such reports are important in tracking the following information: inventories; progress towards NDCs; policies and measures; climate change impacts and adaptation; levels of financial support; technology development and transfer; capacity-building support and capacity-building needs; and areas of improvement (Article 13, paragraph 6, 10 and 14). According to decision 2/CMA.3, paragraphs 9 and 29, each party in a cooperative arrangement must maintain a registry involving internationally transferred mitigation outcomes (Article 6.2). The record must include information and data on authorization, first transfer, subsequent transfer(s), acquisition and use towards NDCs, authorization for use towards other international mitigation purposes and voluntary cancellation (including for the overall mitigation of global emissions, if applicable). Access to these accounts is open to all Parties for the purpose of tracking and to cooperative Parties for

Table IV.5
Parties that have submitted initial reports to the Centralized Accounting and Reporting Platform

Party	NDC date/period	Submission date
Suriname	2020-2030	29-May-2024
Guyana	20-May-2016	22-February-2024
Thailand	2021-2030	07-December-2023
Vanuatu	09-August-2022	06-October-2023
Ghana	04-November-2021	14-September-2023
Switzerland	17-December-2021	17-May-2023

Source: UNFCCC, Centralized Accounting and Reporting Platform, available at https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement/cooperative-implementation/carp-submission-portal/submitted-reports#Initial-and-updated-reports (accessed May 2024).

transparency. Interoperability of registries is a requirement in order to achieve data integrity.

National and international registries are critical tools with which to record corresponding adjustments to emission levels that reflect the transfer (export) or receipt (import) of mitigation outcomes. The Centralized Accounting and Reporting Platform maintained by the UNFCCC secretariat is the international registry for all national reports and regular updates to the national registries affecting global-level emissions. This reduces the risk of double counting that may have the effect of raising overall global emissions if mitigation outcomes are claimed multiple times or by more than one party.

The registries for recording national and international transfers of emission reductions and removals are data intensive and require specialized knowledge and technical capabilities. The Article 6.2 reference manual for the accounting, reporting and review of cooperative approaches provides detailed guidelines that include information to be submitted, the timing and sequencing and the procedures. Developing-country Parties participating in cooperative approaches may receive capacity-building support that an Article 6 technical expert review team may identify in consultation with the participating Party. In this context, the national capabilities and circumstances of participating developing-country Parties and the special circumstances of LDCs and small island developing States are recognized.

The data need to be consistent with national inventories that Parties are required communicate to the UNFCCC secretariat in line with the modalities, procedures and guidelines for the transparency framework for action and support referred to in Article 13 of the Paris Agreement. The national entity or authority preparing the GHG inventories and reports is required to use the 2006 Guidelines of the Intergovernmental Panel on Climate Change (IPCC) or the subsequent version if so decided by CMA. Registries are also required for emission reduction transactions (Article 6.4ERs) (see section C.3).

(c) Outstanding issues

The CMA and COP decisions provide an insight into the direction that Parties may take with respect to outstanding issues on Article 6 and the Paris Agreement in general. Developments on the Article 6 rules, modalities and procedures are informed by recommendations from the Subsidiary Body for Scientific and Technological Advice and draft decisions that are submitted for consideration and adoption by CMA and COP. At COP 28 in 2023, a major issue of concern was whether the scope of cooperative approaches needed to be more clearly delineated. Some Parties stated that Article 6.2 could be implemented

based on decision 2/CMA.3 and decision 6/CMA.4 and other Parties stated that the scope of cooperative approaches needed further clarification, to allow for a degree of uniformity and to help Parties (particularly host Parties) in determining the conditions under which they might engage with Article 6.2. Articles 6.1 and 6.2 of the Paris Agreement, as well as decisions 2/CMA.3 and 6/CMA.4, provide a general understanding that a cooperative approach is undertaken "on a voluntary basis", that it involves the "use of internationally transferred mitigation outcomes" and that certain principles should be upheld with regard to environmental integrity, transparency and robust accounting. However, details regarding the parameters for cooperative approaches may be subject to different interpretations.

This was evident from Parties' different perspectives on the topic in negotiation texts, where at times cooperative approaches were defined as either a framework or an agreement, or a set of mutually agreed standards and procedures, with certain suboptions stating that, among others, cooperative approaches should be categorized as project-based cooperation, sectoral cooperation, subnational/national cooperation or linked emission trading systems (UNFCCC, 2023c). Agreeing on terminology is a challenge in multilateral negotiations, particularly as the choice of language may influence Parties' domestic regulations and have other legal consequences. However, beyond this typical reason, Parties also fundamentally seek more streamlined and harmonized Article 6.2 implementation and clarity on the rules.

Parties also discussed the procedure to be followed when formally authorizing cooperative approaches and underlying internationally transferred mitigation outcomes. Authorization is an essential part of Article 6.2, since it represents formal governmental approval of the transfer or use of internationally transferred mitigation outcomes for a particular purpose (NDC attainment, use in compliance systems or voluntary use by corporations or the private sector; triggers a range of reporting requirements (the initial report describing the cooperative approach follows the authorization); and has implications for when and how corresponding adjustments will be applied to ensure that double counting of internationally transferred mitigation outcomes does not occur. Whether or not a Party is able to revoke its authorization of a cooperative approach or internationally transferred mitigation outcomes is also being negotiated. Therefore, the decision to provide authorization is significant for any Party, as it can have long-term, and potentially irreversible, consequences. In this context, a clearer procedure for providing authorization and the steps that follow needs to be elaborated. At COP 28, Parties also discussed whether there should be a minimum amount of information to disclose in an authorization statement, and whether using a standardized authorization form should be mandatory. Some Parties stated that having a mandatory standardized form would be too prescriptive and others stated that it would ensure greater coherence, since there may be a wide array of cooperative approaches in the future. Clarity on these issues is important for LDC Parties that intend to participate, as they have implications for technical, financial and operational capacity-building (chapter V).

Related to authorization, at COP 28, Parties also considered whether there should be a mandatory sequence of steps after the authorization of a cooperative approach is provided through to the issuance and use of internationally transferred mitigation outcomes. Sequencing may be needed because of ambiguities with regard to what is feasible under Article 6.2 rules. Currently, the UNFCCC secretariat and an Article 6.2 technical expert review team review various reports from Parties on cooperative approaches and internationally transferred mitigation outcomes, to ensure there are no inconsistencies in reporting and that Parties are complying with Article 6.2 requirements. However, at present, it is not evident whether Parties can already

transfer or use internationally transferred mitigation outcomes from a cooperative approach before the approach has been reviewed by the UNFCCC secretariat and the Article 6.2 technical expert review team.

Allowing for the transfer and use of internationally transferred mitigation outcomes prior to a completed review can be problematic. For example, if the determines that a cooperative approach is not compliant with Article 6.2 rules but the underlying internationally transferred mitigation outcomes have already been used by another Party towards its NDC or by a company to fulfil a compliance obligation, it may be challenging, if not impossible, to correct this situation, from both an environmental perspective (e.g. low-quality internationally transferred mitigation outcomes used to offset fossil fuel emissions) and a practical perspective (e.g. to remediate, rescind or impose other corrective measures for an internationally transferred mitigation outcome used for compliance purposes in another jurisdiction that has a particular legal framework). For this reason, it is important for a clear mandatory sequence to be established, such that cooperative approaches are fully reviewed, and any potential inconsistencies addressed, prior to any underlying internationally transferred mitigation outcomes being permitted for transfer or use (UNFCCC, 2023c, paragraph 60).

3. International crediting of emissions and voluntary carbon markets

CMA 3 adopted rules, modalities and procedures for the international carbon crediting mechanism established by Article 6.4 of the Paris Agreement (UNFCCC, 2021a). The Parties designated a Supervisory Body and its membership and rules of procedure for operationalizing the article. The body is responsible for developing methodologies for carbon crediting, registering and managing the registry of activities, accrediting third-party verification bodies and making recommendations to CMA on matters of relevance for the implementation of the Paris Agreement.

The designated national authority for the Article 6.4 mechanism informs the UNFCCC secretariat and the Supervisory Body of carbon credits issued under the mechanism towards the achievement of NDC or for other mitigation purposes (as defined in the annex to decision 3/CMA.3, paragraph 42) (UNFCC, 2021a). To operationalize the Article 6.4 mechanism, the Supervisory Body reviewed the accreditation standards and procedures of the Clean Development Mechanism in 2023 and adapted them to the new mechanism.[13] As such, the role of designated operational entities under Article 6.4 of the Paris Agreement is expected to be similar to that under the Clean Development Mechanism, subject to CMA decisions and established rules, modalities and procedures (UNFCCC, 2023a). The designated operational entities must be accredited by the Supervisory Body as independent auditors that validate projects or verify whether implemented projects have achieved planned GHG emission reductions. The main actors in the Article 6.4 mechanism are project participants that own projects, host-country designated national authorities that oversee national implementation, designated operational entities that provide audit services, the Supervisory Body and the UNFCCC secretariat (figure IV.3).

A validated project is registered by the secretariat (Supervisory Body), while

[13] The Kyoto Protocol had the following three market-based mechanism: Clean Development Mechanism, which operated as a baseline and credit system to finance emission reduction projects in developing countries (non-annex I countries), whereby certified emission reductions generated by these projects could be sold to countries with emission reduction targets (annex B countries); joint implementation, which was also a baseline and credit system but operated in annex B countries, to trade emission reduction units under international oversight (track 2) or not (track 1); and international emission trading, which allowed annex B countries to trade unused assigned amount units that allowed a country to emit 1 ton of CO_2-equivalent.

monitoring and verification are done by the project participants and the designated operational entities, respectively. The scientific aspects of the carbon verification process are critical for ensuring the reliability and quality of carbon credits. Monitoring, reporting and verification need to strictly adhere to the approaches that the designated operational entities apply, based on the rules, modalities and procedures that have been established.

Parties must notify the Supervisory Body of the Paris Agreement Crediting Mechanism (Article 6, paragraph 4(b)) about authorization of any public and private entities as project developers under the mechanism prior to any first transfer of Article 6.4 emission reductions to the mechanism registry. The mechanism's registry, maintained by the Supervisory Body, records all related transactions (issuances and transfers) and distinguishes between those authorized for use towards the achievement of NDCs and those for other international mitigation purposes or authorized uses (decision 3/CMA.3, annex paragraph 55) (UNFCCC, 2021a). The mechanism registry also tracks "Article 6.4 emission reductions "not specified as authorized for use towards achievement of NDCs and/or for other international mitigation purposes (mitigation contribution Article 6.4 emission reductions) that may be used for results-based climate finance, domestic mitigation pricing schemes or domestic price-based measures, for the purpose of contributing to the reduction of emission levels in the host Party" (annex IV, paragraph 29 (b) of the draft decision -/CMA.4) (UNFCCC, 2022a).

The international crediting mechanism raises funds for the Adaptation Fund established by the Paris Agreement. At issuance, 5 per cent of Article 6.4 emission reductions are transferred to the Adaptation Fund held by the mechanism registry to assist developing-country Parties, particularly those vulnerable to the adverse effects of climate change. Another 2 per cent are transferred to the cancellation account for implementing overall mitigation in global emissions in accordance with the CMA decision. Activity participants may also request voluntary cancellation of Article 6.4 emission reductions to contribute to achieving global mitigation targets.

