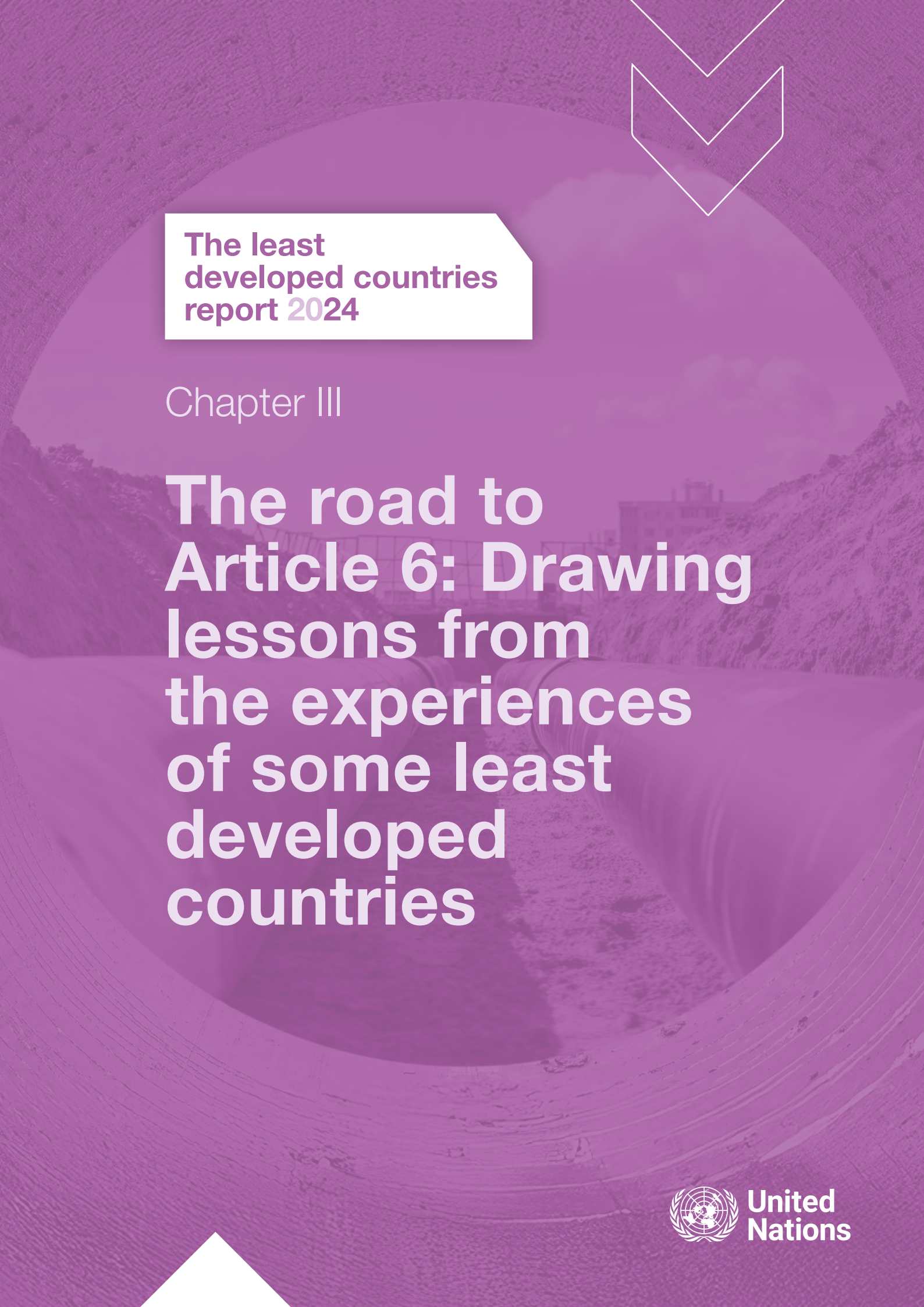
The least developed countries report 2024

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.

