
CLIMATE AUCTIONS

A Market-Based Approach to National Climate Action



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INTRODUCTION

With the Paris Agreement and most of its detailed rulebook now finalized, countries and subnational actors face the challenge of translating climate targets and strategies into action and determining how to finance these actions. There is a particular need for innovative approaches to deliver finance at the scale and pace necessary to limit global temperature rise to well below 2°C. However, evidence is growing that up-front grants and loans—the dominant instruments for allocating limited public concessional funding for climate mitigation—are not optimal to support large-scale decarbonization. As the recent special report of the Intergovernmental Panel on Climate Change has highlighted, *climate auctions* represent one of the most promising new approaches to mobilize finance in support of Nationally Determined Contributions (NDCs).¹ This policy brief presents ways in which climate auctions can be applied at the national level to cost-effectively support countries in achieving their climate targets.

For decades, public funders have relied primarily on grants and loans to allocate public subsidies for climate and development projects internationally. However, these instruments can be costly to administer, deficient at leveraging private investment, and often unsuccessful in delivering intended results. Climate auctions—a 21st-century alternative—competitively allocate public funding to commercially developed mitigation projects, ensuring both transparency in selection processes and efficiency in leveraging investment. Climate auctions offer successful project developers and commercial entities a guaranteed price for verified emission reductions, which these entities can then use to raise additional finance. In addition, climate auctions only disburse funding upon delivery of mitigation results, reducing the risk for the taxpayer. At a national level, climate auctions can help countries achieve their NDCs and other climate targets in the short term while supporting carbon pricing and greater climate ambition in the medium to long term.²

This is not an untested concept. Climate auctions have been piloted successfully at both the international and national levels, and in the era of NDC implementation, they also represent an effective tool to raise climate ambition. While most countries have outlined priority sectors in their NDCs, many are still identifying specific mitigation activities as well as finance needs and strategies.³ Climate auctions can support countries in developing a pipeline of bankable, cost-effective projects for meeting climate targets, while also attracting limited international public funding. For countries seeking to raise their NDC ambition, climate auctions offer a stepping-stone to carbon pricing and regulation.

This brief explores *why* climate auctions are an effective tool for achieving climate outcomes, focusing on how developing country policymakers can utilize auctions to accelerate NDC implementation and raise climate ambition. It then outlines *how* climate auctions work and *where* they are most effective in achieving climate outcomes.

WHY CLIMATE AUCTIONS

Climate auctions resolve challenges for national policymakers seeking to achieve their climate targets, for international and domestic public funders seeking to effectively allocate limited resources for climate outcomes, and for project developers and commercial entities seeking to invest in clean technologies.

NATIONAL POLICYMAKERS

Climate auctions can help national policymakers **achieve mitigation results in line with their NDCs**, while also laying the groundwork for increased climate ambition over time. Specifically, climate auctions provide direct incentives to kick-start mitigation investments in key sectors. As auctions rely on limited public funding, they can also serve as a **bridge to implement carbon pricing or other regulations**, which can be crucial for unlocking economy-wide climate action.

Climate auctions can facilitate NDC implementation in four ways:

First, by providing direct support to close cost viability gaps and de-risk investments, climate auctions can attract commercial entities to undertake mitigation projects. Leveraging the private sector's strength in seeking out and structuring bankable and cost-effective projects **helps national policymakers build viable project pipelines to implement their NDCs**. The pipeline of bankable projects identified through the auction process extends beyond auction winners and can be utilized for further results under subsequent carbon pricing policies. By engaging the private sector, climate auctions also contribute to developing an ecosystem of support for mitigation activities.

Second, **climate auctions can help build private sector capacity and willingness to engage in carbon pricing schemes**. In some sectors, introducing effective carbon pricing or other regulatory policies may be difficult due to industry opposition. In the short term, climate auctions provide a direct incentive to stimulate investments in these difficult sectors. This initial support provides industries the chance to

build capacity and make the necessary investments before they are subject to carbon pricing or mandatory abatement policies. In some cases, repeated auctions and greater uptake of mitigation activities will also drive down the cost of the mitigation technology, paving the way for further investments and decreased compliance costs in a future carbon pricing or regulatory scheme. Finally, auctions can also send a price signal to policymakers seeking to design effective carbon pricing or other emissions regulations.