The role of national authorities is not only to approve projects, but also to assess their relevance for national priorities and national policy frameworks. In this regard, the national authority or the designated national authority is required to indicate publicly to the Supervisory Body the type of Article 6.4 activities and sectors that it would consider approving, ensuring that only projects that meet the development priorities of the country are approved. This can be accomplished by setting strategic priorities, policies and regulations before any project is approved for Article 6 mechanisms.

Some countries, including some LDCs, have already taken action to review policies and regulatory frameworks in readiness for Article 6 implementation. Zambia, for example, has issued "Guidelines for the submission and evaluation of mitigation activities under Article 6 of the Paris Agreement: Part I of the carbon market framework for Zambia" (box IV.2). Although the measures are preliminary, and subject to revision, they set out the evaluation criteria and indicators for assessing projects, their mitigation activities and processes and the initial registry structure based on the monitoring, reporting and verification system. The second part, which is under development, will set out the rules for transitioning from the Clean Development Mechanism and for voluntary carbon market projects, the infrastructure for the registry and its procedures, and the fee structure and sharing of proceeds (Zambia, 2023).

The criteria for authorizing projects may be guided by national priorities, and transaction costs of monitoring, verification and reporting to international bodies

Box IV.2
Zambia: Institutional arrangements for Article 6

In Zambia, the Ministry of Green Economy and Environment is the designated national authority for the implementation of Article 6.4. The Ministry will also oversee bilateral engagements under Article 6.2. The Permanent Secretary in the Ministry is the authority for the approval and authorization of proposed mitigation activities, based on recommendations issued by the Technical Climate Change Subcommittee for Mitigation.

This subcommittee is a technical working group responsible for assessing activity proposals against the criteria specified in the Carbon Market Framework for Zambia. The body is not new, as it was previously responsible for reviewing and evaluating Clean Development Mechanism projects. All secretariat matters for Article 6 fall under the Ministry as the designated national authority, and the latter will be responsible for all reporting and related workstreams, including updating NDCs and performing registry operations.

The Zambia Environmental Management Agency is mandated by the Ministry to oversee accounting and monitoring of GHG emissions. However, it requires capacity-building, particularly in forest-related emissions accounting.

Source: Zambia (2023).

D. Leveraging international support for LDCs

The particular circumstances, vulnerabilities and capacity constraints among LDCs are explicitly recognized by the Paris Agreement. The Agreement has several references to "the specific needs and special situations of the least developed countries with regard to funding and transfer of technology" (preamble), "the priorities and needs of developing country Parties, especially those that are particularly vulnerable to the adverse effects of climate change and have significant capacity constraints, such as the least developed countries" (Article 9) and to the need for capacity-building, particularly for "countries with the least capacity, such as the least developed countries" (Article 13).

This section examines the challenges and the opportunities for LDCs in implementing Article 6 of the Paris Agreement. Subsection 1 discusses the challenges that may arise in the implementation of Article 6 in LDCs. It proceeds by reviewing the approaches that countries are adopting, the nature of their agreements and the implications for national legislation and institutional arrangements, as well as State capacities for verification, monitoring and reporting. It also highlights the implications of various options for carbon crediting, including the attribution of carbon rights and the sharing of benefits from carbon projects. Most LDCs are low-level emitters of GHGs, and have substantial natural resources, mainly forests and other terrestrial and marine ecosystems that act as GHG sinks and reservoirs. These natural resources can potentially increase these countries' carbon credits, on the condition that they retain substantial economic benefits from them and that the buying parties raise mitigation ambitions. In this regard, subsection 2 focuses on the potential benefits that LDCs could leverage from non-market cooperation approaches to unlock further international support for capacity-building, mainly in areas that are critical to their participation in carbon trading. For environmental integrity, equity and the global good, the Parties to the Agreement need to commit to bringing net-zero targets forward while implementing Article 6.

1. Challenges posed by the Article 6 mechanisms

(a) Policies, institutions and regulatory frameworks

The transition to a low-carbon development trajectory may not be easy among most developing countries. LDCs need to pursue industrial and structural transformation agendas to achieve sustainable development. However, policy trade-offs are significant for low-income countries due to their particular circumstances, which, among others, restrict their feasible options. NDCs of LDCs, for example, indicate that their contributions to global mitigation efforts are largely conditional on international support, which ranges from 10.0 to 68.8 per cent of the cost of implementing NDCs. This implies that the NDCs that have been submitted by these countries reflect ambitions that may be politically achievable within their budgets and national priorities, but not to their full potential (UNDP, 2023). In addition, they also reflect broader awareness of the national stakeholders, and how decisions associated with their implementation affect various groups in the economy (Röser et al., 2020).

Apart from the financing gap, the major challenge for many LDCs in effectively implementing the Paris Agreement is that domestic policies, institutions and regulatory frameworks are generally at an early stage of development. Although many LDCs signalled in NDCs the intention to use carbon

markets in the future (table IV.4), the clearest indication of their contribution to global mitigation efforts is through environmental policies. To date, LDCs have not yet implemented mandatory carbon policies to reduce emissions from industrial processes, but a few have developed guidelines, or are formulating policies, for voluntary cooperation and transactions involving international carbon credits (chapter II).

Carbon markets are complex, and the international architecture implied by the Paris Agreement is a challenge for countries that have not yet developed the appropriate domestic policies for their implementation. Carbon markets have some potential to contribute to global mitigation efforts for countries that have prepared for them, as shown in chapter II, but countries need to be realistic about the role those markets can play in mobilizing fiscal resources and capital for projects that are necessary for structural transformation in LDCs.

Government policies on benefit-sharing and their environmental regulations might have a positive or negative impact on the markets, depending on how investors perceive those policies (Streck, 2020). However, situational factors in LDCs may prevent the implementation of compliance market policies because of national circumstances such as low industrial emissions and the lack of policies on carbon trading. It might be necessary for carbon market policies to be introduced incrementally, in a phased manner in order to allow for the assessment and testing of various policy instruments.

(b) Scale of national carbon markets

Most LDCs are structurally small open economies with limited financial market depth. Therefore, it may be prudent to jointly implement carbon policies at the regional level, including setting up market structures to attract investments in carbon projects and scale up the volumes of carbon credits. For example, the Africa Carbon Markets Initiative was created with such objectives in mind, namely to enhance climate action and potentially generate demand for carbon credits in the region.[14] A regional approach allows countries to pool resources for institutional functions, such as harmonizing and strengthening their regulatory frameworks, maintaining a regional registry of carbon credits and reporting to the international supervisory body. It also requires countries to harmonize their environmental policies and cooperate in projects that have regional benefits. The cost savings from a regional approach may be particularly significant for smaller economies, particularly if the net benefits of the regional approach are to increase demand, raise the quality of the carbon credits generated and increase the net price for carbon credits from the cooperating countries.

(c) Access to international support

Article 6 details infrastructure requirements for participating members. It also requires the rigorous reporting and tracking of mitigation outcomes. These activities necessitate the creation of a dedicated government institution to operationalize national registries for Article 6.2 and Article 6.4 mechanisms and take charge of reporting requirements under the mechanism. Governments also need to put in place relevant policies, institutional and regulatory frameworks and domestic arrangements for activities and transactions involving both mechanisms.

The African group of negotiators expressed the need for effective means of implementation, including in the areas of research and technology development, an additional thematic focus on economic and fiscal instruments, regional and international cooperation on adaptation and renewable energies and just transition practices,

[14] The Africa Carbon Markets Initiative is a project developed by the Global Energy Alliance for People and Planet, the Rockefeller Foundation, Sustainable Energy for All, the United Nations Economic Commission for Africa, and the United Nations Climate Change High-Level Champions.

among others (Mantlana and Nondlazi, 2024). There are also concerns about the dilution of climate-related and sustainable development finance, highlighting the need for criteria, principles and guidelines with regard to the implementation of Article 6.8 and carbon markets in general (UNCTAD, 2023). Most LDCs depend on external financing for development and the debt vulnerabilities of these countries have increased since the COVID-19 pandemic (UNCTAD, 2023, 2020). Debt relief and external debt cancellation could free up resources for mitigation and adaptation in climate-vulnerable countries. Effective climate action could be achieved with more financial and technology support to LDCs, to implement programmes that could assist in accelerating low-carbon development and structural transformation. This implies, for example, support for sustainable production and consumption, developing green export strategies, greening supply chains and enhancing transparency and stakeholder participation in market and non-market actions (Greenpeace and CLARA, 2023).

UNCTAD, in *The Least Developed Countries Report 2023*, emphasized the gravity of the debt crisis, compounded by the impacts of climate change and the polycrisis, on LDCs. It also highlighted the proliferation of debt-creating official development assistance (ODA) and shrinking fiscal spaces in these economies. UNCTAD stressed that climate finance needed to be distinct, transparent and additional to development finance.

Carbon markets have the potential to mobilize large-scale investments and finance (chapter II), but for LDCs, the markets need to be reformed and more vibrant, to expand liquidity. In some cases, it might be necessary to increase the proportion of emissions placed under a compliance regime to boost carbon prices and increase mitigation ambitions. The latter could be introduced through cascading emission caps in sectors targeted for mitigation in conformity with NDC submissions. In addition, LDCs could use their long-term low-emission strategies to align climate policies with their development priorities. Most importantly for LDCs, the development and transfer of technologies, investments and private financial flows could be key in achieving a low-carbon economy. Financing instruments for the low-carbon transition need to be adapted to the particular needs of LDCs to enable appropriate and flexible access to climate finance. Non-market approaches under the Article 6.8 mechanism being proposed by developed-country partners should be additional and complementary to ODA and to private-sector investments in climate projects. Joint programmes under non-market approaches could also unlock opportunities for countries to cooperate on adaptation and mitigation, and boost trade and investment (Keohane et al., 2017; UNCTAD, 2023).

There are many areas in the rules on Article 6 that remain under negotiation, such as rules, modalities and procedures on particular issues, including removal activities. Agreement has not yet been reached on the Article 6.4 Supervisory Body's draft recommendations on removal activities presented to CMA 5 (UNFCCC, 2023b).This is partly because Parties have different priorities and domestic circumstances, which means that certain activities that fall under the category of removals may be preferred. Parties have concerns ranging from the quality of certain types of activity and the competitiveness of domestic projects if the market is oversupplied to broader fundamental questions on who bears liability for the long-term monitoring of removals and for the remediation of reversals, for example. In addition, the recommendations on removal activities need to address the permanence and remediation of reversals. Therefore, clarity is needed with respect to the rules on the treatment of emission reduction activities that risk reversal.

