7 The role of market mechanisms in bridging the emissions gap

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7.1. Introduction: The role of carbon markets and current status

In the Paris Agreement, cooperation among countries is considered a way to both implement nationally determined contributions (NDCs) and promote greater ambition, while also fostering sustainable development and encouraging broad participation from the private and public sectors. Market mechanisms are therefore seen as an important component in collective action to achieve the long-term goals of the Paris Agreement. In principle, the role of markets within the context of the agreement is to enable all parties engaged in mitigation actions to implement these in a cost-effective manner, while simultaneously providing an opportunity to enhance their ambition.

Under article 6, the Paris Agreement provides for an international framework for market mechanisms to enable greater ambition in both mitigation and adaptation actions (Bodansky *et al.* 2016). It also allows countries to voluntarily cooperate to achieve their NDCs, "promote sustainable development and ensure environmental integrity and transparency" (article 6.2), so long as parties avoid double counting mitigation outcomes. The fact that 87 per cent of new and updated NDCs specify countries' intentions to possibly use voluntary cooperation under article 6 (United Nations Framework Convention on Climate Change [UNFCCC] 2021) confirms a significantly increased interest in this approach, compared with previous NDCs.

Although article 6 established these principles, the rules that facilitate their implementation in practice are still the subject of negotiations, including guidance for cooperative approaches (article 6.2), which covers all forms of international mitigation markets, the rules for a mechanism (article 6.4), and a framework and work programme to promote non-market cooperation (articles 6.8 and 6.9). These rules, modalities and procedures are an anticipated key outcome of the of twenty-sixth United Nations Climate Change Conference of the Parties (COP26).

There is already considerable experience in designing and implementing market mechanisms to control pollutants, including different forms of carbon markets (Schmalensee and Stavins 2017; Michaelowa *et al.* 2019a; World Bank 2021a). The current state of carbon markets is very diverse. Such markets include both voluntary and compliance-driven programmes, which are used both domestically and internationally to reduce emissions, and involve different types of allowances and credits and both public and private sector entities as buyers and sellers (box 1, figure 7.1).

Box 7.1. Current state of carbon markets

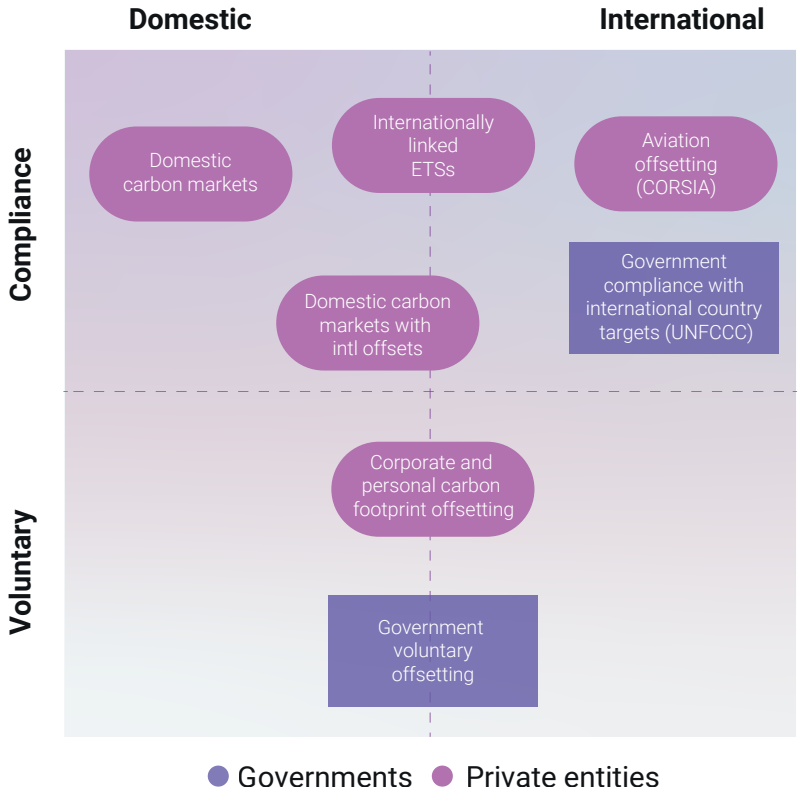
Compliance carbon markets are marketplaces in which participants act in response to an obligation established by a regulatory body. The most prominent examples of such markets are national or regional emissions trading systems. In national emissions trading systems, governments set a cap on the aggregate level of greenhouse gas (GHG) emissions that regulated entities can emit over a period of time. These entities are required to submit an emission permit (or allowance) for each ton of carbon dioxide equivalent (tCO_2e) they emit. Emissions trading systems can be restricted to domestic borders or may have international elements through links with other emissions trading systems (e.g. the European Union, the European Union-Swiss link and the California-Quebec link) and/or the acceptance of international offsets (e.g. the Republic of Korea's Emissions Trading Scheme – K-ETS).