Third, **climate auctions can leverage and strengthen market infrastructure**, where applicable, to catalyze and produce emission reductions for achieving climate targets. Irrespective of the evolution of future emissions trading schemes, using existing government focal points and globally agreed methodologies for calculating and verifying emission reductions bypasses the need to design monitoring and evaluation systems from the ground up. Under the Clean Development Mechanism (CDM), 106 developing and emerging economies established national authorities for coordinating, approving, and verifying the results of projects that generate carbon offsets.⁴ In addition, the CDM and other international carbon market offset systems, including the Verified Carbon Standard (VCS), Gold Standard (GS), and Climate Action Reserve (CAR), have generated methodologies for measuring mitigation results across a range of sectors, offering ready-made systems for monitoring, reporting, and verifying results under a climate auction scheme. Climate auctions can also strengthen carbon market infrastructure (e.g., by utilizing verification agents that confirm reductions have occurred), further laying the necessary groundwork for introducing more economy-wide carbon pricing policies.

Fourth, while retaining the strengths of a market-based mechanism, **climate auctions can align with and channel support for national development**. For example, countries can choose to hold an auction covering specific subsectors or technologies,

thus directing commercial investment into areas prioritized for economic development. The projects supported through climate auctions can also result in other development outcomes, like local enterprise development, job creation, or health benefits.

PUBLIC FUNDERS: INTERNATIONAL AND DOMESTIC

Public funders play a critical role in de-risking climate investments and supporting projects that may not yet be commercially viable.¹ However, public funders also face the challenge of determining how best to use their limited resources to help countries achieve their NDCs and other climate goals. To maximize impact, public funders must 1) reduce the time and cost of “picking winners” or selecting funding recipients; 2) determine the level of funding needed to generate mitigation results without crowding out private investment; 3) leverage private investment, thus avoiding overreliance on public resources; and 4) ensure that projects receiving funding deliver lasting results.

While public funders aim to **minimize resources needed to pick winners**, the process of eliciting and reviewing funding proposals can be time consuming, opaque, and costly. Funders have to choose which projects to support based on often-competing selection criteria, leading to politically fraught and lengthy selection processes. Climate auctions resolve this challenge using competitive tendering to transparently allocate funding to the projects that can reduce emissions at the lowest price. As with renewable energy auctions, these auctions can be designed to take place online over the course of hours as opposed to the weeks, months, and sometimes years required to allocate funding in the current system.

Having selected recipients, public funders must also **determine the right level of subsidy** to achieve climate or development results without crowding out private investment.⁵ To do so, public funders typically make a case-by-case determination of the level of support needed to make projects commercially attractive while minimizing public outlays. Setting the public subsidy at an appropriate level is resource intensive, and funders looking across a portfolio of grants they provided for climate mitigation would have difficulty assessing whether they truly delivered the best value for their money. Climate auctions, through competitive tendering, transparently reveal the minimum amount of finance required to make a mitigation project commercially viable. Finally, climate mitigation finance can be denominated in the key unit of interest: tons of emissions reduced.

Rapid progress toward achieving NDCs requires that limited public funding must **unlock large volumes of private investment**. Public climate finance has failed to leverage significant private investment (according to the Organisation for Economic Co-operation and Development, the US\$81.4 billion of public climate finance flowing from developed to developing countries in 2013 and 2014 mobilized only US\$29.5 billion in private capital) and can even act as a deterrent to innovation.⁶ Instead, climate auctions employ results-based payments, providing a steady stream of revenues, thus allowing developers to attract additional lower-cost commercial finance. This not only lowers the required outlay of public finance but can also significantly lower the abatement cost of capital-intensive projects by reducing overall costs of capital. Additionally, competitive tendering can incentivize private sector innovations and cost reductions, further reducing the required public funding needed to make a project bankable.

¹ Public funders include both international funders such as bilateral development agencies and multilateral climate funds, as well as domestic sources such as climate and environment funds.