For LDCs, forest and land-based mitigation projects offer the greatest potential for participation in voluntary carbon markets (chapter II), but these areas remain under negotiation. Given the lack of outcomes

on removal activities at CMA 5, the Article 6.4 Supervisory Body has been tasked with revising its draft recommendations with a view to their consideration at CMA in 2024. Ahead of COP 29, there are several pertinent issues for LDCs, particularly regarding who is liable for conducting monitoring, reporting and verification after the end of a project's last crediting period and for how long, as well as how reversals will be addressed. Several Parties at CMA 5 considered the draft recommendations to be indefinite in this area. For example, one of the recommendations was that monitoring should be conducted after the end of the last crediting period (UNFCCC, 2023b; paragraph 16 of annex II), but a time frame was not provided for the duration of such monitoring, and a provision was introduced to halt monitoring if a project developer made a request (requiring approval by the Supervisory Body), either by providing evidence that the removals faced a negligible risk of reversal or that potential future reversals had already been remediated based on the project's current reversal risk rating. However, the grounds for what constituted "evidence" were not provided, key terms, such as "negligible", were undefined and reversal risks could either be underestimated or increase in the future for many project types, all of which rendered this provision questionable. Liability for monitoring and for any potential future reversals will ultimately fall to the host Party after the project developer is discharged of responsibility. As NDCs become more ambitious and cover more sectors, and as emissions data become more granular, host Parties will increasingly account for emission sources and sinks at higher levels of detail. For example, several large-scale nature-based projects may appear to face a low risk of reversal while the projects are in operation yet, in future, it may be seen that the risk was underestimated and that significant reversals have taken place. In such an instance, the host Party, which may be an LDC, given that nature-based projects are more common in LDCs, will need to address the reversals at a considerable financial cost, while also making up for the unexpected significant release of GHGs, through additional mitigation efforts in order to ensure that it can satisfy its NDC.

As nationally determined contributions' targets become more ambitious, host Parties should watch the technical details of projects that carry significant risks of reversal

2. Opportunities afforded by the Article 6 mechanisms

The Paris Agreement is a technically demanding international treaty. Successful domestication of the Agreement requires several steps to assess the readiness of countries to fully comply with its articles. The focus of this chapter is on Article 6 mechanisms, yet the discussion serves to show the extent of the policy-related, institutional and technical challenges that LDCs are likely to face. It may be a good practice for LDCs to adopt an incremental approach to institution-building, rather than charting a new pathway with limited experience. NDCs submitted by LDCs indicate that most countries have adopted a cautious approach by electing to build on their experiences by retaining Clean Development Mechanism institutional arrangements. Many countries have also put in place coordination mechanisms to implement major frameworks, such as the 2030 Agenda for Sustainable Development and successive programmes of action for LDCs, including the Doha Programme of Action for the Least Developed Countries for the Decade 2022–2031 (UNDP and UNRISD, 2017; UNCTAD, 2021).

National development plans and NDCs should guide the conception of projects that can be considered for authorization by developed-country Governments. In this regard, certain criteria may need to be set, such as a minimum threshold for investments or operational capital, positive sustainable development impacts and higher standards for credits. Many developing countries in Africa have taken the first steps in regulating carbon market transactions in their jurisdictions (see annex 4 of this report).

Projects should also reflect the ambition set in NDCs, particularly those consistent with

national long-term development plans. This is particularly important for LDCs that are at a low level of industrial development and have a high proportion of the population that lacks access to basic services, including energy. For example, clean energy has been identified as one of the more important interventions for mitigation and has the potential to yield significant co-benefits (Edenhofer et al., 2012). NDCs of the five countries with the least access coverage show that they have prioritized clean and renewable energies, both as a mitigation strategy and as a sustainable development path out of poverty. For example, the Burundi NDC features energy as a key sector that will benefit from an additional 64.85 megawatts (MWs) of hydroelectricity and 7.5 MWs of solar power. Chad plans to construct a 210-MW gas-powered turbine and large-scale photovoltaic power plants that will add 240 MWs to the grid by 2025 and an additional 400 MWs by 2030, and seven wind power plants of 100 MWs are also planned. South Sudan plans to increase energy from renewable sources from 300 MWs in 2021 to 1,450 MWs by 2030 and, according to its NDC, plans to develop six hydropower plants over a period of 10 years, to 2035.

As countries formulate long-term development plans, including a low-carbon development framework, policy designs need to be rigorously tested against strategic considerations, taking into account political and economic suitability at the domestic level. The following are some other strategic considerations at this stage: assessing regulatory and institutional capacities; strengthening enforcement mechanisms (including monitoring, reporting and verification strategies); defining roles and responsibilities across government institutions and addressing capacity gaps; piloting and streamlining operational procedures and outlining technical details (including guidance, policies and regulations for approving mitigation activities for effective engagement with Articles 6.2 and 6.4 mechanisms, as well as non-market voluntary activities under Article 6.8); and assessing infrastructure requirements, along with the operating procedures and tools needed to meet reporting-related and other commitments under the Paris Agreement.

Most countries that have established compliance markets began with pilot models through which to gain experience before implementing the technical and structural infrastructure needed to operate a fully fledged national carbon market. Some countries, such as South Africa, have a series of policy instruments, including carbon taxes, rebates and other incentive structures, as part of carbon policies. Regulatory, scientific and statistical capacities are major areas that require development and skills development. The voluntary market model also provides countries with many entry points for policy development and the enhancement of regulatory capacities. Ghana, for example, issued a regulatory framework for carbon markets, which establishes the institutional structure as well as eligibility criteria for projects (annex 4).

In the international crediting mechanism under Article 6, Governments need to track activities throughout the process, from project authorization to the issuance of credits. Governments are also responsible for reporting, including internationally transferred mitigation outcomes or certified emission reductions. The cost of establish monitoring, reporting and verification protocols that are robust and less vulnerable to manipulation is not negligible. Governments need to define requirements, including eligible sectors, the regulations for authorizing projects, the applicable fees and taxes and the benefit-sharing arrangements. The designated national authority could map pathways that strategically respond to national development priorities by applying a selection process for the approval of projects and adhering to robust crediting methodologies. A cost recovery mechanism is therefore also needed, as some of the infrastructure and capabilities needed for these technical functions may require upfront investments

and technologies that may not be readily available in some developing countries.

LDCs could benefit from the facilitation offered through various mechanisms of the Paris Agreement to assess their readiness and address gaps in policies, institutions, regulations, finance, technology and infrastructure. As noted in chapters II and III, lessons drawn from Clean Development Mechanism experiences could be useful in addressing identified gaps and in refining project approval processes. Many Clean Development Mechanism projects that were registered in low-income countries did not attract demand for carbon credits, raising concerns that project developers were not aligned with national priorities. For instance, many Clean Development Mechanism projects targeted nature-based solutions, whereas some LDCs prioritized the development of energy, transport, agriculture, forestry, waste management, cement production and technologies.

Article 6, paragraph 8 can unlock international support for LDCs and other countries that are vulnerable to climate change and other shocks. The article defines a framework for non-market approaches aimed at assisting Parties "in the implementation of their nationally determined contributions, in the context of sustainable development and poverty eradication, in a coordinated and effective manner, including through, inter alia, mitigation, adaptation, finance, technology transfer and capacity-building, as appropriate" (United Nations, 2015b). A work programme needs to be developed to implement the framework (decision 4/CMA.3) with the potential to respond to climate actions that the markets cannot address. Providing LDCs with financial, technological and capacity-building support is essential for their effective participation in the mechanism.

The Article 6.8 mechanism may balance the discourse that overemphasizes the role of carbon markets in mobilizing resources for climate actions. Most LDCs have viable land- and forest-based resources they could use for NDCs, which are critical for results-oriented activities aimed at reducing emissions from deforestation and forest degradation, as well as sustainable forest management and conservation (REDD+), in addition to overall nature conservation. Non-market approaches could be important in amplifying the positive sustainable development impacts of projects, in contrast to common practices in voluntary carbon markets whereby actors assume multiple roles as standard setters, project developers and traders, often to the detriment of climate justice, equity and environmental integrity (Blum and Lövbrand, 2019). A major positive contribution of non-market approaches in this regard could include securing land-tenure rights and promoting rights-based approaches in the interests of local communities and Indigenous people who may be involved in nature-based solutions focusing on agriculture, forestry and other land uses. Such approaches could also be key to strengthening policies and capacities for ecosystem protection and for a just transition to a low-carbon economy. In addition, they could help foster support for the technical and financial capabilities needed for adaptation activities, such as land restoration, and for promoting sustainable practices that are key to living within planetary boundaries (Greenpeace and CLARA, 2023).

International cooperation is critical in order to enable LDCs to access the support noted under the Article 6.8 mechanism. The approaches proposed will only succeed if countries can benefit from the initiatives and leverage the kind of support that responds to their particular circumstances. The proposed areas of focus have increased since the initial focus areas were agreed upon. However, resources pledged for the implementation of the initiatives have not matched the needs. Country proposals submitted to UNFCCC in the context of identifying and framing elements of the work programme on non-market approaches as set out in decision 4/CMA.3 highlight areas that are likely to pose challenges in implementing carbon market mechanisms. They point to the need for the joint

implementation of programmes carried forward from the Rio Conventions (i.e. UNFCCC, the Convention on Biological Diversity and the United Nations Convention to Combat Desertification). They also show the need for new, innovative areas of cooperation by the Parties on non-market approaches and collaboration with non-Party stakeholders in activities consistent with the Paris Agreement. For LDCs, further work on capacity-building related to the technical aspects of the Paris Agreement needs to be elaborated by the Parties in implementing Article 6.8.

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Annex 4: Selected examples of domestic policies with regard to voluntary carbon markets

Benefit-sharing is a major issue that Governments are interested in regulating in voluntary carbon market transactions. It is useful for LDCs to draw lessons from the experiences and good practices of some developing countries in this area. For example, the Kenya regulatory framework stipulates how benefit-sharing agreements between communities and project developers should be structured and how the country could benefit from land-based and other projects. This includes environmental protection, adaptation, contribution to the international climate obligations of the country and upholding the rights of local communities and benefit-sharing with them (box 4.1). The process of establishing a benefit-sharing formula is complex, as is the choice of the many types of project benefits that may accrue to local communities and Indigenous people. In the Congo, the plan includes how benefits should be managed for the good of the community (box 4.2). The Ghana regulatory framework establishes, inter alia, fees relating to the management and issuance of credits and benchmarks for mitigation options that will be retained domestically (box 4.3).

Box 4.1
Kenya Climate Change (Amendment) Act 2023 and voluntary carbon markets

Kenya has been one of the leading countries in the voluntary carbon market in terms of the number of projects and credits originating in the country. Kenya has had dedicated legislation on climate change since 2016, in the form of the Climate Change Act. In 2023, this Act was amended to include regulations for carbon markets. The amendment sets out several important provisions for greater transparency and safeguards; for example, it contains a mandate for the development of a publicly accessible national registry of carbon credits and it requires carbon projects authorized under the Act to undergo environmental and social impact assessments.

The Act also makes a clear distinction between land-based projects and other projects. Land-based projects (though not defined) are required to have a community development agreement that outlines the relationships and obligations of the participants in a project under development on public or community land. The community development agreement is to be made public in the registry. The Act also stipulates that a community development agreement must contain information on how the project will share at least 40 per cent of its annual aggregate earnings with the community, for land-based projects, and at least 25 per cent, for non-land-based projects.

Regulations under the Act aim to ensure that carbon market activities not only benefit those involved in a project, but also support positive development in the country more broadly. This includes environmental protection, adaptation, contribution to the international climate obligations of the country and upholding the rights of, and benefit-sharing with, local communities. However, there may be a need to align terminologies used in the national context to those used in the international crediting mechanism under article 6, to avoid ambiguities and misunderstandings by various actors and to ensure correct interpretation of the regulations to safeguard the environment and human rights.

Source: Climate Change (Amendment) Act, 2023. Available at https://kenyalaw.org/kl/fileadmin/pdfdownloads/Acts/2023/TheClimateChange_Amendment_Act_No.9of2023.pdf.