In voluntary carbon markets, participants are under no formal obligation to achieve a specific target. Instead, companies, private entities and national governments seek to voluntarily offset their emissions, for example, as part of a social responsibility strategy. Voluntary buyers can procure domestic or international carbon credits from various different crediting programmes, as well as allowances from compliance markets (Doda *et al.* 2021).

Compliance carbon markets have historically generated more mitigation action and stronger incentives for decarbonization than voluntary carbon markets, though they may face more political opposition and entail higher regulatory burdens. Voluntary carbon markets can be an important tool to mobilize the private sector and expand the reach of carbon markets beyond sectors and regions subject to explicit climate regulation.

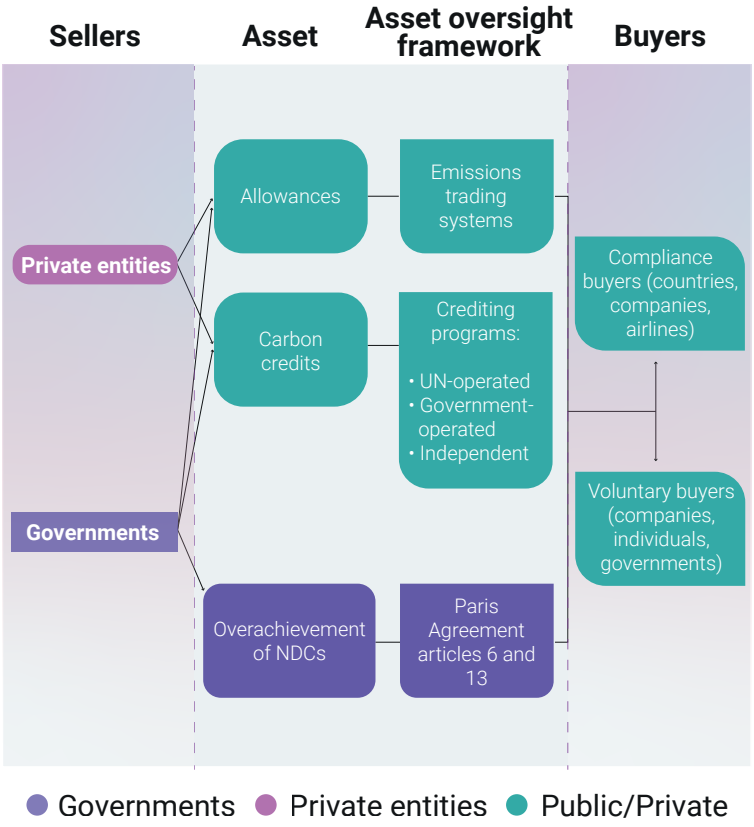
In terms of structure, domestic carbon markets have the advantage of normally allowing better oversight and control through full regulatory control by a relevant authority, with little risk of spillover effects from other systems or jurisdictions, and all mitigation benefits accrued domestically. Adding international elements to markets will increase their complexity, but also presents a significant advantage of potentially reducing compliance costs by making use of cheaper mitigation opportunities in other jurisdictions.