Finally, public funders must **ensure that projects deliver lasting results**. Funders want projects to be successful, but the prevailing international climate finance model is for donor countries (acting via bilateral agencies or multilateral climate funds) to disburse funds based on complex grant applications with no guarantee that the intended climate results will materialize. When funders allocate grants prior to project completion, they must conduct due diligence to understand and mitigate risks that projects won't deliver intended results.⁷ Funders also want projects to become commercially viable and outgrow reliance on public funding. In up-front grant-based systems, public funders often find themselves in the position of providing continued funding if they wish to see continued mitigation. Climate auctions, by providing results-based payments, address this challenge.⁸ Auction winners cannot redeem their price guarantees until their project's successful results are verified, which reduces delivery risk for funders. Auctions also help build carbon market infrastructure, both by developing a pipeline of projects and a stable demand signal over time. As these markets are established, with sufficiently high and stable carbon pricing, public funders can phase out their support and instead allow the market to take over the role of incentivizing low-carbon investment.

PROJECT DEVELOPERS AND COMMERCIAL ENTITIES

Project developers and commercial entities assessing mitigation opportunities must **realize a favorable risk-return profile** before deciding to invest.⁹ Particularly in developing economies, climate projects often face barriers to investment due to their high (perceived) risk, uncertain returns, or capital intensity that entails long payback periods.¹⁰ While up-front grants lower the capital cost of projects, they often stop short of addressing the revenue risk that makes many projects unviable. At a minimum, climate auctions' results-based payments provide the revenue certainty commercial developers need to make projects bankable. A commercial developer holding a price guarantee from a public fund (see next section for mechanics) can take this to a bank as collateral to secure up-front financing, just as it does with power purchase agreements in the case of renewable energy projects.

The procedure for securing public subsidy via a climate auction can also be far more transparent and less bureaucratic than up-front grant and concessional loan processes. Commercial project developers have a simple, clear set of requirements to receive their performance-based payment upon project completion. In addition, where a competitive market for emission reductions exists, climate auctions offer potentially higher returns by providing the option to sell to the market.

EXHIBIT 1

How Climate Auctions Resolve Policy, Funding, and Investment Challenges










NATIONAL POLICYMAKERS



PUBLIC FUNDERS



PROJECT DEVELOPERS AND COMMERCIAL ENTITIES

Objective	Challenges of Current System	Climate Auctions Solution
 Achieve mitigation results	<ul style="list-style-type: none"> Complex process for developing and implementing project pipelines in line with NDCs 	<ul style="list-style-type: none"> Auctions develop a pipeline of bankable projects Auctions utilize existing market infrastructure to rapidly achieve results
 Ratchet up climate ambition through effective carbon pricing	<ul style="list-style-type: none"> Difficulty introducing carbon pricing 	<ul style="list-style-type: none"> Auctions provide direct support for mitigation to ease transition to regulation Auctions offer the learning opportunity to strengthen carbon market infrastructure
 Minimize resources needed to pick winners	<ul style="list-style-type: none"> Reliance on time-intensive, costly processes for selecting projects 	<ul style="list-style-type: none"> Transparent and competitive auctions award funding to projects that deliver emission reductions at least cost
 Determine the right level of subsidy	<ul style="list-style-type: none"> Subsidy determined via inefficient negotiation Subsidy can crowd out private investment 	<ul style="list-style-type: none"> Auctions reveal the minimum amount of finance required to make a project viable
 Leverage private investment	<ul style="list-style-type: none"> Poor public/private leverage ratio 	<ul style="list-style-type: none"> Results-based payments de-risk investments, crowding in commercial finance Competitive auctions can help drive down abatement costs, lowering the required subsidy over time
 Ensure project delivers results	<ul style="list-style-type: none"> No guarantee public funding achieves impact 	<ul style="list-style-type: none"> Results-based payments ensure public funding is disbursed only if emission reductions are achieved
	<ul style="list-style-type: none"> No assurance commercial investments continue in absence of public funding 	<ul style="list-style-type: none"> Auctions develop a pipeline of projects and stabilize demand for a carbon market, enabling countries to move away from public funding
 Realize favorable risk-return profile	<ul style="list-style-type: none"> Grants lower investment costs, but do not lower risk or increase returns 	<ul style="list-style-type: none"> Results-based payments provide steady revenue and allow developers to attract commercial finance

