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Evaluation of the Pilot Auction Facility for Methane and Climate Change Mitigation

Final Report

Ipsos MORI and SQ Consult

DISCLAIMER: This report was prepared independently by Ipsos MORI and SQ Consult at the request of the World Bank to assess The Pilot Auction Facility for Methane and Climate Change Mitigation (PAF). The findings, interpretations, and conclusions expressed in the report do not reflect the views of the World Bank.

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List of Acronyms

BMU	German Federal Ministry for the Environment, Nature Conservation, and Nuclear Safety
CDM	The Clean Development Mechanism
CERs	Certified Emission Reduction units
Citi	Citibank N.A.
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
COP	Conference of the Parties
EHS	Environment, Health and Safety
EPAF	Environmental Price Assurance Facility
ER	Emission Reductions
ERPA	Emission Reductions Purchase Agreements
ETS	Emission Trading Systems
GHGs	Greenhouse Gases
GS	Gold standard
G8	Group of Eight
HFC	Hydrofluorocarbons
ICAO	International Civil Aviation Organization
IEG	Independent Evaluation Group
JI	Joint Implementation
KPC	Kommunkredit Public Consulting
MRV	Monitoring, Reporting and Verification
NACAG	Nitric Acid Climate Action Group
NACAP	The Nitric Acid Climate Auctions Program
NDCs	Nationally Determined Contribution
NEFCO	Nordic Environment Finance Corporation
NorCAP	Carbon Procurement Facility
NERA	NERA Economic Consulting (Auction Manager)
OECD	
DAC	The Organization for Economic Co-operation and Development's Development Assistance Committee
PAF	Pilot Auction Facility for Methane and Climate Change Mitigation
PAFERNs	Pilot Auction Facility Emission Reductions Notes
PMR	Partnership for Market Readiness
RFP	Request for Proposal
SDGs	Sustainable Development Goals
SECO	Swiss State Secretariat for Economic Affairs
ToC	Theory of Change
UNEP	United Nations Environment Program
UNFCCC	United Nations Framework Convention on Climate Change
VCS	Verified Carbon Standard
WBG	World Bank Group

Executive Summary

The Pilot Auction Facility for Methane and Climate Change Mitigation (PAF) is a pay-for-performance mechanism which uses auctions to allocate scarce public funds to stimulate investment in projects that reduce greenhouse gas emissions while leveraging private sector financing. The PAF is hosted by the World Bank Group and is funded by Germany, Sweden, Switzerland (through a joint contribution of the State Secretariat of Economic Affairs (SECO) and the Climate Cent Foundation), and the United States. PAF Contributors have provided US\$53 million in total resources. The establishment of the facility was an outgrowth of the Methane Finance Study Group Report, delivered to the G8 in 2013 as a result of its request for innovative pay for performance approaches to addressing methane. Three auctions have been conducted to date, one each in 2015, 2016, and 2017.

The PAF provides price guarantees in the form of put options (Pilot Auction Facility Emission Reduction Notes, PAFERNs), which provide holders the right but not the obligation to sell future emission reductions at a pre-determined price. The PAF allocates these put options and sets the guaranteed price level through an auction, revealing the true abatement cost of the projects while also ensuring that only the most cost-effective projects receive financing. Once these options reach maturity, option holders may present eligible carbon credits and redeem their options at the guaranteed floor price. The ability to choose whether or not to redeem depending on the market context and their project circumstances, is designed to give flexibility to the option holder.

The primary objective of the PAF is to demonstrate a new, cost-effective climate finance mechanism that incentivizes private sector investment and action on climate change in developing countries by providing a guaranteed floor price on GHG reduction credits. It aims to demonstrate that auctions can be used as an efficient way of allocating scarce public resources for climate change mitigation and to providing a long-term price signal for future mitigation projects.

Evaluation scope and methodology

This Formative Evaluation addresses the evaluation questions relating to the OECD Development Assistance Committee (DAC) criteria of Relevance, Efficiency and Effectiveness, and explores early impacts to the extent feasible at this point in implementation.¹ This evaluation also analyses the operational processes of the PAF as part of the assessment of PAF's efficiency, and provides recommendations and lessons learned for any future PAF-like instrument. The evaluation covers the activities carried out within the period from September 2014 to December 2017, encompassing three auction rounds and two redemption windows.

The approach to carry out this assignment has followed a theory-based evaluation, gathering and/or analyzing data via the following tools: analysis of monitoring information; wider literature review; 27 in-depth interviews and a survey to auction participants. PAF's contribution to the emission reductions achieved has been estimated based on self-reported data from successful bidders.