Figure 7.1a Market typology



Source: Adapted from La Hoz Theuer (2021)

Figure 7.1b Cross-border unit transfers



Source: Adapted from La Hoz Theuer (2021)

Experiences from these various markets and approaches provide important learnings for the design of new cooperative approaches. This chapter initially provides an assessment of the potential role of market mechanisms under the Paris Agreement in both the near term and in achieving long-term climate goals (section 7.2), then examines technical issues that have implications for the effective implementation of article 6 (section 7.3), and finally discusses actions that can be taken to unlock market potentials and enhance ambition (section 7.4).

7.2. The potential role of international carbon markets under the Paris Agreement: near-term versus net-zero implications

7.2.1. Near-term implications

NDCs define the mitigation contribution of each party to meeting the goals of the Paris Agreement. Countries have prepared their NDCs using different target types and metrics ranging from reductions in all greenhouse gas (GHG) emissions relative to a fixed emissions level (e.g. a 50 per cent reduction in all GHGs in 2030 relative to 2005), to specific actions such as planting a specific number of trees by a specific date, to conditional contributions that apply only if an additional condition is met (Hood and Soo 2017). The heterogenous nature of the current NDCs in this way creates challenges for both negotiating and establishing effective real-world markets, as well as the risks of double counting, emission leakages and unattainable targets.

There is growing interest from countries in using markets and voluntary cooperation to implement their NDCs. As of 30 July 2021, the share of parties that indicated an intention or possibility of using voluntary cooperation has nearly doubled, from 44 to 87 per cent in the new or updated NDCs, compared with previous NDCs. Moreover, the share of parties that have set qualitative limits on voluntary cooperation, such as using certain standards and guidelines to ensure additionality and avoid double counting, has increased from 19 to 39 per cent (UNFCCC 2021).

The existing quantitative literature that estimates the maximum potential gains from cooperation generally assumes that the heterogeneous NDCs could be translated into a common comprehensive, transferable emissions mitigation metric. This is evidently not something that is going to happen quickly, if at all, and the results must therefore be interpreted as estimates of **potential** gains from cooperation compared with independent implementation of the same targets. These studies do not include ancillary domestic benefits that may have motivated countries' choice of NDC target methods.

A relatively limited number of studies have so far provided quantification of the gains from cooperative implementation of NDC pledges (e.g. Fujimori *et al.* 2016; Hof *et al.* 2017; Edmonds *et al.* 2019; Böhringer *et al.* 2021; Edmonds *et al.*

2021). With the aim of achieving the current NDC ambition through global cooperation, most models estimate a global carbon price of US$9–38/$tCO_2$ between 2025 and 2030.[1] In contrast, the studies find that due to the varying stringency in NDCs, the shadow price of carbon for a country to independently and cost-effectively achieve its unconditional NDC pledge by 2030 ranges from US$0/$tCO_2$ to over US$250/$tCO_2$ across models and studies (with each study analysing then-current NDC pledges), highlighting the potential gains through international emissions trading. As a result, the estimated mitigation costs by 2030 in an ideal situation could be reduced by 40–60 per cent through the full use of market mechanisms (Aldy *et al.* 2016; Fujimori *et al.* 2016; Hof *et al.* 2017; Edmonds *et al.* 2019; Edmonds *et al.* 2021). Although there are uncertainties associated with economic modelling, results in all studies suggest significant potential cost reductions and economic gains from using market mechanisms. These results provide a strong incentive for countries to negotiate a credible agreement on article 6 and to move towards more compatible NDCs over time.