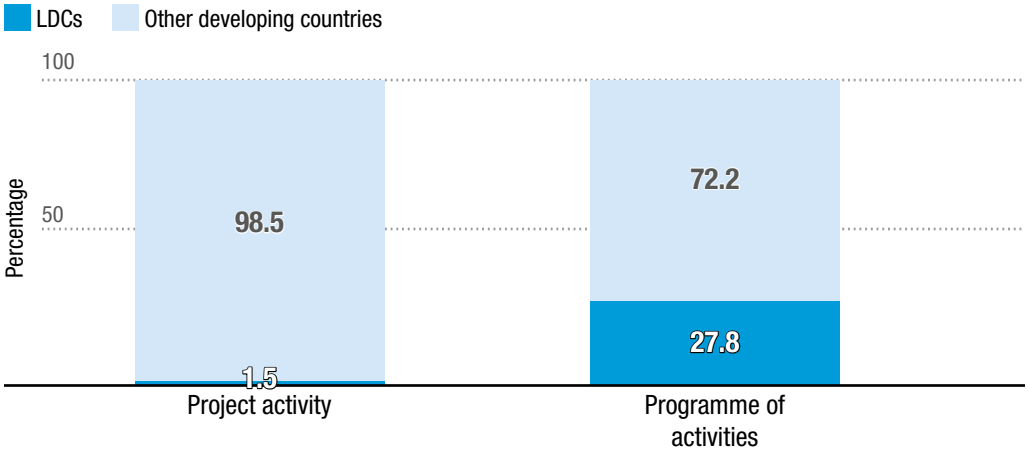
Five-year commitment periods were too short to significantly alter low aggregate emissions in least developed countries

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)

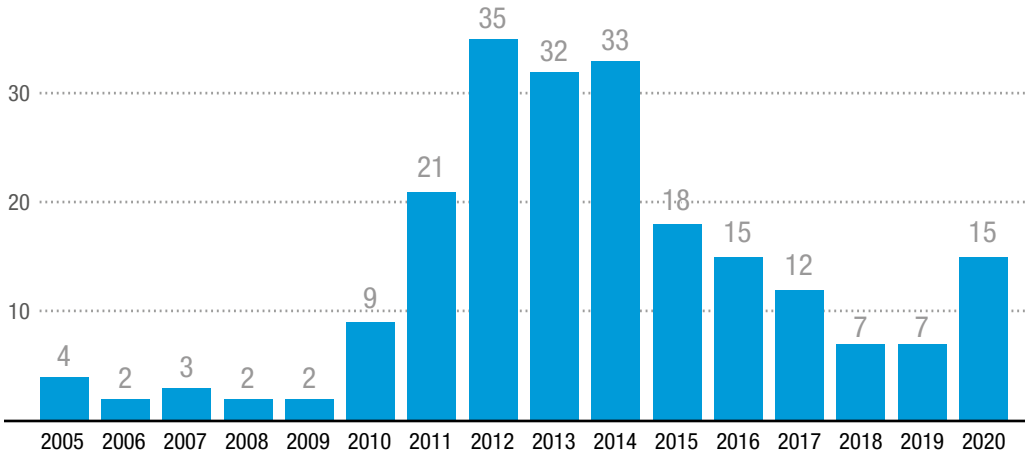


Source: UNCTAD calculations, based on data from the United Nations Environment Programme Copenhagen Climate Centre database, available at https://unepccc.org/cdm-ji-pipeline/ (accessed May 2024).

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

Figure III.2

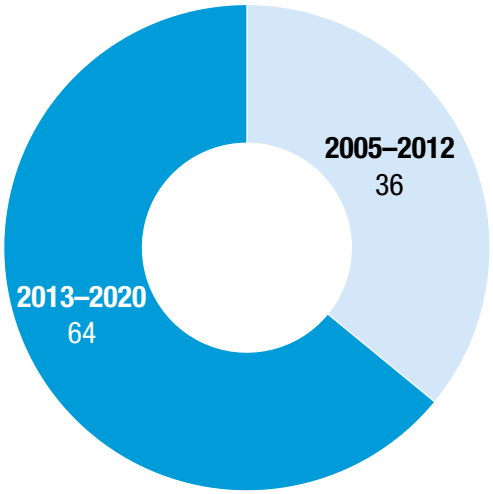
Projects in least developed countries registered under the Clean Development Mechanism, 2005–2020



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.