Box 4.2
The Congo benefit-sharing plan

The Congo will soon implement its benefit-sharing plan for its emission reduction programme in Sangha and Likouala, the two most forested departments in the country. This is not part of a carbon market mechanism, because no carbon credits will be created; rather, it is part of a jurisdictional REDD+ programme that generates payments for results (payments for emission reductions), which are then distributed to the beneficiaries, including Indigenous people and local communities, by the World Bank Forest Carbon Partnership Facility via its Carbon Fund. Projects that are funded by the Carbon Fund are required to have a benefit-sharing plan in place. Although it is not a credit-generating project, implementation of the benefit-sharing plan serves to provide useful lessons in the regulation of benefit-sharing by host countries, including LDCs.

The benefit-sharing plan of the Congo states that participating Indigenous people and local communities will receive both monetary and non-monetary benefits. The monetary benefits paid are based on their performance and participation in the implementation of emission reduction programme activities. The plan stipulates that the monetary benefits must be reinvested in community projects chosen by the communities, with an NGO service provider appointed to manage the benefits on behalf of the communities.

The benefit-sharing plan distributes different shares of benefits based on various scenarios. For example, if all of the direct beneficiaries – Indigenous people and local communities, the private sector and the Government – fully perform their assigned functions, Indigenous people and local communities will receive 30 per cent of the net revenues from the sale of emission reductions for their contributions to the programme, the private sector will receive 55 per cent and the Government will receive 15 per cent.

If the private sector performs, but Indigenous people and local communities underperform, for example, the latter will receive a percentage of the private sector's share of net revenues. If the opposite occurs, Indigenous people and local communities do not need to give a portion of their share to the private sector. In case of non-performance of the programme (i.e. no net emission reductions are achieved), a "performance buffer reserve" is activated. This is a reserve that automatically sets aside a percentage of gross payments that act as an insurance policy to ensure that beneficiaries are still paid a certain amount. Not all information in the benefit-sharing document, such as on the monitoring and evaluation of performance (e.g. performance thresholds), is addressed in the present discussion.

The following are some key takeaways based on a review of this benefit-sharing plan:

- Requiring the existence and implementation of a benefit-sharing plan is an important element of carbon market participation. This is an aspect which LDCs could work towards when engaging with Article 6 or the voluntary carbon market.
- The concept of a non-performance buffer reserve that ensures that Indigenous people and local communities still receive some benefits in years when a programme does not perform as well as planned is a good system with which to cushion the shock of low or non-existent revenues due to the overall underperformance of the programme.
- The benefit-sharing plan of the Congo appears to be in line with the requirements of the Forest Carbon Partnership Facility, yet parts of it are complex and may be difficult to achieve. Benefit-sharing plans, whether in this context or in the voluntary carbon market context, should be as clear and precise as possible so that all beneficiaries and other stakeholders engaging in the voluntary carbon market can understand their respective roles and responsibilities.
- It would be desirable in some contexts for communities to have direct control over project benefits. It may also benefit the local communities if some proportion of the revenues are paid directly through cash transfers.

Sources: Forest Carbon Partnership Facility Carbon Fund Methodological Framework, Section 5.2 on benefit-sharing (2020). Congo, 2020. Benefit sharing plan for the emission reduction programme for Sangha Likouala Version 5 (Ministry of Forest Economy), available at https://documents1.worldbank.org/curated/en/962821607411556246/pdf/Republic-of-Congo-Benefit-Sharing-Plan-for-the-Emission-Reduction-Program-ERP-for-Sangha-Likouala.pdf.

Box 4.3
Ghana carbon market regulation

Ghana published its framework on carbon market regulation in December 2022. It is among the most comprehensive frameworks formulated by prospective host Parties, and addresses issues related to Article 6 and voluntary carbon markets. These include the legal mandate of the Ghana Article 6 framework, the respective roles and responsibilities of the relevant institutions in Ghana, eligible mitigation activities, authorization requirements, the fee structure for corresponding adjustments and requirements for voluntary carbon market projects and actors among others.

The framework establishes broad parameters concerning potentially eligible mitigation activities the Government may authorize under Article 6. It delineates clear institutional responsibilities between the Ministry of Environment, Science, Technology and Innovation, the Environmental Protection Agency and the Carbon Market Office and its three committees. It also identifies any mitigation outcome already covered by the unconditional part of the Ghana NDC for inclusion in a "red list", rendering it ineligible for authorization under Article 6. This is because mitigation under the unconditional part would not be considered additional. As a result, only mitigation concerning the conditional part, or beyond the NDC scope, can be potentially authorized. Such clarity is positive, since it can diminish the risk of non-additional activities being approved.

The framework has also established a "white list" of mitigation activities or technologies that fall under the conditional part, or beyond the NDC scope, that can be deemed automatically additional (i.e. no requirement to demonstrate technical, regulatory or financial additionality). Automatic additionality is based on five criteria, with three categories included on the white list for the period 2022–2025: waste handling, renewable energy and sustainable cooking, each with their own subcategories. According to the criteria, the activity or technology must: be part of the conditional mitigation programmes of action in sectors/subsectors/categories in the Ghana NDC; align with the Ghana sectoral regulatory or standard requirements; contribute to sustainable development and demonstrate environmental integrity; be consistent with the priority areas established in a bilateral agreement between Ghana and the participating Party in an Article 6.2 cooperative approach; and align with the applicable technologies in the latest version of the Clean Development Mechanism positive list of technologies approved by the Executive Board.

The policy to waive additionality tests for certain activities was likely designed to provide greater certainty to the market. However, project-level additionality tests could strengthen environmental integrity.

The framework also establishes a measure aimed at mitigating the risk of overselling by not fully authorizing all credits (i.e. mitigation-sharing). For every 1,000 mitigation outcomes, Ghana will authorize 990 mitigation outcomes, thereby reserving 1 per cent of all issued credits in a national buffer account "to shore up the risk of overselling against the NDC target or contribute to overall mitigation of global emissions." The framework also specifies that Ghana will issue an annual public notification on the use of such reserve units, which provides for greater transparency. Integrating the principle of partial authorization (or mitigation-sharing) and seeking transparency about how such units will be used is a good practice that could be replicated by other developing countries engaging with Article 6. However, the reserve rate to counter the risk of overcrediting may have to be adjusted on a case-by-case basis, depending on national circumstances. For example, Indonesia has proposed a higher rate of 10–20 per cent for a domestic reserve for activities within its NDC scope and a minimum 20 per cent rate for activities outside its NDC scope.

The Ghana framework has also set seven different types of fees related to the management and issuance of carbon credits and provides authorizations via corresponding adjustments. These include fees to create an account in Ghana's carbon registry, issue units and provide letters of approval and corresponding adjustments. Some fees are set at a flat rate, while others depend on issuance volume and on the type of project (small-scale vs large-scale, forestry vs non-forestry). Overall, such a comprehensive framework, which details the processing and managing of some of the administrative and technical costs of running the Carbon Market Office, its registry and more, is positive for the development of carbon markets.

For example, the fee for applying corresponding adjustments is set at either $3 per internationally transferred mitigation outcome for grant-based small-scale activities or $5 per internationally transferred mitigation outcome

for all other types (small-scale mitigation activity, large-scale non-forestry activity, forestry activity). It is important to apply corresponding adjustment fees that seek to reflect the opportunity cost to NDCs and the marginal cost of processing the authorization. The framework stipulates that 90 per cent of the proceeds from the corresponding adjustment fee will be directed to a mitigation ambition fund to support additional mitigation beyond NDC (and to the conditional part) and that the remaining 10 per cent will cover administrative costs of creating and reporting on internationally transferred mitigation outcomes. This approach is a good way to factor in the cost of authorizing internationally transferred mitigation outcomes that can no longer count towards the Ghana NDC, and to then finance additional mitigation activities from the revenues. The appropriate fee per internationally transferred mitigation outcome may not be known in advance, as markets are still adjusting to the new international crediting mechanism. In future, countries may have to adjust the fees or install automatic adjustment measures in order to recoup appropriate fees that reflect opportunity costs and the international market price of carbon credits. Thus, as implementation of Article 6 in Ghana progresses, it may be worthwhile to consider whether the existing fees are appropriate or need to be revised upwards.

Finally, the Ghana framework grants pre-approval to some voluntary market standards such as the Gold Standard, Verra's Verified Carbon Standards, the REDD+ Environmental Excellence Standard and certain ISO standards. It also states that methodologies will still be assessed by Ghana on a case-by-case basis. Given that methodologies adopted by some standards may lead to inaccurate quantification of mitigation (e.g. overcrediting, non-additional activities and impermanent outcomes), the cautionary approach taken by the Government is another good practice. Importantly, any project on the voluntary carbon market must seek formal recognition from the Ghana Carbon Market Office, regardless of whether the credits will be authorized under Article 6. This is a prudent measure as it allows some oversight of voluntary carbon market activities. In addition, any prospective voluntary carbon market project developer must apply for formal recognition of their project by the Carbon Market Office, which serves as another important way for the Office to review the quality of a prospective project before it can be registered and any carbon credits issued.

In conclusion, the Ghana carbon market framework is comprehensive and provides numerous lessons for other developing countries aiming to establish their own regulations. This example underscores the high level of detail required to design such a complex framework. There are many positive examples of how government intervention can deliver greater oversight and control over domestic carbon market activities, which are unregulated in many countries. The framework's positive provisions include a comprehensive delineation of institutional responsibilities, a clear process for authorizing carbon credits under Article 6 and seeking to capture the opportunity cost of applying corresponding adjustments, a provision for partial authorization (mitigation-sharing) and a requirement for all voluntary carbon market projects to apply for government approval. Evaluation of the regulations may be required in future to ensure that they remain relevant as carbon markets evolve.

Sources: Government of Ghana (2022). Ghana's framework on international carbon markets and non-market approaches, available at https://cmo.epa.gov.gh/wp-content/uploads/2022/12/Ghana-Carbon-Market-Framework-For-Public-Release_15122022.pdf.

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The least developed countries report 2024

Chapter V

Policy actions and conclusions

United Nations

Carbon markets have so far failed to deliver as sources of meaningful additional finance to help LDCs in their efforts to combat climate change and move closer to attaining the Sustainable Development Goals. To be able to leverage carbon markets to progress towards their development goals, LDCs need to develop a proactive stance that defines the terms of their engagement with carbon markets by making this just one instrument in their policy toolbox for achieving green structural transformation of their economies. LDCs need enhanced support from their development partners, in line with the principle of common but differentiated responsibilities and respective capabilities. This entails, first, designing multilateral, regional and domestic rules and frameworks for carbon markets that take into account the specific needs of and conditions in LDCs. Second, LDCs need to receive capacity-building support that not only equips them with the technical knowledge of the workings of carbon markets, but also empowers their policymakers to leverage carbon markets as part of their broader sustainable development strategies, as decided and formulated by LDCs themselves.

A. Least developed countries and carbon markets: The need to be strategically proactive

Considering the potential long-term benefits of participation in carbon markets for sustainable development of LDCs, including boosting their prospects for green structural transformation, it is imperative for these countries to adopt a proactive stance. Such a stance needs to focus on the extent to which they choose to actively engage in carbon markets, and the objectives and modalities of their participation.