The modelling studies estimate that around 4–5 $GtCO_2e$ could be traded per year by 2030 with a market volume of US$60–100 billion per year if NDCs are transformed into tradable emission mitigation actions (Fujimori *et al.* 2016; Edmonds *et al.* 2019; Edmonds *et al.* 2021). Net market transactions constitute balance-of-trade changes and therefore changes to participants' gross domestic product (GDP) and/or exchange rate position. For selling regions, this would represent a potentially significant new net export (Piris-Cabezas *et al.* 2019; Edmonds *et al.* 2021; Kachi *et al.* 2020). The extent to which this will actually occur is very uncertain, with many parties emphasizing domestic implementation and mentioning flexible mechanisms as an additionality in their NDCs.

Carbon markets shift both emission mitigation actions and emission mitigation investments from buyers to sellers. Provided that sellers are primarily developing countries, carbon markets have the potential to transfer emission mitigation-related capital towards developing economies, help prevent lock-ins to carbon-intensive infrastructure and contribute to capacity-building to further reduce emissions. Redistributing capital investments potentially carries implications for other sustainability metrics, such as local air quality, forest conservation, rural livelihoods, food prices, water quality and energy access, as well as for the regional distribution of incentives for technology development and innovation.

While increasing emission mitigation innovations in selling regions, carbon markets could reduce incentives in buying regions. In buying regions with greater capacity to develop capital-intensive emission mitigation technologies, the overall pace of technological change that favours emissions mitigation could be reduced if ambitions are not increased at the same time. However, under different policy designs, near-term flexibility facilitated by low-cost mitigation options, such as reducing tropical devastation, can free resources to boost investments into research and development and yield improved technologies in the longer term (Szolgayová, Golub and Fuss 2014; Koch *et al.* 2017).

Studies of potential emissions mitigation with international markets indicate that land-use emission mitigation opportunities are undertaken earlier than under independent NDC implementation (Edmonds *et al.* 2021). By valuing land-use change emissions, international carbon markets can also provide incentives to prevent deforestation and increase afforestation and reforestation (Lubowski and Rose 2013; Fujimori *et al.* 2016; Edmonds *et al.* 2019; Piris-Cabezas *et al.* 2019; Edmonds *et al.* 2021; Fuss, Lubowski and Gulub 2021).

The need for an interlinked implementation of climate goals and the Sustainable Development Goals (SDGs) is being increasingly recognized at the political level to enhance synergies and maximize co-benefits. However, tools and approaches to assess and report on sustainable development impacts of article 6 cooperative approaches are lacking and remain an unresolved topic in negotiations (Olsen, Arens and Mersmann 2018; Kachi and Mooldijk 2020). Similarly, there are unresolved issues about how the use of cooperative approaches can be designed to contribute to financing adaptation in vulnerable countries with limited potential for direct participation.

7.2.2. Net-zero implications

For climate change to stabilize, global anthropogenic net emissions must decline to zero (chapter 3). As of 13 September 2021, 50 parties to the United Nations Framework Convention on Climate Change (UNFCCC) have announced net-zero targets, of which five parties have explicitly indicated their intent to use international trading to achieve their net-zero pledges. In addition, a growing number of non-State and subnational actors have made net-zero pledges with trading considered.

When global net carbon emissions start to approach zero, carbon market conditions will be very different to how they are currently. Reducing global carbon emissions to net zero involves reducing carbon emissions to near zero in all sectors in all regions, with emissions that remain positive being offset by so-called negative emissions or carbon dioxide (CO_2) removal (see chapter 3). This suggests that the overall scope for transactions in physical (i.e. tons of CO_2 – tCO_2) will shift towards negative emissions over time.

1 The Asia-Pacific Integrated Model/Computable General Equilibrium (AIM/CGE) 2.0 ADVANCED analysis from the Intergovernmental Panel on Climate Change (IPCC) Special Report on global warming of 1.5°C database estimates a substantially higher value of carbon price (US$73/$tCO_2$) by 2030.

The marginal cost of removing the final tons of CO_2 from some hard-to-abate sectors and regions could become high, implying that transactions that occur could be very valuable.