HOW CLIMATE AUCTIONS WORK

As a market-based and transparent approach to allocating public climate finance, climate auctions offer a cost-effective and low-risk alternative to traditional grants and loans. Climate auctions provide project developers and commercial entities a guaranteed price for emission reductions or carbon credits generated from clean technologies. These price guarantees (essentially a contract between a project developer and a public funder) guarantee both a buyer and a fixed price for emission reductions. While the public funder acts as a buyer of last resort, project developers also have the option to sell emission reductions to the market (in cases where a national or international market for emission reductions exists), therefore minimizing reliance on public resources; in fact, if project developers sell credits to the market, public resources can be redirected to other climate initiatives, thus catalyzing several projects or outcomes with the same funds.

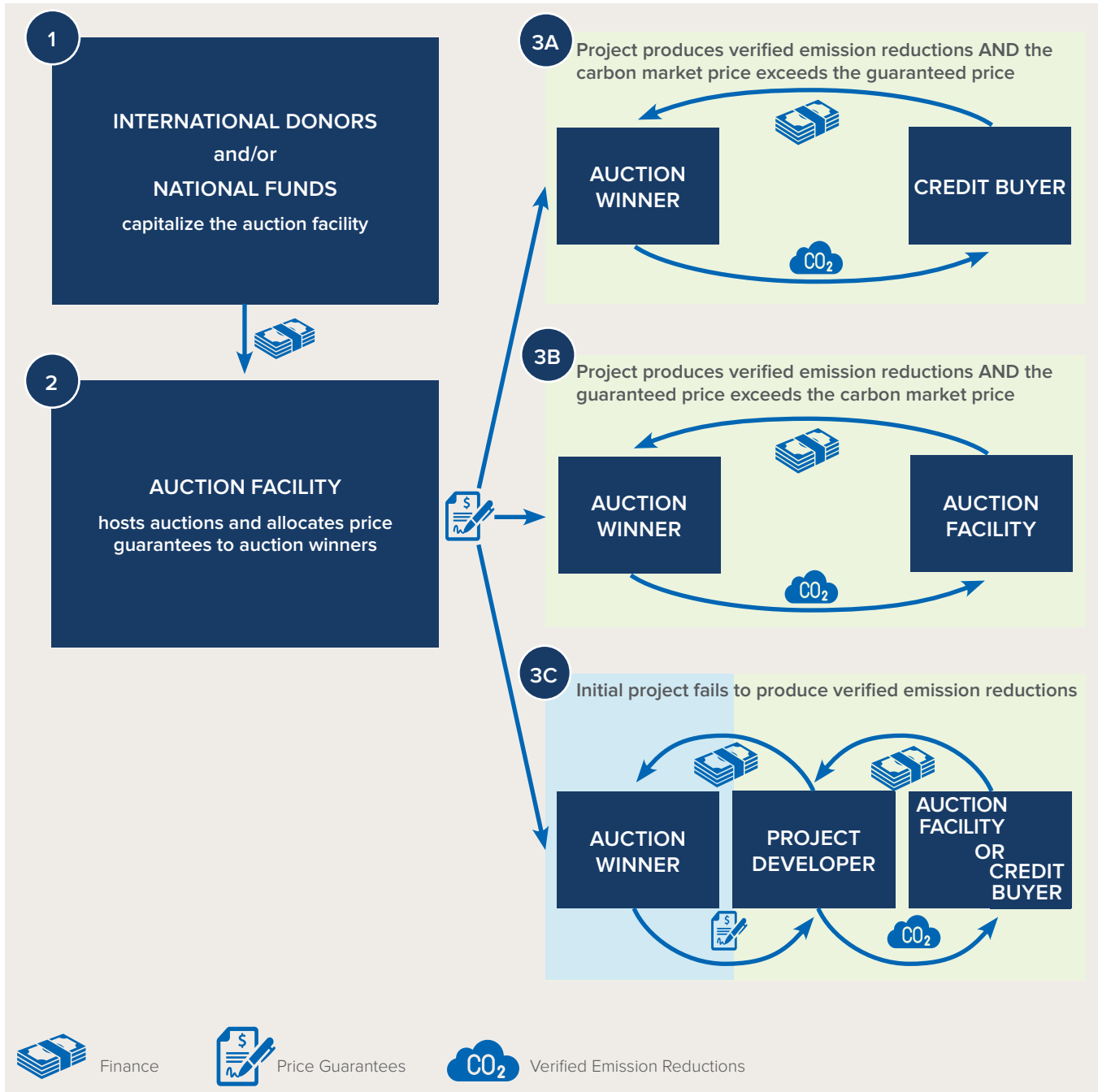
Exhibit 2 illustrates how climate auctions work:

- 1.** International and/or national public funders (including bilateral development agencies, multilateral climate funds, and national climate or environment funds) **allocate funding to the auction facility.**ⁱⁱ Public funders do not disburse funding up front, but rather commit to pay a fixed price per ton of carbon dioxide equivalent upon verification of emission reductions.
- 2.** The auction facility, which may be hosted by a national government or by an international institution, then holds an auction. Through competitive bidding, **project developers and commercial entities compete to receive a share of the funding**, thus revealing the minimum price at which they can deliver emission reductions. Auction winners pay a premium price to receive price guarantees, which provide the right but not the obligation to redeem emission reductions at a fixed price. This premium can be used to administer the facility, and/or used to expand the size of the subsidy program.
- 3. Auction winners then develop mitigation projects**, generating third-party verified emission reductions. If the project succeeds in generating emission reductions, the project developer can either (a) sell the emission reductions to the market (if the market price exceeds the guaranteed price) or (b) sell to the auction facility (if the market price remains below the guaranteed price). If the project does not produce verified emission reductions the project developers could (c) sell the price guarantee to other project developers and commercial entities.

ⁱⁱ This funding does not need to be transferred to the auction facility upon signature of the contribution agreement but can rather be contributed in arrears at the point of redemption.

EXHIBIT 2

The Climate Auction Model: A Three-step Process



The climate auction model can be adapted and simplified for various country contexts. For example, where a carbon market does not exist, auctions can still allocate price guarantees, but these guarantees would not offer the option to sell to the market. Similarly, the auction facility may choose to remove the tradability of price guarantees, meaning that auction winners would not sell guarantees to other project developers or commercial entities.

Climate auctions are a relatively new instrument but have a proven track record. At the international level, the World Bank's Pilot Auction Facility for Methane and Climate Change Mitigation (PAF) allocated nearly US\$54 million in climate finance to mitigate up to 21.6 MtCO₂e over three climate auctions held between July 2015 and January 2017. Supported by funding from Germany, Sweden, Switzerland, and the United States, the PAF was designed to stimulate private finance flows to projects reducing methane and nitrous oxide emissions in developing countries. The PAF auctions resulted in a net benefit of US\$2.10/tCO₂e for methane

emission reductions from waste and US\$1.80/tCO₂e for nitrous oxide emission reductions from chemical and fertilizer plants. In total, the auctions attracted 50 project developers and commercial entities from 23 countries, demonstrating the effectiveness of the approach in catalyzing private finance for mitigation.

At a domestic level, the United Kingdom's Contracts for Difference (CfD) programme has used a similar approach to support low-carbon energy technologies. Whereas climate auctions disburse price guarantees for carbon credits, CfD offers low-carbon generators a "top-up" between the market electricity price and a minimum power price determined through an auction. For each CfD auction, the UK government sets a budget for each "pot," and only technologies within the same pot compete, ensuring that less mature technologies receive support and move down the cost curve. As of January 2019, CfD has hosted two auctions rounds, which issued contracts to over 5 GW of low-carbon power capacity.^{iii,11}

ⁱⁱⁱ Similarly, Australia has utilized auctions to purchase emission reductions through its AU\$2.55 billion Emissions Reduction Fund. While this scheme differs from the auction model described above, including that it offers purchase agreement contracts instead of price guarantees, it is notable that the Australian Government has contracted for significant abatement—193 MtCO₂e at an average price of AU\$12/tCO₂e as of December 2018—through an auction mechanism.