In view of the modest performance of carbon markets to date, and the numerous market risks and associated long-term implications for sustainable LDC development policies, these countries are advised to adopt a cautionary approach when considering the potential of carbon markets to contribute to their structural transformation, and when making projections of future financial inflows from those markets. LDC policymakers need to weigh the opportunities and pitfalls of engaging with carbon markets, as well as the trade-offs involved, as discussed in this chapter.

1. Carbon markets: Balancing potential gains and significant risks

The potential financial benefits of participating in well-designed and well-governed carbon credit markets offer a significant incentive for LDCs to host carbon projects. Given the prospects of an increased demand for internationally transferred mitigation outcomes and high-integrity carbon credits, selling

LDCs are advised to adopt a cautionary approach when considering the potential of carbon markets to contribute to their structural transformation

carbon credits can generate significant revenue for project owners, which may be public entities. That revenue can then be redistributed to various actors. An equitable redistribution of such benefits, including among local communities, Indigenous peoples, public authorities and the private sector, should have, not only a positive local impact, but also support the country's overall development. This is how ideally the proceeds of carbon projects should be used, but it is far different from what typically takes place.

Carbon markets can have numerous positive sustainable development impacts depending on how carbon projects are implemented

Apart from the direct financial proceeds from the sale of carbon credits and the way in which they are distributed domestically among different social segments, carbon markets can have numerous positive sustainable development impacts (sometimes called co-benefits) depending on how carbon projects are implemented. Beyond greenhouse gas (GHG) mitigation outcomes, many projects emphasize their contributions to sustainable development, such as health benefits, gender empowerment and education. These outcomes can improve people's living standards and support national sustainable development. However, the benefits in both dimensions have been minimal so far, as discussed in chapters II and III. Looking to the future, the realization of the potential benefits depends on a series of actions, policies and programmes that should be implemented by both LDCs themselves and their development partners (discussed below and in section B).

Excessive and unrealistic expectations of financial benefits could induce LDC Governments to enter into contracts with unfavourable terms

At the same time, LDCs and their development partners need to be aware that the future contribution of carbon markets to structural transformation and sustainable development in LDCs is subject to several risks, discussed below.

First, some risks from participation in carbon markets derive from the workings of the markets themselves. This refers to the risks related to regulatory changes and other demand-side shocks in major jurisdictions that generate demand for carbon credits, which will typically evolve according to the domestic priorities and political and policy developments internal to those jurisdictions. In the case of larger jurisdictions, these developments will have a major impact on the demand for internationally transferred mitigation outcomes. Additionally, on a global scale, carbon markets could encounter the risk of fallacy of composition, whereby a large number of countries – mainly developing – strive to sell carbon credits at the same time, yet worldwide demand does not expand at the same pace.[1] Such an excess supply of carbon markets would further depress carbon prices, or at least keep them from rising over the long term. As a result, investors would no longer be attracted to these markets. For LDCs, it would mean that they would fail to realize even the modest annual market value of land-based carbon credits, projected to be $6 billion in 2030, when considering a scenario where carbon prices rise to $100 per ton of CO_2-equivalent (chapter II).

Second, excessive and unrealistic expectations of financial benefits could induce LDC Governments to enter into contracts with unfavourable terms, such as requiring them to relinquish control of large areas of land or sell their "low-hanging fruit" of climate action, leaving them burdened with addressing sources of emissions that are the most difficult to reduce. This risk would compromise their future policy space, not only in the environmental field, but also in terms of broader development policies. Moreover, it would extend across periods covered by different nationally determined contributions. LDCs need to be aware that exporting internationally transferred mitigation outcomes in the current nationally determined contributions period could

[1] This situation would be analogous to that which arises when a significant number of developing-country exporters expand their exports of manufactures simultaneously, so that the rate of supply growth outpaces the rate of demand expansion. This depresses international prices of manufactures, causing a deterioration of these countries' terms of trade – a phenomenon referred to as fallacy of composition in development strategies (Mayer, 2002).

lead to rising average abatement costs in future nationally determined contributions periods. In other words, selling low-hanging fruit makes the future pursuit of a policy of increasing mitigation ambition – in the spirit of the Paris Agreement – more expensive.

This risk can be mitigated by ensuring that a fair share of the benefits from emission reductions, as stipulated in Article 6.2 arrangements, remain in LDCs. In this context, it is important that the principle of "equitable sharing of mitigation benefits between the participating Parties," as specified in the rules, modalities and procedures of Article 6.4 (UNFCCC, 2022), is also upheld in bilateral arrangements under Article 6.2.

Third, a pure focus on generating large volumes of credits to benefit financially from market participation can lead to reducing climate action at a global level, as large polluters will tend to rely on low-quality carbon credits to meet emission reduction targets on paper without actually changing their business models. This would exacerbate climate change-related damage, which disproportionately affects LDCs.

Fourth, unregulated markets are fertile ground for practices subject to poor governance and surveillance, given their current level of opacity. Ideally, LDC engagement in these mechanisms should be conditional on clear safeguards and concrete measures to increase market transparency in order to enable clear tracking of benefits and prevent the sale of carbon credits that enrich profiteers.

Beyond the workings of global, regional and local carbon markets themselves, participation in these markets requires that host countries build and operate institutions, such as commissions, as well as laws, measurement mechanisms and carbon registries, as analysed in chapter IV. They also need to develop corresponding skills and capabilities, and bear the costs of creating and maintaining the necessary institutions and capacities. However, such costs may represent critical constraints on LDC participation in carbon markets.

The above considerations indicate the need for LDCs to develop proactive positioning vis-à-vis carbon markets. They should determine whether their participation in those markets is in line with their development priorities after considering the trade-offs involved, rather than being passive approvers of projects and agreements initiated by foreign agents (whether public or private). In other words, LDCs need to undertake a careful analysis of the potential benefits and pitfalls involved in carbon market participation before deciding whether and under what conditions to participate.

Adopting a proactive stance on carbon markets means that LDCs should regard carbon projects as but one policy tool, among others, to be mobilized by their policymakers as part of their strategies for sustainable development. Carbon projects can only be considered effective if they make a contribution to the green structural transformation of LDCs. To this end, developing the appropriate institutions and capabilities would enable them to be in control of the development of carbon projects in their countries on their own terms. This is also a way of ensuring against carbon projects evolving under an extractivist model (box V.1).

> Carbon projects can only be considered effective if they make a contribution to the green structural transformation of LDCs

Box V.1
The extractivist drift

Wealthier stakeholders may initiate projects and agreements aimed mainly at securing access to carbon credits while paying little attention to the economic, social (including gender aspects) and environmental impacts on local communities and, more broadly, on host countries. These other purported goals of carbon projects imply some form of equitable sharing of the financial proceeds from projects, as well as providing broader economic and social co-benefits.

The development of carbon markets has given rise to a new commodity: carbon credits. However, the production of this commodity and its trading risks following a pattern similar to that of natural resource extraction in many developing countries. Under the extractivist model, natural resources (e.g. energy commodities, minerals and metals, forest products and aquatic resources) are extracted in developing countries for trading and processing abroad. This limits the potential for upgrading to more value added activities in the originating area, which consequently remains impoverished (Chagnon et al., 2022).

It could also be argued that carbon markets have become as, if not more, important than critical energy transition minerals in terms of the new "gold rush" for carbon projects and certified emission reduction in LDCs.

The risk that carbon markets lead to an extractivist economic model is strong in relation to carbon projects that involve nature-based solutions. Such solutions generally involve restrictions on access to natural resources for the duration of projects, which tends to be long. So far, foreign private actors in particular have sought to purchase national assets in many developing countries, including LDCs, often in the form of land for carbon crediting purposes, rather than providing "no strings attached" climate finance. This has pushed many countries to promote solutions such as poorly regulated carbon credit mechanisms, which might not directly serve their own interests. The risk is that, instead of setting up a mechanism whereby wealthy actors support actions on top of their own decarbonization efforts, these actors are motivated to purchase carbon credits as a way of meeting both their decarbonization goals (or to substantiate other forms of voluntary claims) and global climate finance targets, thereby blurring the difference between climate finance and carbon finance.

An aggravating risk of the possible extractivist drift of carbon markets is that the geographical areas covered by carbon market projects involving nature-based solutions are often much larger than those of a typical mine or oilfield. In some cases, given the size of the land area involved in carbon projects, they have been likened to land grabbing. This phenomenon attracted much attention in the 2010s (UNCTAD, 2013; Borras et al., 2011). When large land sales or leases to foreign investors have been associated with environmental goals, this has been termed "green grabbing" (Batterbury and Ndi, 2018). The extent of land area set aside for carbon project development can be especially large in forestry projects. Consequently, the possible adverse economic, social and environmental impacts of nature-based carbon market projects can be much greater than those of typical natural resource extraction projects. Another possibly contentious issue relating to nature-based projects is that of land tenure, as a country often has in place conflicting systems of land tenure. This is a key issue for both mitigation and adaptation to climate change and can influence the success of carbon projects.

Projects involving nature-based solutions in the forestry sector need to avoid exploitation of forest resources based on extractivist logic. Rather, forests need to be managed according to the principles of sustainable forestry, which includes the economic, social and environmental dimensions of sustainability (FAO, 2005). Achieving sustainability in forest management can be accelerated by the adoption of innovation, whether technological (e.g. open access to remote-sensing data and the facilitated use of cloud computing), policy-related (e.g. the promotion of multi-stakeholder partnerships and cross-sectoral approaches in land-use policies and planning) or financial (e.g. innovations to enhance the value of standing forests) (FAO, 2024). Thereby, sustainable forest management can contribute to the structural transformation of LDC economies (FAO, 2022).

Source: UNCTAD.

2. How to integrate carbon market participation into national development strategies

LDCs that participate in carbon markets are advised to subsume this engagement under their broader long-term development objectives and policy goals. This means LDC policymakers' considering carbon market participation not only as a tool of climate policy, but rather as an instrument within their broader strategies for sustainable development. In other words, carbon market participation is best viewed in terms of how it fits into national development plans, nationally determined contributions and other long-term policies and policy documents. By adopting this perspective and acting accordingly, carbon market engagement can provide a contribution to sustainable development and structural transformation of LDCs.

The perspective mentioned in the previous paragraph applies to all forms of engagement with carbon markets. However, the voluntary carbon market provides an additional incentive for this type of alignment of carbon projects with the Sustainable Development Goals, since the associated carbon credits become sought after by buyers and so fetch a higher price. It is not difficult for carbon market project developers to claim alignment with the Goals, given the wide array of themes and areas covered by the Goals. However, rather than simply seeking a generic alignment of carbon projects with the Goals, LDC policymakers are advised to aim at ensuring that the carbon projects contribute to the attainment of structural transformation in their countries.

The Least Developed Countries Report series has long argued that, for LDCs to reach their development goals (e.g. the Sustainable Development Goals, the targets of the Doha Programme of Action and the national objectives enshrined in their national development plans), a green structural transformation of their economies is necessary (e.g. UNCTAD, 2015, 2021).

Therefore, LDCs hosting carbon projects should channel their resources to sectors and activities that directly contribute to this type of structural transformation (e.g. renewable energy). They should also encourage the design of projects in a way that contributes to the goal of structural transformation (e.g. sustainable forestry, in the case of forestry projects, since it combines forest conservation with the sustainable development of natural-resource-based economic activities).