As discussed in chapter 3, net-zero pledges across countries and organizations have different timings, sectoral coverage, gas coverage and legal statuses. In addition to the challenges discussed in section 5.3, ambiguity of net-zero targets creates additional barriers to using market mechanisms to achieve net-zero targets. Further complexity arises from uncertainty in how to treat the various forms of CO_2 removal (National Academies of Sciences, Engineering, and Medicine 2019) in carbon markets. Some carbon markets (Australia, Colombia, New Zealand and the Republic of Korea, and California, Alberta and China's regional systems) already recognize the role of nature-based removal credits and the long-term importance of bringing emission sources and sinks into a common market framework aimed at achieving net-zero emissions (La Hoz Theuer *et al.* 2021).

To reach global net-zero emissions, countries with emissions greater than zero may need to be balanced by countries with negative emissions. Almost all global net-zero scenarios assessed in the Intergovernmental Panel on Climate Change (IPCC) Special Report on global warming of 1.5°C and Fifth Assessment Report databases have similar marginal costs across world regions, which implicitly assume international cooperation to achieve global net-zero scenarios. Van Soest *et al.* (2021) examined cost-optimal emission phase-out years, without fairness considerations, for both 1.5°C and 2°C targets across six integrated assessment models. Their findings revealed significant variations in the timing in which countries reached net-zero emissions, which indicates that there is potential for using market mechanisms to achieve a global net-zero goal.

The magnitude, value and patterns of emissions trading to reach a global net-zero target are dynamic and depend on several factors, such as the use of CO_2 removal technologies and the timing of reaching net zero in each region (Yu *et al.* 2021). Market size, for example, reaches US$300–400 billion in 2030 and around US$1 trillion in 2050 in scenarios with different net-zero timings. Studies have found that land resources also play an important role (Intergovernmental Panel on Climate Change [IPCC] 2018; Yu *et al.* 2021). Removal credits by technology-based CO_2 removal approaches could play an increasingly important role to achieve net-zero emissions but will be limited by the global removal capacity of these technologies (Allen *et al.* 2020; La Hoz Theuer *et al.* 2021).

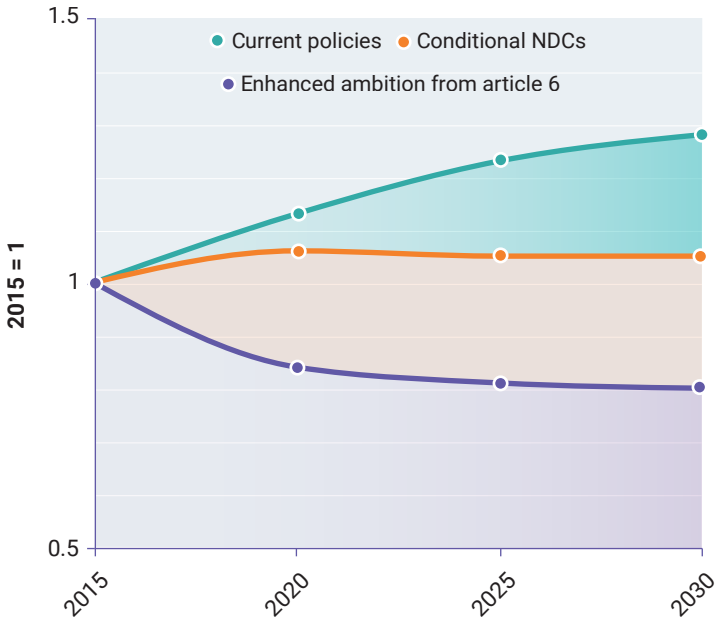
Box 7.2. Enhancing ambition through carbon markets