WHERE CLIMATE AUCTIONS WORK

With a track record in cost-effectively supporting renewable energy, methane, and nitrous oxide projects, climate auctions have the potential to support a range of additional mitigation activities. In considering climate auctions as a tool to meet NDC targets, national policymakers should take into account the conditions under which climate auctions work most effectively:

1. Because payments are disbursed only after a project produces verified emission reductions, the ability to **effectively monitor, report, and verify (MRV)** climate outcomes is a mandatory condition for utilizing climate auctions.^{iv} Initially, selection of appropriate activities can draw on accepted MRV frameworks established under existing offsetting programs (the Clean Development Mechanism [CDM], Verified Carbon Standard [VCS], Gold Standard, etc.). As national MRV capabilities are built, the auction model can also extend to reduce emissions from activities thus far underrepresented in offsetting schemes.
2. Climate auctions are most effective where **insufficient or uncertain revenue is the key barrier to commercial investment**. The climate auction model leverages commercial investment by reducing revenue risk—closing viability gaps and providing the revenue certainty investors may need to access commercial lending. However, it may not be suitable for activities that face institutional or technical barriers, or activities characterized by high uncertainty in future costs (e.g., projects with uncertain operating costs such as large-scale biomass projects with unpredictable future fuel costs).
3. A successful auction requires **competition among commercial actors willing to pursue mitigation projects**.^v Auctions can be designed to enhance competition (e.g., by broadening project eligibility) or can be complemented by awareness-raising and capacity-building measures targeting potential bidders prior to issuing the tender to increase participation in the auction.
4. Climate auctions should generally target activities with **high (long-term) abatement potential**. Targeting these high-emission activities could have several benefits, including better distributing the administrative costs of the auction facility, and leveraging cost reductions and learning in key sectors.

Finally, climate auctions can have a high impact in sectors covered by carbon markets. Competitive carbon markets allow auction winners to sell emission reductions to the market instead of redeeming their price guarantees, saving the auction facility from disbursing public funds. With strong enough carbon prices, carbon markets also can act as a natural sunset mechanism for public support. However, it is important to note **the existence of a carbon market is not necessary for climate auctions**. Even in the absence of a carbon market (i.e., in the case where the auction winners would always sell emission reductions to the auction facility), climate auctions still offer the most cost-effective means for achieving mitigation outcomes.

^{iv} This brief focuses on climate outcomes (i.e., tCO₂e) as the result to trigger payment disbursement. However, climate auctions may allocate finance on the basis of other metrics (e.g., reduction in energy usage per square meter of building space).

^v Some activities that inherently have less competition (e.g., natural monopolies in electricity transmission or public transport) are therefore generally not suitable for climate auctions.

Given the four conditions outlined above, the table below presents a menu of NDC implementation activities that would likely be suited to climate auctions. These activities represent those most likely to attract commercial interest in emerging economies, most often prioritized in countries' NDCs, and most likely to achieve significant abatement potential.^{vi,12}

^{vi} To generate this selection, an initial list of activities was developed by assessing the projects registered using existing CDM and VCS methodologies. This approach narrowed the landscape of mitigation activities to those with easily implemented MRV frameworks and those likely facing a revenue gap as the barrier to investment. This list was then further narrowed by qualitatively assessing the extent of private sector participation, which removed activities typically undertaken by natural monopolies. Finally, the remaining subset of mitigation activities was evaluated against the investment potential in emerging economies, the priority areas identified in developing countries' NDCs, as well as the abatement potential as outlined in the latest IPCC assessment report.