Carbon projects tend to have more of a direct impact at the local level (apart from their contribution to global mitigation). Therefore, their management needs to be part of environmental policy and complementary to broader policies, such as industrial, science, technology and innovation policies, as well as financial and fiscal policies. Ideally, these different policies should be coherent and mutually supportive. In this context, carbon markets should not only be one of a broader toolbox that LDC policymakers have at their disposal, but should also reflect coherence and synergies among them, so that they are mutually supportive.

> Carbon market participation is best viewed in terms of how it fits into national development plans and nationally determined contributions

Steering carbon projects in a way that contributes to structural transformation requires LDCs to adopt proactive positioning vis-à-vis carbon markets, take the lead in project selection and negotiations, and be actively involved in their content, execution and monitoring. This in turn requires that LDCs be equipped with the institutions and institutional capacity necessary to participate in carbon markets, and play a leading role in developing their own related projects in their countries.

> Steering carbon projects in a way that contributes to structural transformation requires LDCs to adopt proactive positioning vis-à-vis carbon markets, and take the lead in project selection and negotiations

National development plans and nationally determined contributions should guide the conception of projects considered for authorization by Governments of developed countries. Ideally, projects should meet a threshold of investment, operational capital, positive sustainable development impacts and higher standards for the credits. Projects should also reflect the ambition set in nationally determined contributions,

particularly those consistent with long-term national development plans.

LDCs should demarcate unconditional nationally determined contributions activities from mitigation activities that can be included under Article 6 cooperative frameworks. This also means that plans relating to Article 6 participation need to be considered when the next editions of nationally determined contributions are drafted, as unconditional mitigation activities might not pass the additionality test under Article 6.4, which would exclude them from generating carbon credits. In essence, LDCs need to take a holistic view that encompasses domestic climate policy, strategies for engagement on international carbon markets and the opportunity cost of future options.

3. Strengthening domestic institutions to maximize developmental gains from carbon projects

Beyond the institutions required by international treaty obligations, national institutions have a critical role to play in ensuring that carbon domestically bring developmental gains to their countries

Another possible way in which carbon projects may contribute to structural transformation in LDCs is through their potential impact on institutional development in these countries. An upgrading of institutional capacities is an essential component of structural transformation, and can have positive feedback effects on other aspects of economic and social development (UNCTAD, 2006, 2009). So far, however, LDC participation in carbon projects has not led to any significant institutional capacity-building. This is primarily because most LDCs have been involved in only a few carbon projects, and 13 of them do not have any experience with such projects, as shown in chapter III. Moreover, in most cases, the initiative, design, implementation and management of projects have been undertaken mainly by foreign private project developers, while Governments have played a minor role. Rather than developing State capacities to perform the governance functions of regulating, checking and enforcing agreements or carbon market rules, these functions have been outsourced to private actors, most of which are foreign. Therefore, learning by doing, the accumulation of experience and capacity-building, all of which could lead to institutional development, have been largely absent.

LDCs that from now on decide to host carbon projects in their territory and/or develop their own carbon markets will need to establish an institutional framework that includes commissions, laws, measurement mechanisms and carbon registries. Not only are institutions necessary for the operation of any market, as analysed in chapter IV, but, more specifically, Article 6 of the Paris Agreement requires countries engaging in both voluntary markets and intergovernmental carbon agreements to establish a minimal set of institutional arrangements. The UNFCCC imposes regulatory, technical, governance and administrative compliance requirements, as also noted in chapter IV.

Beyond the institutions required by international treaty obligations, national institutions have a critical role to play in ensuring that carbon projects established domestically bring developmental gains to their countries. Institutional development and capacities, and the associated skills, contribute to LDC success in capturing a significant share of the revenues from carbon credit sales and ensuring that host countries reap positive sustainable development impacts from carbon markets. Such institutional development strengthens the negotiating position of host countries vis-à-vis other stakeholders, such as project developers. In its absence, carbon projects will be driven by the interests of project developers and may not align with national development goals, or their design risks being based on an extractivist model (box V.1).

In building the institutions to better participate in carbon markets, LDCs and other developing-country host parties could consider creating synergies by collectively setting the terms of host-country

engagement, including partial authorization, split liability for measurement, reporting and verification, minimum mitigation sharing (i.e. a portion of mitigation is not authorized, but can still be counted by the host party for their nationally determined contributions) and remediation of reversals between buyers and hosts. This might strengthen LDC negotiating positions in international markets, giving them a firmer common basis for negotiating terms with buyer countries and entities, rather than competing with one another in a race-to-the-bottom approach to attract investments at the expense of their individual interests. Such collective action could be undertaken at the subregional or regional level.

Through such a common approach, selling countries could set a common minimum price for credits, differentiated by activity type, across all countries. Going one step further, countries could operationalize a voluntary pool of credits to which they contribute with a minimum sale price. Pooling would reduce administrative and financial costs for the participating countries, while also helping to increase transparency and reduce competition among them. This would reduce their administrative and financial costs through centralization, which could also increase transparency and minimize competition.

To develop the institutional framework required for proactively steering carbon projects to make the best use of carbon markets in support of their green structural transformation, LDCs need technical expertise for drafting legislation and building the requisite institutions. Additionally, they need to mobilize the necessary resources (financial or otherwise) for establishing and operationalizing those institutions. The support that the international community can provide to LDCs for them to acquire the skills and resources necessary for their institutional development is discussed in section B below.

4. Domestic legislation can play a critical role

The adoption of relevant national legislation and regulations is one critical component of institutional development to ensure that the implementation of carbon projects contributes to the LDC host country's sustainable development and structural transformation. To reach this goal, such laws and regulations need to include provisions on who can implement carbon projects within the national territory, and they need to define benefit-sharing arrangements to ensure those projects bring developmental benefits.

The benefit-sharing arrangements should specify how revenues from credit sales are to be distributed, and particularly how monetary and non-monetary benefits will be distributed among stakeholders in or affected by a project. Therefore, a robust benefit-sharing arrangement is an important element to ensure that any project has a minimum social negative impact. In particular, its implementation should ideally safeguard the interests of Indigenous peoples and local communities, making sure that they benefit from voluntary carbon market business transactions that take place in their territories. The evolution of the domestic legislation of Zambia analysed in chapter IV provides an interesting example of how domestic institutions are evolving in some LDCs to respond to the developmental concerns of LDC host countries.

Selling countries could set a common minimum price for credits, differentiated by activity type

A robust benefit-sharing arrangement is an important element to ensure that any project has a minimum social negative impact

Governments need to adopt measures to ensure that carbon projects are genuinely additional and that their implementation is not simply for compliance purposes. To this end, regulations can be crafted so that projects are coherent with government programmes and priorities, and the positive sustainable development impacts accruing from those projects are in line with national priorities.

National legislation should also consider establishing a grievance mechanism (box V. *2*).

Box V.2
Grievance mechanisms

Grievance mechanisms are an essential component of the carbon market architecture. This is because they are the main avenue for people negatively affected by carbon credit projects to seek remediation. Most voluntary carbon market standards have such a mechanism in place. However, literature suggests that most grievance mechanisms in voluntary carbon market standards have serious shortcomings, and that there was even one instance of a standard with no grievance mechanism in place (Dalfiume and Michaelowa, 2023). A recent review of these processes found improvements to these mechanisms, but also that many of the initial shortcomings persist (Dalfiume et al., 2024). To construct an effective grievance mechanism, certain basic criteria need to be met: accessibility, transparency, predictability, independence, adequacy and safeguards.

The later review found that the best example of a grievance mechanism that meets these criteria is found outside the carbon market, namely the United Nations Green Climate Fund's Independent Redress Mechanism. On the carbon market, the Gold Standard was found to have the best grievance mechanism. Climate Action Reserve, Verra, American Carbon Registry and ART TREES have grievance mechanisms with a good level of detail, but also some significant shortcomings (Dalfiume et al., 2024).

The shortcomings include limited accessibility – due, for example, to the exclusion of local languages – and limited independence, such as when the decision-makers in a grievance have a clear conflict of interest, for example when members of the standard's board of directors also mediate grievances.

There is wide variation in the quality of the current grievance mechanisms available under different projects (Dalfiume and Michaelowa, 2023; Dalfiume et al., 2024). The implications of the shortcomings under some standards are manifold. Primarily, they make it difficult for people impacted by carbon-credit-generating activities to gain redress, or the redress may be insufficient to compensate for the harm. This in turn can influence the position of the local communities affected by carbon market activities vis-à-vis the project itself, the project developers and the carbon markets more generally. While harm must be avoided from the outset of a project, some unforeseen negative consequences may arise, and if there is no effective way to address them, communities are left feeling disadvantaged by such projects.

Avoiding and remedying harm is especially important for the LDCs. In these countries, access to official legal recourse may be more limited than in other countries due to poverty among affected communities or individuals, or to weak institutional capacity to provide for the appropriate recourse and remedy. To promote a positive attitude towards carbon market projects from local communities, it is therefore essential that instruments to limit the damage that carbon market activities can cause are available, and that a grievance mechanism is in place.

Source: UNCTAD.

B. Enhancing and realigning international support to least developed countries: A road map for development-oriented carbon markets

1. Carbon finance, climate finance and development finance: Clarifying their respective roles

The launch and growth of carbon markets have given rise to some confusion between carbon finance and climate finance and therefore a distinction needs to be made between them. The former refers to the revenue realized from projects through the sale of carbon credits earned,[2] whereas the latter refers to the funds required for addressing climate change. Climate finance can involve local, national or transnational financing, which may be drawn from public, private and/or alternative sources of financing. It includes, in particular, the commitment by developed countries, at the fifteenth session of the Conference of the Parties to the UNFCCC in 2009, to mobilize $100 billion a year by 2020 for climate action in developing countries. This target was later extended to 2025. It is to be followed by the updated new collective quantified goal on climate finance that was still being debated in multilateral climate negotiations under the aegis of the UNFCCC at the time of writing this report.

Donor countries have tended increasingly to try and share the burden of providing climate finance with their private sector by means of the latter's acquisition of carbon credits. Correspondingly, some participants in climate negotiations have argued that carbon finance should be part of climate finance. However, this raises the risk that the purchase of carbon credits will weaken the commitment of donor countries to deliver and increase their climate finance contributions to developing countries, including LDCs. In so doing, it contradicts the original intentions under which carbon finance and climate finance were conceived. It is important to avoid confusion, by making a clear distinction between carbon finance and climate finance, as further argued below.[3]

If carbon credits are used to channel finance to projects without counting the underlying reductions towards a mitigation goal, there could be ways of accounting for this as part of climate finance goals. Careful monitoring is needed to ensure that such "carbon finance" provided by the private sector is additional to, and does not replace, any commitments relating to public climate finance contributions. Therefore, whatever future developments occur in the carbon markets, they should not

> Carbon finance refers to the revenue realized from projects through the sale of carbon credits earned, whereas climate finance refers to the funds required for addressing climate change

[2] As mentioned in chapter II and in the present chapter, a separate issue concerns the sharing of the financial benefits of the revenues from carbon projects among the different actors involved in the projects (e.g. host State, local communities, intermediaries, brokers, private project developers and non-governmental organizations). Therefore, the market value of carbon credits is much higher than what domestic agents receive from the sale of carbon credits.

[3] This is also the position, for instance, of the West Africa Alliance on Carbon Markets and Climate Finance (Wallengren et al., 2024).

detract from the international community's responsibility to mobilize the climate finance required to address climate change.