The main goal of article 6 of the Paris Agreement is to enable parties to increase their ambition towards achieving the agreement's long-term goals. Many researchers have documented that the initial nationally determined contributions (NDCs) are insufficient to be aligned with trajectories to reach the long-term Paris Agreement goals (Fawcett *et al.* 2015; United Nations Environment Programme [UNEP] 2020). However, recent studies by Piris-Cabezas *et al.* (2019) and Edmonds *et al.* (2021) have shown that if the savings from more cost-effective global implementation of NDCs were redeployed towards increased ambition, global emission reductions could be roughly doubled over the next decade at no added cost to parties compared with parties acting alone to implement their commitments (figure 7.2). A major part of the potential ambition increases derives from natural climate solutions, notably forests. Piris-Cabezas *et al.* (2019) estimate that this doubling of climate ambition provides about two thirds of the reductions necessary to get on a 2°C pathway through 2035, closing about half of the current gap without any added cost compared with parties acting independently. Although these calculations are evidently speculative, they highlight both the potential power of carbon markets and how far NDCs need to be enhanced to capture that potential.

Carbon markets do not create ambition for parties. Rather, they create conditions that make enhanced ambitions more attractive through the implicit incentive that emissions mitigation is cost-effective, thereby lowering political and stakeholder resistance to tightening targets and facilitating emission reductions and strengthened targets over time. Experience from the world's current major emissions trading systems supports this approach (Parker 2019). Emissions within trading systems have always fallen faster and at a lower cost than initially expected (Haites 2018). Periods of low prices have been followed by a period of policy reassessment and more ambitious targets, as seen under the European Union Emissions Trading System (EU ETS), the Regional Greenhouse Gas Initiative (RGGI) and California's cap-and-trade programme.

Various explicit mechanisms have been proposed to increase ambition. These include, for example, taxing or 'cancelling' a portion of emission mitigation trades. Under a fixed emissions budget, such schemes could increase overall emissions abatement in the near term. However, according to Piris-Cabezas *et al.* (2019), such an approach applied on a per transaction basis functions as a type of tariff on mitigation exports and hinders the ability of markets to deliver cost-effective mitigation. In the long term, this prevents markets from lowering costs and thereby from facilitating increases in ambition.

Figure 7.2. Increased ambition potentially available from economic efficiency savings available from the ideal implementation of article 6



Source: Adapted from Edmonds *et al.* (2021)

7.3 Using market mechanisms under article 6

Although there is potential for international carbon markets to reduce costs to achieve NDC goals and increase ambition, such potential will remain unknown until important details are determined under article 6. These include establishing robust rules to ensure environmental integrity, including the avoidance of double counting, capacity-building and the management of potential carbon leakages.

7.3.1. Getting the accounting right

To avoid double counting the same emission reductions/removals, the Paris Agreement requires parties participating in article 6.2 cooperative approaches to apply 'corresponding adjustments', i.e. adjusting the balance of their emissions or removals covered by their NDCs to reflect internationally transferred mitigation outcomes.

To ensure environmental integrity under article 6.4, parties are negotiating the application of corresponding adjustments, though their implementation is being complicated by the diverse scope and formulation of the parties' NDC pledges (Greiner *et al.* 2019; Asian Development Bank 2020). Parties have different views on how to define the scope of NDCs, for example, whether to define them in terms of sectors, gases and/or policies and measures. There is also disagreement over whether corresponding adjustments should be required for internationally transferred mitigation outcomes generated outside the scope of selling countries' NDCs.

Many NDCs only include single-year targets, such as 2025 or 2030, which raises the question of how to treat non-compliance years when accounting for internationally transferred mitigation outcomes. Several accounting methods have been put forward to address this challenge (Greiner *et al.* 2019; Lo Re and Vaidyula 2019; Asian Development Bank 2020).

7.3.2. Trade when the basic policy environment lacks a fixed emissions limit

Target setting in the NDCs is still very heterogeneous. Some NDC emission mitigation targets (Graichen, Cames and Schneider 2016; Vaidyula and Hood 2018; Schneider *et al.* 2019) are expressed in non-GHG terms, such as energy efficiency and forestry, while others are framed as intensity targets and/or targets relative to projected business-as-usual (BAU) emissions. Uncertainties in BAU emission projections may weaken the actual ambition of mitigation targets (Hood, Briner and Rocha 2014; Graichen, Cames and Schneider 2016; Hood and Soo 2017; Vaidyula and Hood 2018; and Rocha and Ellis 2020). The scope of NDCs also differ in terms of sectors and GHGs: some cover all sectors and all GHGs, some have more limited coverage and others are unclear and only include indicators, such as policies and measures.