EXHIBIT 3

NDC Implementation Activities Suited to Climate Auctions

Activity	Rationale for auction suitability
<p>Buildings</p> <p>New green residential buildings</p>	<ul style="list-style-type: none"> Green buildings represent a significant abatement and investment opportunity in rapidly growing economies experiencing high rates of urbanization. The buildings sector is identified as a focus area in 74 NDCs. To achieve adequate private sector participation and scale of investment needed to minimize transaction costs, auctions could target real estate developers in urban areas.¹³
<p>Industry</p> <p>Waste heat recovery in industrial plants (e.g., steel, cement)</p> <p>Fuel switching to renewable sources for self-consumption in industrial plants (e.g., steel, cement, pulp and paper, refineries, aluminum)</p> <p>Energy efficiency measures in industrial plants (e.g., steel, cement, pulp and paper, refineries, aluminum)</p> <p>Clinker substitution in cement facilities</p> <p>Nitrous oxide (N₂O) reduction in nitric acid production facilities</p>	<ul style="list-style-type: none"> Industry is the second-largest source of direct GHG emissions, with energy-related industrial emissions representing the largest abatement potential. Industry is identified as a focus area in 147 NDCs. Given the heterogeneity of industries, auctions may need to be industry specific. Therefore, countries with large industries could target one specific application in a climate auction. High mitigation potential given the global warming potential of nitrous oxide.
<p>Power</p> <p>Utility-scale renewable electricity (wind, solar PV, CSP, geothermal)</p>	<ul style="list-style-type: none"> The power sector represents the largest source of emissions in most countries and is identified as a priority area in 138 NDCs. Decarbonizing the power sector can also lower emissions in other end-use sectors (e.g., transport). While currently, renewable energy auctions award results-based payments for electricity generated (\$/kWh), the climate auction model awarding payments for emission reductions can also be used to incentivize clean power investments.
<p>Transport</p> <p>Fuel efficiency improvements for road transport</p> <p>Fuel switching (biofuels or electricity) for road transport</p>	<ul style="list-style-type: none"> Due to rapidly growing demands for transport services in developing countries, the sector has high mitigation potential. Transport is identified as a focus area in 147 NDCs. Auctions could be aimed at commercially owned fleet operators in order to achieve adequate competition levels and reduce costs associated with MRV.
<p>Waste</p> <p>Landfill waste to energy (Landfill gas to energy, municipal solid waste to energy)</p> <p>Wastewater methane capture to energy</p> <p>Landfill composting</p>	<ul style="list-style-type: none"> The high global warming potential of methane offers high mitigation potential, and urbanization trends are placing greater pressure on developing sustainable waste management systems. Waste is also identified as a focus area in 149 NDCs. Waste projects, particularly landfill waste to energy, have a strong proven track record in the PAF.

CONCLUSION

This policy brief has sought to provide information for countries wishing to take advantage of this efficient policy tool by explaining the mechanics of climate auctions, the general conditions under which they work best, and the kinds of mitigation activities for which they are particularly well-suited.

Climate auctions represent an innovative tool to spur private investment in low-carbon activities in the near term, while laying the groundwork to mobilize finance at the scale and pace needed to meet longer-term climate and development goals. In particular,

climate auctions transparently allocate public finance to the most cost-competitive mitigation projects, thereby ensuring greater climate impact of scarce public funds. At the same time, climate auctions help strengthen carbon market readiness—including through the development of MRV frameworks, by stabilizing carbon prices in nascent markets, or by building capacity of project developers to undertake mitigation activities. In doing so, climate auctions can act as a transition tool to establishing the regulatory frameworks that can enable achievement of more ambitious, self-sustaining climate outcomes over time.

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ENDNOTES

¹ *Planning for NDC Implementation Quick Start Guide and Reference Manual*, The Climate Development and Knowledge Network, 2016, <https://www.cdkn.org/ndc-guide/wp-content/uploads/2016/12/Quick-Start-Guide-final-pdf.pdf>; H. de Coninck, A. Revi, M. Babiker, P. Bertoldi, M. Buckeridge, A. Cartwright, W. Dong, J. Ford, S. Fuss, J.C. Hourcade, D. Ley, R. Mechler, P. Newman, A. Revokatova, S. Schultz, L. Steg, T. Sugiyama, 2018, “*Strengthening and implementing the global response.*” In: *Global warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty* [V. MassonDelmotte, P. Zhai, H. O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J. B. R. Matthews, Y. Chen, X. Zhou, M. I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, T. Waterfield (eds.)]. In Press. https://www.ipcc.ch/site/assets/uploads/sites/2/2018/11/SR15_Chapter4_Low_Res.pdf; Shelagh Whitley, Marigold Norman, and Nella Canales Trujillo, *Mobilising private climate finance in lower-income countries*, 2016, <https://www.odi.org/sites/odi.org.uk/files/resource-documents/10535.pdf>.

² *The Potential for Climate Auctions as a Mechanism for NDC Implementation*, Vivid Economics, December 2018, <https://doi.org/10.1596/31058>.