Climate finance should be different from development finance, according to UNFCCC

Besides the distinction between carbon finance and climate finance, as noted above, it is important to distinguish between climate finance and development finance. As stipulated by the UNFCCC, climate finance should consist of "new and additional financial resources" (United Nations, 1992, Article 4.3) and should therefore be different from development finance. By the same token, there should be no confusion between carbon finance and development finance. The development of carbon markets, whatever its future trajectory, does not exempt the international community from the need to overcome the glaring shortcomings of the international financial system in mobilizing and channelling the finance required by LDCs to reach their development goals (including the Sustainable Development Goals) (UNCTAD, 2023).

Another trend that has developed in international development finance is that public funds are being used to provide incentives for private investment in developing countries, including LDCs, in the context of blended finance operations (UNCTAD, 2019). Similarly, public funds are being deployed in carbon projects as incentives for private sector involvement in those projects. This represents the diversion of official development assistance (ODA) funds to uses that are different from those for which they were initially intended (i.e. traditional development aid), which remains underfunded. Thus, no matter how carbon markets develop in the future, they should not absolve the international community of its ODA commitments and pledges, including the target of deploying 0.15–0.20 per cent of donor country gross national income for ODA to LDCs.

2. Carbon market integrity needs to be strengthened

Accusations of a lack of environmental integrity of carbon projects and of greenwashing have been a major obstacle to the development of carbon markets, and have tended to dampen demand for carbon credits, as shown in chapter I. In response, various initiatives have been launched, including the Integrity Council for the Voluntary Carbon Market, which aims to set thresholds to determine which credits are deemed to be of "high integrity," or the Voluntary Carbon Markets Integrity Initiative, which focuses on the demand side by developing a claims code to guide and regulate companies making voluntary claims on the back of purchasing carbon credits.

In 2024, the United Nations was scheduled to launch its Principles for Carbon Markets with Integrity and Credibility. An initiative of the Secretary-General, they were developed with the participation of several agencies of the United Nations system, including UNCTAD. The principles aim to strengthen the trust, integrity, transparency and credibility of carbon markets. Concerning the supply side, the principles include transparency, additionality, permanence of claimed reduction or removal units, social and environmental safeguards (including gender issues and human rights) and equitable distribution of benefits. On the supply side, the principles include accurate offset claims, transparency, etc. They also encompass the market itself, aiming at market integrity and credibility. The United Nations is expected to play a more substantial role in convening and facilitating coordination efforts among the various stakeholders (such as crediting mechanisms' governing bodies, multilateral institutions, Governments, standard setters of voluntary principles, business and financial institutions, and the broader carbon market ecosystem) and in promoting a unified shift to high-integrity and high-credibility carbon markets. It is expected that

the rollout of the principles, and their gradual adoption by market participants worldwide, will improve the credibility of carbon markets and make them more development friendly.

3. Carbon markets and common but differentiated responsibilities

LDCs are contributing to global climate change mitigation, even though they are minor emitters – both historically and currently – and lag behind in economic and social development. LDC commitments are expressed by their continuous and active participation in multilateral climate negotiations and their formulation of ambitious nationally determined contributions. It has been argued that these countries should engage with carbon markets despite being only marginally responsible for climate change (Africa Carbon Markets Initiative, 2024; Keane et al., 2021). Such engagement was supposed to be rewarded by financial inflows, positive sustainable development impacts and benefit-sharing in carbon projects, all of which were expected to contribute positively to LDC development (chapter I). However, as this report's analysis has shown, the expected positive rewards from their participation in carbon markets have either not materialized or, at best, been limited and insufficient. Moreover, the specific conditions and needs of LDCs have often not been adequately taken into account when devising international carbon market mechanisms and instruments. This suggests that the principle of common but differentiated responsibilities and respective capabilities enshrined in the UNFCCC and the Paris Agreement has not been adequately implemented. Expectations concerning the benefits that LDCs can derive from engaging with carbon markets need to be toned down. LDC policymakers are advised to give careful consideration to the consequences of hosting carbon markets on their countries' future climate policy, including the possibility of being left with the more challenging forms of mitigation, as mentioned above.

The analyses undertaken in this report also show that a large share of the commitments contained in the nationally determined contributions of the LDCs are conditional upon receiving support from their development partners for implementation of their climate action plans and projects. It is in the interest of the international community that a larger share of these commitments become unconditional over successive generations of nationally determined contributions, as this would provide greater certainty to the future trajectory of climate policy at a global scale. Therefore, development partners need to provide substantially greater support to LDCs so that these countries can achieve structural transformation of their economies, while at the same time contributing to climate change mitigation.

Making the structural transformation of LDCs compatible with their contributions to climate change mitigation requires the international community to allow these countries to use a significant proportion of the remaining carbon budget compatible with the Paris Agreement objectives (i.e. to keep long-term global average surface temperature at well below 2°C above pre-industrial levels and pursue efforts to limit it to 1.5°C by the end of this century). LDCs emitted just 48 gigatons of CO_2-equivalent between 1,750 and 2019, compared with 1,502 gigatons of CO_2-equivalent emitted by developed countries (UNCTAD, 2022). The indicative remaining carbon budget compatible with a temperature rise of +1.5°C (+2°C) is approximately 300 (900) gigatons of CO_2-equivalent, according to the Intergovernmental Panel on Climate Change (IPCC, 2021). However, the structural transformation required for LDCs to reach their development goals will, in principle, entail higher emissions by this country group in the future. They should therefore be allowed to use a significant proportion of the remaining carbon budget,

Expectations concerning the benefits that LDCs can derive from engaging with carbon markets need to be toned down

in line with the principle of common but differentiated responsibilities and respective capabilities enshrined in the UNFCCC (United Nations, 1992, Preamble, Article 3.1, Article 4.1) and in the Paris Agreement (United Nations, 2015, Preamble, Article 2.2, Article 4.3, Article 4.19).

The principle of common but differentiated responsibilities and respective capabilities can be implemented through the provision of special and differentiated treatment of LDCs in the rules and institutions that steer carbon markets

In the case of carbon markets, the principle of common but differentiated responsibilities and respective capabilities can be implemented through the provision of special and differentiated treatment of LDCs in the rules and institutions that steer these markets. This would be a means of allowing LDCs to pursue their structural transformation while upholding the environmental obligations undertaken internationally in contributing to climate change mitigation. This requires the international community to provide LDCs with the frameworks and rules that allow them to pursue these paths in parallel, in the spirit of climate justice. Subsection B.4 below provides some examples of how this can be achieved.

4. Addressing equity gaps in Article 6 participation

Negotiations on the rules and modalities of implementation of Article 6 will play a critical role in shaping carbon markets in the future and will therefore have long-term consequences. Therefore, they are particularly important, as is the challenge of reaching consensus on a number of issues. This section discusses some critical issues from the point of view of LDCs, which negotiators should consider in terms of making carbon markets more effective tools in the pursuit by LDCs of sustainable development and structural transformation.

It is in the interest of LDCs to support ambitious outcomes of Article 6.2, which can have positive knock-on effects. These countries would benefit especially from: (a) better definitions of the scope of cooperative approaches; (b) a common authorization statement; (c) clear sequencing for the authorization and trade of internationally transferred mitigation outcomes; and (d) tighter confidentiality rules. Together, these provisions would contribute to levelling the playing field between all Parties to the Paris Agreement and deliver greater predictability and transparency. These effects, in turn, would strengthen the position of LDCs when negotiating terms of cooperative approaches should they wish to participate in Article 6.

It is important for any LDC that may be already entering into negotiations on a cooperative approach with a prospective buyer country to have clear requirements that will safeguard that country's national interests, in order to avoid the shortcomings of past project implementation highlighted in chapters II and III. This can be achieved in different ways. First, it could be beneficial to include mitigation sharing terms, whereby perhaps 50 per cent or more of any mitigation from the cooperative approach is not authorized (and hence not claimed as part of internationally transferred mitigation outcomes) but can still count towards the host country's nationally determined contribution.

Second, host countries could also agree to authorize only mitigation that involves mitigation that is very expensive or technically difficult for the host country to undertake, in comparison with less expensive mitigation. This would avoid a situation whereby the LDCs need to finance costly abatement on their own in the future in order to reach their nationally determined contributions, since they will have already sold off inexpensive abatement to other Parties.

Third, host countries could also develop a fee structure, including applying corresponding adjustments and authorizing internationally transferred mitigation outcomes, since these entail administrative and opportunity costs, given that the host country will no longer be able to count the mitigation outcomes as part of its nationally determined contributions.

Fourth, a host country could require a buyer country to provide financing to

conduct measurement, reporting and verification for mitigation over the long term and to remediate all or a particular share of future reversals (particularly important for nature-based mitigation) that might occur years or decades later. In the absence of such a requirement, the host country would risk incurring unaccounted heavy financial costs in the future.

Fifth, a host country could also mandate the buyer country to provide separate financing to support climate adaptation efforts as part of the overall terms of the cooperative approach.

5. Ensuring greater support for much-needed capacity-building in least developed countries

Capacity-building in LDCs is crucial for enabling the development of domestic regulatory frameworks for carbon markets. It is an overarching challenge that pervades Articles 6.2 and 6.4 of the Paris Agreement. Multiple efforts across different workstreams are needed to overcome the shortfall of capacity in these countries. There is a push for greater UNFCCC support for Article 6 implementation, with LDCs repeatedly urging the UNFCCC to expand its capacity-building efforts (Government of Ethiopia, 2017a, 2017b; Government of Senegal, 2022a, 2022b), including by means of its regional collaboration centres. Additionally, capacity-building relating to carbon markets has started being included in technical cooperation programmes of other United Nations agencies acting in a coordinated and coherent manner so as to avoid duplication and create synergies.

LDCs are advised to continue to call on donor countries, particularly prospective buyers, to increase their funding and other support for UNFCCC Article 6 capacity-building efforts. Other independent agencies and entities that can impartially advise LDCs can also be of assistance.[4] In addition, prospective carbon credit buyers may contribute resources to the UNFCCC secretariat and to other independent entities in their efforts to develop capacity-building activities and conduct workshops aimed at assisting LDCs, in particular in determining whether and to what extent they wish to engage in Article 6. While prospective buyer countries themselves may undertake such activities, most capacity-building efforts would better be managed by an independent entity that, unlike a prospective buyer, does not stand to benefit from the outcomes of a potential cooperative approach. This is important so as to ensure not only against possible conflicts of interest, but also that LDCs and other host countries do not feel under undue pressure and that they receive impartial advice.

As part of intensified capacity-building efforts, it is important for LDCs to be well-equipped to comply with international requirements and obligations related to carbon market participation. They also need to acquire the necessary skills to assess and negotiate carbon projects in such a way that projects make a positive contribution to their domestic structural transformation. Apart from gaining an understanding of the technicalities of carbon markets, this also means mastering the capability of linking carbon projects to broader national development plans and strategies and creating synergies between them. This wider approach requires moving away from a compartmentalized and siloed approach to technical assistance by promoting joint efforts across different international organizations and cooperation agencies.

> Capacity-building in LDCs is crucial for enabling the development of domestic regulatory frameworks for carbon markets

[4] The mandate of the UNFCCC could be strengthened through a decision to expand its capacity-building products, activities and workshops for prospective host Parties, particularly LDCs. This decision would be taken by the Conference of Parties serving as Meeting of Parties to the Paris Agreement (CMA).