The lack of a fixed emissions limit in many NDCs makes accounting complex. Some researchers have recommended the use of economy-wide absolute emission targets for all NDCs to facilitate robust accounting and reduce complexity

(Graichen, Cames and Schneider 2016; Schneider *et al.* 2019). Although this is not likely to happen anytime soon, parties could be requested to provide clearer and more transparent NDC targets as a potential short-term step. For this purpose, the Katowice Climate Package includes detailed provisions on how countries should describe or clarify the scope of their NCDs. However, some provisions of this package are only mandatory for second and subsequent NDCs or require countries to provide relevant information by 2024 (Schneider *et al.* 2020).

The treatment of mitigation outcomes generated outside the scope of NDCs is an important issue in negotiations. The main advantages of allowing emission reductions outside the scope of NDCs include the full utilization of mitigation potential, reduced mitigation costs, improved data quality of uncovered sectors and the facilitation of their inclusion into future NDCs (Spalding-Fecher 2017; Schneider *et al.* 2020). Disadvantages include disincentives to enhancing the scope of NDCs, a lack of fairness, scrutiny and quality assurance, and double-counting risks (Spalding-Fecher 2017; Howard 2018; Warnecke *et al.* 2018; Hood 2019; Michaelowa *et al.* 2019b; Schneider and La Hoz Theuer 2019; Schneider *et al.* 2020).

Many options have been raised to address the above cited concerns, such as applying corresponding adjustments regardless of NDC scope, bringing relevant sectors and GHGs into the scope of next NDCs, imposing international oversight on the quality of NDCs and restrictions on the number of and deadline for achieving internationally transferred mitigation outcomes, quantifying NDC targets in terms of GHG emissions and specifying the scope of NDCs (Marcu *et al.* 2017; Mizuno 2017; Spalding-Fecher 2017; Howard 2018; Greiner *et al.* 2019; Warnecke *et al.* 2018; Schneider and La Hoz Theuer 2019; Schneider *et al.* 2020). Care needs to be taken in framing such offset programmes so that macroscale outcomes deliver the intended aggregate emissions mitigation. Calvin *et al.* (2015) showed that well-intentioned offset programmes have the potential to inadvertently lower overall ambition.

Although some of the proposed options are ideal in theory, they may lack political feasibility. Many parties have been concerned by potential limitations on article 6 participation and threats to the bottom-up nature of NDCs.

7.4 The way forward

One possible outcome of COP26 is that initial article 6 rules will be agreed upon, with the intention that they be improved gradually over time and strengthened through other market arrangements. This has been the case for other parts of the Paris Agreement. The Clean Development Mechanism (CDM) could be a useful reference in this regard, as despite receiving many criticisms, it has played a crucial role in facilitating or enhancing many countries' mitigation efforts. In many developing countries, the capacities developed through participation in the CDM (e.g. to measure and verify emissions) have helped them prepare their initial NDCs. In some countries, such as China and the Republic of Korea, participation in the CDM provided valuable lessons and capacities for establishing domestic carbon markets.

Success of the Paris Agreement market arrangements will require the establishment of solid managerial, technical and institutional capacity. Parties participating in article 6.2 will need to jointly agree on a cooperative framework for emission reductions, decide how to establish domestic modalities and procedures to complete the authorization, quantification, monitoring, verification and reporting of internationally transferred mitigation outcomes and make corresponding adjustments after the transfer of these outcomes (World Bank 2021b). Participation in the article 6.4 mechanism will be more demanding for host parties than the CDM, as it will involve documenting transparent reductions, as well as showing additionality to their NDCs and supporting sustainable development.