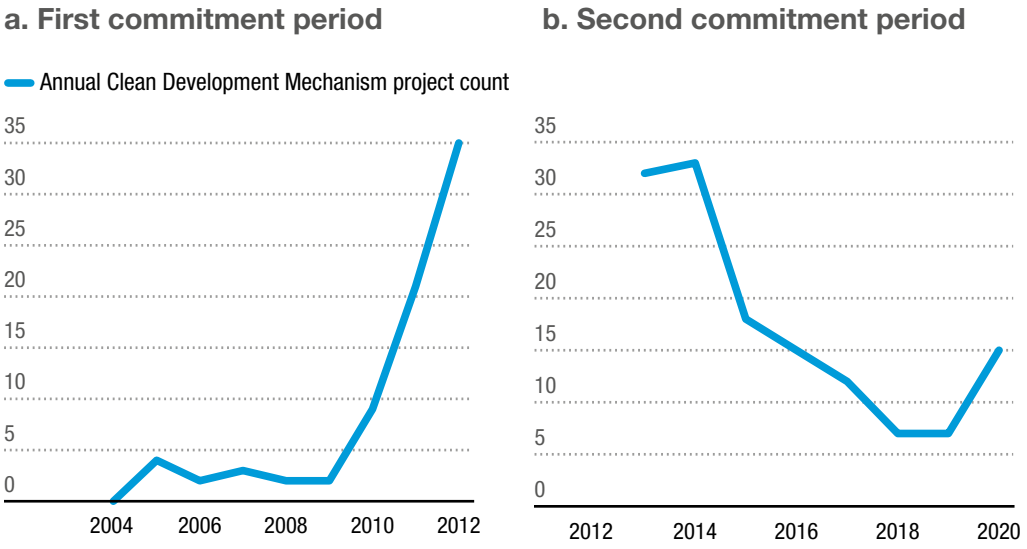
[8] In addition to initiatives under the UNFCCC, other examples include the Carbon Initiative for Development, which is a World Bank trust fund that mobilizes private finance for clean energy access in low-income countries, and the Asian Development Bank-administered Japan Fund for the Joint Crediting 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).

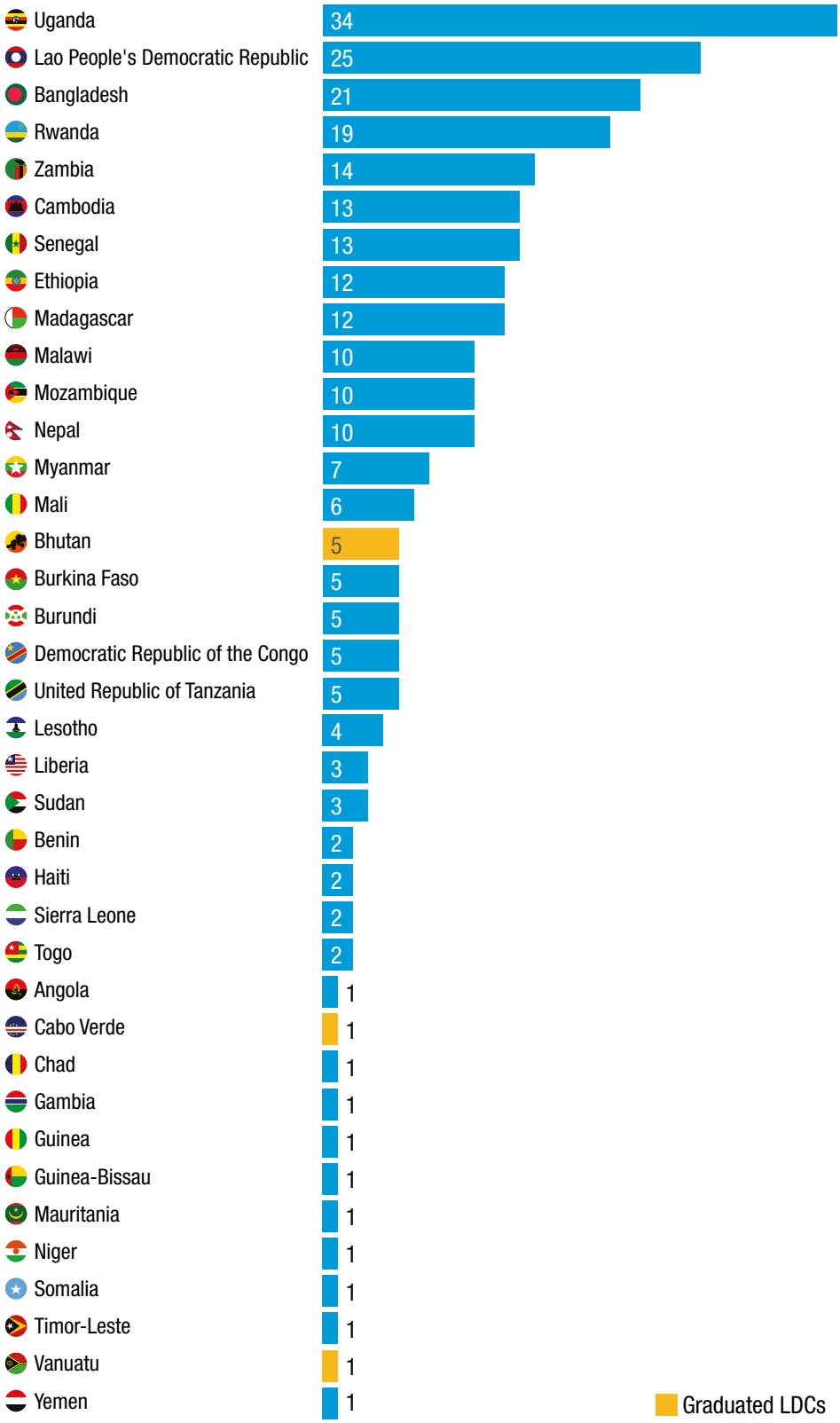
Note: Programmes of activities that span more than one country are counted once.