6. A future marked by equity: Strengthening Article 6 to boost sustainable development and structural transformation in the least developed countries

Imagine a future where Article 6 is bolstered to meet the development needs of LDCs, ushering in a wave of positive changes and opportunities for these countries. Article 6.2 sets the framework for exchanging internationally transferred mitigation outcomes through bilateral or multilateral agreements between countries. While internationally transferred mitigation outcomes are widely understood to refer to carbon credits, they could also involve the trading of mitigation outcomes that are not specific to GHGs (such as a kilowatt-hour (kWh) of renewable energy) or provide a way of recording trade in emission allowances between internationally linked cap-and-trade systems (for example, between the European Union and Switzerland).

Overarching rules relating to Article 6.2 were set at COP26 (Decision 2/CMA.3) and COP27 (Decision 6/CMA.4), but numerous outstanding issues remain to be resolved in negotiations, notably concerning arrangements for authorizing internationally transferred mitigation outcomes, reporting on and reviewing them, and promoting the overall transparency of the system. The remainder of section B provides further suggestions on how the international community can best support LDCs in maximizing the potential benefits of carbon markets by addressing specific considerations in Article 6.2 that are important to LDCs. Going forward to COP29 and beyond, the following are some of the key issues in Article 6 that are of concern to LDCs: the scope of cooperative approaches, the authorization statement, sequencing, confidentiality, the international registry and removal activities, as discussed below.

(a) Scope of cooperative approaches

Articles 6.1 and 6.2 of the Paris Agreement, as well as Decision 2/CMA.3 and Decision 6/CMA.4, provide a general understanding that a cooperative approach is undertaken "on a voluntary basis", that it "involve[s] the use of internationally transferred mitigation outcomes" and that certain principles should be upheld, including environmental integrity, transparency and robust accounting. However, specific details concerning the parameters for a cooperative approach are lacking, which can result in different interpretations of the guidance. Consequently, many countries fundamentally disagree on how uniform Article 6.2 implementation should be. LDCs need greater clarity on the definition and scope of a cooperative approach. This would introduce a higher degree of uniformity, provide greater transparency on what countries are doing, clarify expectations of prospective host Parties, and strengthen their position in defining the terms of their cooperative approach. While greater clarity concerning the scope of cooperative approaches will not necessarily deliver a more transparent system under Article 6.2 (which largely depends on national interpretations of the rules and a willingness to disclose information), it could indirectly support such an outcome. This may help increase the quality of cooperative approaches and help LDCs decide whether and how to become involved in Article 6.2.

Countries may choose to adopt a cooperative approach that entails trading internationally transferred mitigation outcomes using a specific methodology provided in Article 6.4, while also subscribing to other mutually agreed upon provisions, such as benefit-sharing , where a certain share of the mitigation remains in the host country and counts towards its nationally determined contributions, or where the cost of remediating reversals is split between the Parties.

Transparency in the cooperative approach, including on specifics, provides useful

information to all Parties, including LDCs, and can set a high bar that signals the level of disclosure that should be provided in such an approach.

LDCs and other developing countries may wish to pursue a mandatory template for authorizing cooperative approaches that disclose core details. A common template would ensure that all parties play by the same rules while minimizing the chance of potentially conflicting interpretations of how and when to authorize cooperative approaches and the steps to follow them. In the absence of a common template, each country is likely to pursue its own process for authorizing a cooperative approach. This risks creating inconsistencies or leading to non-compliance with the Article 6.2 rules, particularly by LDCs, which face more significant capacity constraints than many buyers.

(b) Authorization statement and sequencing

Authorization is an essential component of Article 6.2, since it: (a) represents formal government approval of the transfer or use of internationally transferred mitigation outcomes for a specific purpose (attainment of nationally determined contributions, use in compliance systems, or voluntary use by companies); (b) triggers a range of reporting requirements (with an initial report describing the cooperative approach that follows the authorization); and (c) has implications for when and how corresponding adjustments will be applied in order to avoid double counting of internationally transferred mitigation outcomes. The formal authorization of cooperative approaches and underlying internationally transferred mitigation outcomes may closely overlap with defining the scope of a cooperative approach mentioned above. Again, for LDCs, it would be beneficial to have a common mandatory template requiring the disclosure of a minimum amount of information about each authorization. There remain ambiguities in Article 6.2 rules concerning whether there should be a mandatory sequence of steps, from post-authorization of a cooperative approach all the way through to the issuance and use of internationally transferred mitigation outcomes.[5] For LDCs, a template with clear and mandatory sequencing may be beneficial to create a level playing field for all Parties, provide predictability, and minimize the risk of placing a significant burden on Parties in the long run. It would also ease capacity limitations that some LDCs may face.

LDCs and other developing countries may wish to pursue a mandatory template for authorizing cooperative approaches that disclose core details of cooperative approaches

(c) Confidentiality

Concerning confidentiality of information reported by Parties about their engagement in Article 6.2, LDCs and other countries would benefit from as much transparency as possible of Article 6.2. This would mean clarifying rules around confidentiality along the lines of the proposal tabled for negotiations at COP28. Delivering more clarity on confidentiality and boosting transparency in Article 6.2 would ensure that all Parties follow the same rules and pursue high-quality cooperative approaches. Possible actions include: (a) defining the types of information deemed confidential; (b) developing a code of conduct for Parties to justify confidentiality in order for reviewers to assess the claim for confidentiality and to handle confidential

Concerning confidentiality of LDCs would benefit from as much transparency as possible concerning information reported by Parties about their engagement in Article 6.2

[5] The UNFCCC secretariat and an Article 6.2 technical expert review team must review various reports from Parties about their cooperative approaches and internationally transferred mitigation outcomes to ensure there are no "inconsistencies" in reporting, and that countries are complying with Article 6.2 requirements. Allowing the transfer and use of internationally transferred mitigation outcomes before a completed review can be problematic. For example, if, after the review has taken place, it turns out that a cooperative approach is not compliant with Article 6.2 rules but the underlying internationally transferred mitigation outcomes have already been used by another country towards its nationally determined contributions or by a company to fulfil a compliance obligation, it may be difficult, if not impossible, to rectify this situation: both from an environmental perspective (e.g. low-quality internationally transferred mitigation outcomes being used to offset fossil emissions) and from a practical perspective (e.g. an internationally transferred mitigation outcome used for compliance reasons in another jurisdiction that has a particular legal framework).

information appropriately; (c) developing a procedure to address instances where the basis for confidentiality is unclear, questionable or has not been provided; and (d) determining how to address cases where inconsistencies are detected regarding confidential information. In addition, LDCs that may wish to participate in Article 6.2 will benefit from greater transparency by being able to review other Parties' cooperative approaches and fulfilment of reporting requirements when assessing whether and how to engage in Article 6.

Rapid implementation of an international carbon registry by the UNFCCC secretariat is a priority for LDCs

(d) International carbon registry

Rapid implementation of an international carbon registry by the UNFCCC secretariat is a priority for LDCs. The international carbon registry is an essential part of the Article 6.2 infrastructure and is likely to be used primarily by host countries, such as LDCs. Many of them do not have their own national carbon market registry or would prefer to use a system managed by the UNFCCC rather than by third-party registries run by companies or other non-governmental entities.

For LDCs, multilateral action on a carbon registry is especially important, as it avoids the burden of having to develop their own registries, for which they may not have the capacity or financial resources. For this to happen, there would first need to be a clear agreement at COP29 on whether the international registry can transact units, from Article 6.4 in particular, or if it will be limited to simply tracking internationally transferred mitigation outcomes traded elsewhere. For LDCs, it would likely be more beneficial for the international registry to allow authorized units from the Article 6.4 mechanism to be traded in the international registry.

In the absence of an international registry being established or fully functional (i.e. with the possibility to transfer units), LDCs may struggle to participate in Article 6.2, or they may resort to using registries of voluntary carbon market standards, which carries potential legal, security and conflict-of-interest risks.

If the international carbon registry is operationalized, in preparations for its implementation LDCs will urgently need capacity-building in order to be able to fully benefit from its functionalities and operations (Government of Senegal, 2022a).

(e) Removal activities

These activities have been a contentious issue in Article 6 negotiations, particularly with regard to who is liable for measurement, reporting and verification after a project's last crediting period, for how long, and how reversals will be addressed. For LDCs, it is vital that there be clear rules determining liability for post-crediting measurement, reporting and verification and for remediation of reversals such that host countries are not unduly penalized. While different options have been proposed in the past, one way to minimize this risk could be to require a project developer to conduct mandatory post-crediting measurement, reporting and verification and remediation for reversals for at least 100 years, as already practised in other crediting systems. When Article 6.4 credits are authorized for use in nationally determined contributions, host countries, such as LDCs, could also include a requirement in their cooperative approach, whereby the buyer must assume full or partial liability for conducting long-term measurement, reporting and verification and remediation of reversals.

The international community has the responsibility to ensure that a potential outcome of removal activities at COP29 will not place an undue burden on LDCs, for instance in attributing liability for post-crediting measurement, reporting and verification and for long-term remediation of removals. A requirement that project developers conduct a minimum of 100 years of measurement, reporting and verification and address any reversals after the end of the last active crediting period would ensure that host countries are not burdened with the costs of doing this on their own.

C. Conclusions

Since their launch in the mid-1990s, carbon markets have largely fallen short of their intended goals and promises, particularly for LDCs. This holds true whether they are evaluated in terms of augmenting financial inflows into these countries, their contribution to climate change mitigation or their contribution to the structural transformation of LDCs. While their positive impact has been limited at best, the outlook may improve with the transition of the carbon markets from the Clean Development Mechanism era to the Article 6 era, for different reasons. First, the new phase benefits from the experience accumulated in the previous era. Second, the awareness of the potentials and pitfalls of engagement with carbon markets has intensified among policymakers, private sector, civil society and other stakeholders originating from all countries Party to the Paris Agreement, including LDCs. Third, this heightened awareness and different stakeholders' determination to obtain better outcomes from carbon markets have led to the prolonged negotiations of the rules of implementation of Article 6. The expected positive outcomes will not happen automatically; they need decisive action by both the LDCs themselves and the international community.

LDCs need to adopt a proactive, strategic stance towards carbon markets, which entails considering if and how to participate in such a way that these markets are supportive of their development goals and structural transformation. LDCs that decide to participate will have to strengthen their institutional capacities and equip themselves with the skills to adopt clear negotiating positions vis-à-vis prospective investors, but also when participating in multilateral discussions.

LDCs require the support of the international community in helping them build the skills necessary to critically assess the opportunities and pitfalls of engaging with carbon markets. This supposes an understanding of not only the technical aspects of market operations and the corresponding mechanisms, but, critically, the contributions of those markets to the sustainable development and structural transformation of LDCs. It entails including carbon markets as one tool in a much broader toolbox of development policies. Similarly, development partners' support to LDCs on carbon markets should complement their support and obligations in other fields, such as finance and technology.

In all instances, the special circumstances of LDCs need to be acknowledged. Given that they are latecomers in the process of development, they have historically been low GHG emitters and remain so, contributing minimally to climate change. Therefore, the principle of common but differentiated responsibilities and respective capabilities needs to be applied to them whenever feasible and appropriate, so that their decision-making and policymaking with respect to their participation in carbon markets contributes to their long-term development.

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