³ *Planning for NDC Implementation Quick Start Guide and Reference Manual*, The Climate Development and Knowledge Network, 2016, <https://www.cdkn.org/ndc-guide/wp-content/uploads/2016/12/Quick-Start-Guide-final-pdf.pdf>.

⁴ “Clean Development Mechanism: Designated National Authorities,” UN Framework Convention on Climate Change, accessed December 17, 2018, <https://cdm.unfccc.int/DNA/index.html>; *Good-Bye Kyoto: Transitioning away from Offsetting after 2020*, Carbon Market Watch, 2017, https://carbonmarketwatch.org/wp-content/uploads/2017/04/Good-bye-Kyoto_Transitioning-away-from-offsetting-after-2020_WEB_1final.pdf.

⁵ *Strategic Use of Climate Finance to Maximize Climate Action: A Guiding Framework*, World Bank Group, 2018, <https://openknowledge.worldbank.org/handle/10986/30475>.

⁶ *Climate finance from developed to developing countries: 2013-17 public flows*, Organisation for Economic Co-operation and Development, 2018, <http://www.oecd.org/environment/cc/Climate-finance-from-developed-to-developing-countries-Public-flows-in-2013-17.pdf>.

⁷ “Project Preparation,” Green Climate Fund, accessed December 19, 2018, <https://www.greencclimate.fund/gcf101/funding-projects/project-preparation>.

⁸ *Results-Based Climate Finance in Practice: Delivering Climate Finance for Low-Carbon Development*, World Bank Group, Frankfurt School of Finance and Management, 2017, <https://openknowledge.worldbank.org/handle/10986/26644>.

⁹ Barbara Buchner, Morgan Herve-Mignucci, Chiara Trabacchi, Jane Wilkinson, Martin Stadelmann, Rodney Boyd, Federico Mazza, Angela Falconer, Valerio Micale, *The Global Landscape of Climate Finance 2013*, 2013, <https://climatepolicyinitiative.org/wp-content/uploads/2013/10/The-Global-Landscape-of-Climate-Finance-2013.pdf>.

¹⁰ Shilpa Patel, *Climate Finance: Engaging the Private Sector*, International Finance Corporation, 2011, https://www.ifc.org/wps/wcm/connect/5d659a804b28afe9978f908d0338960/ClimateFinance_G20Report.pdf?MOD=AJPERES.

¹¹ “Contracts for Difference (CfD) Allocation Round One Outcome,” UK Department for Business, Energy & Industrial Strategy, accessed January 25, 2019, <https://www.gov.uk/government/publications/contracts-for-difference-cfd-allocation-round-one-outcome>; “Contracts for Difference (CfD) Second Allocation Round Results,” UK Department for Business, Energy & Industrial Strategy, accessed January 25, 2019, <https://www.gov.uk/government/publications/contracts-for-difference-cfd-second-allocation-round-results>; “Auction December 2018,” Australian Government, Clean Energy Regulator, accessed January 24, 2019, <http://www.cleanenergyregulator.gov.au/ERF/Auctions-results/december-2018>.

¹² “CDM Pipeline,” UNEP DTU Partnership, accessed December 10, 2018, <http://www.cdmpipeline.org/>; “Project Database,” Verra, accessed December 10, 2018, <https://www.vcsprojectdatabase.org/>; Tom Kerr, Aditi Maheshwari, and John Sottong, *Climate investment opportunities in emerging markets: An IFC analysis*, International Finance Corporation, http://www.ifc.org/wps/wcm/connect/2b169cd5-e5c2-411a-bb71-be1eaff23301/3503-IFC-Climate_Investment_Opportunity-Report-FINAL-11_7_16.pdf?MOD=AJPERES; IPCC. (2014). *Climate Change 2014, Mitigation of Climate Change (WGIII)*. In *Fifth Assessment Report of the Intergovernmental Panel on Climate Change*. Cambridge, UK; New York, NY: Cambridge University Press.

¹³ *Study on using the climate auction model to catalyse energy and resource efficient buildings*, Carbon Trust and The World Bank, https://www.pilotauctionfacility.org/sites/paf/files/24684_Climate_Auction_Mechanism_Web.pdf.



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