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).

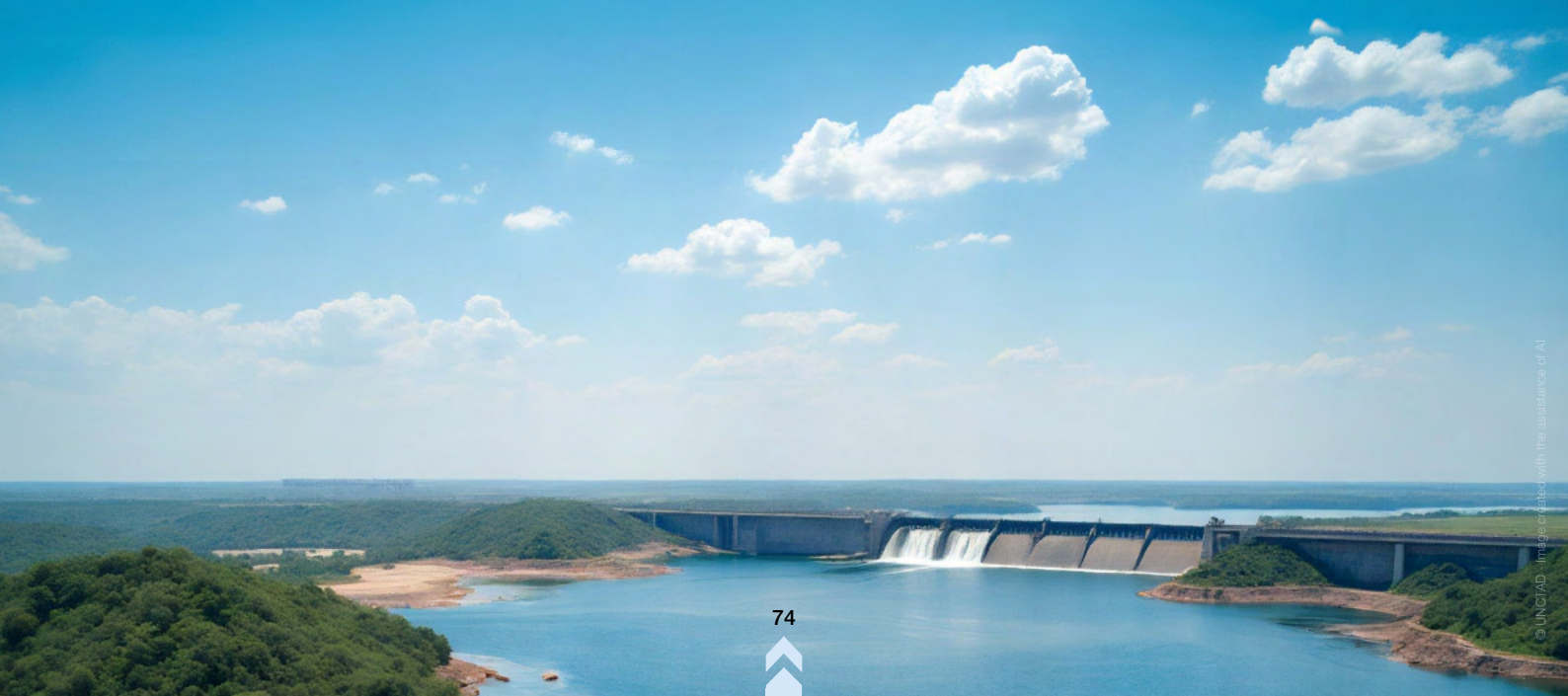
Note: Programmes of activities that span more than one country are counted for each participating country.

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.



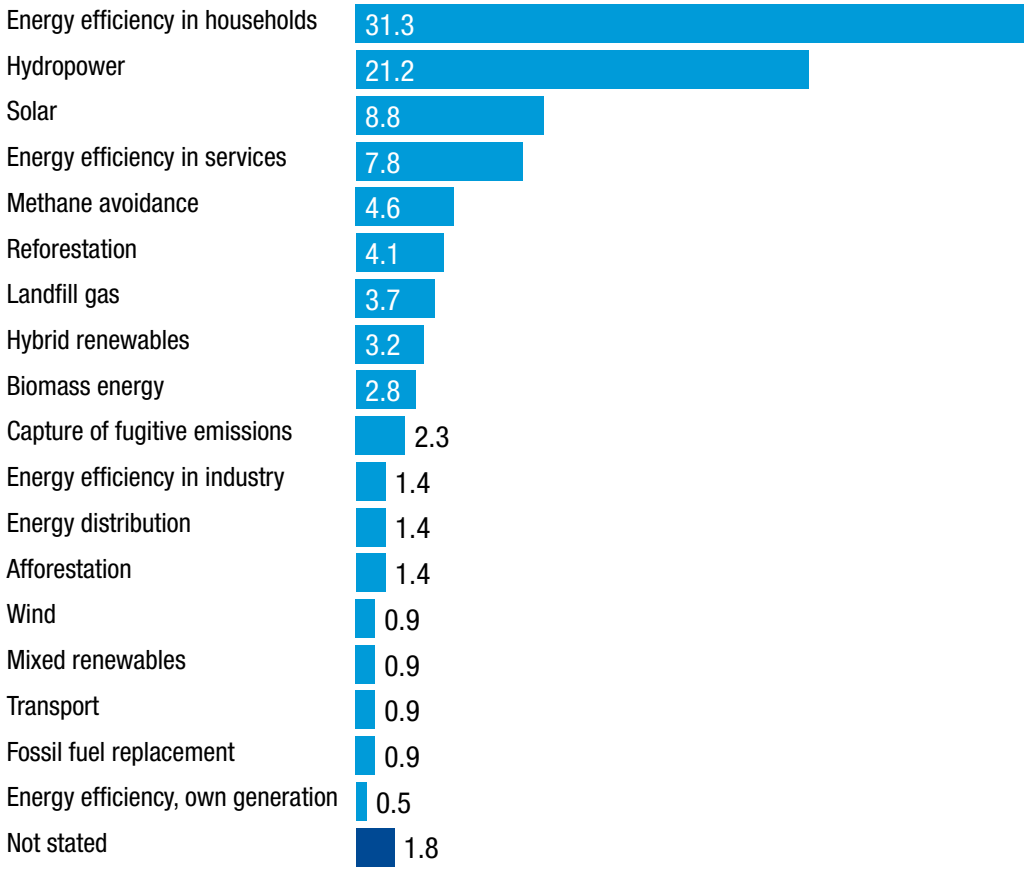
Uganda may therefore have benefited more than other LDCs if local participants in projects were given the opportunity to broaden engagement in Clean Development Mechanism projects and if domestic service providers and experts acquired skills and networks needed to increase their stakes in carbon project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