¹ The bulk of activities to promote replication started in 2018. Impact and sustainability, hence, are assessed to a limited extent.

Main findings and conclusions

This evaluation has found that PAF was well received by market participants and expert stakeholders, and donors were also satisfied with its design. Participation levels in the three auctions (which overall met the expected levels), confirmed its relevance for participants as a facility to finance their mitigation efforts. The PAF was strongly aligned with the objectives of both the WBG and its donors at the time of funding commitment, though current priorities for some donors have evolved. Regardless, donors consider that the PAF concept has been proven as an efficient way of deploying funding.

The PAF successfully tested different auction formats and generated lessons learned that will inform future efforts for scaling-up and replicating the concept. While it only targeted stranded projects, the model could potentially be applied to new projects too. The future applicability of its approach is less clear, however, due to short-(until 2020) and long-term (post 2020) market uncertainty (but not due to issues with the PAF design).

In total 50 bidders participated in PAF auctions (14 in more than one auction) as a result of an effective outreach effort, with projects located in several countries in Latin America and Asia. PAFERs equivalent to 4.7 million tCO₂e were redeemed across the first and second redemption windows. It is estimated that between 44% and 59% of these emission reductions (1.9 million tCO₂e to 2.6 million tCO₂e) would not have been achieved without PAF. Redemption rates were high, and trading appears to have been key to achieve these high redemption rates.

The PAF worked well as a proof of concept; it demonstrated the viability of an auction for tradable climate assets. In addition, the PAF appears to have come close to finding the marginal abatement cost of auction winners. However, there is further potential for learnings from the PAF to be disseminated through outreach activity to wider audiences, other sectors and geographies.

The PAF Secretariat managed the auctions in an effective and efficient way. Overall, donors, participants and stakeholders involved in the management of the action were satisfied with the work carried out by the WBG, and it is perceived to bring credibility to the PAF concept through its existing financial structures, expertise in carbon markets, legal issues and risk management and global reach. The information provided before the auctions was useful, helpful and sufficient for bidders to understand the terms of the auction. The auctions ran smoothly, with good collaboration between NERA and the PAF Secretariat, and bidders did not experience any issues during the auction day. Marketing and outreach activities were appreciated by bidders and fundamental to attract a large pool of participants. Webinars were particularly praised by interviewees as they helped them to understand technical concepts in an efficient and engaging way.

There have been examples of trading, not only between auction winners, but also with an organization that did not participate in auctions (or if it did, it was unsuccessful) and with one winner from another auction. Trading was facilitated to the extent possible by the PAF Secretariat, although some argued that this feature was limited by the difficulty to trade PAFERs outside of PAF participants. Redemption was the most difficult process for winners, who experienced varied issues (problems meeting deadlines, and difficulties in understanding the CDM framework process, among other issues). However, high redemption rates indicate that despite being challenging, the process was effective.

It is too early to assess the impacts and sustainability of the PAF, understood as the scale-up and replication of the pilot. There are only a few examples of replication to date, such as the Nitric Acid Climate Auctions Program (NACAP), and the Environmental Price Assurance Facility (EPAF), given ongoing market uncertainty. Nonetheless, the concept has proved to be an effective mechanism to allocate scarce funding to reduce GHG emissions and mitigate climate change. It has

provided lessons learned and indications of contexts where the concept may be applied. In this regard, existing WBG-commissioned reports are also rich resources to inform replication.

Lessons learned

This evaluation has provided lessons learned in several main aspects: first, on the elements related to the auction design that PAF-like instruments should consider when replicating the model; second, on the characteristics that new auction hosts should have; third, on how to design auctions in a way that a wide base of participants is ensured; and last, on how to improve participants' experience of taking part in auctions.

Lessons learned for applying PAF-like model in other contexts:

- The put option approach to providing a price guarantee has been found to be helpful amidst significant project or market uncertainty. It would be less useful when market prices are stable and easily predictable, but could still play a role in risk mitigation or pre-financing.
- PAFERN tradability between winners as well as (potentially) external parties was shown to be helpful, but not critical to achieving good redemption rates.
- Puttable bonds (PAFERNs) that function like a put option as the delivery mechanism are a solid, but complex option. Most other potential donors, including developing country governments or private sector entities, likely lack the necessary infrastructure and may need to opt for more simplified issuance and transferability protocols to manage costs.
- While the PAF model has broad potential, it is only viable where sufficient competition is anticipated between bidders with similar characteristics. Hence, designers should thoroughly investigate the market potential and relevant parameters e.g. whether subgroupings are needed for different project profiles.
- The PAF model appears to more naturally fit with existing projects, yet has potential viability for new projects where there is sufficient competition and the participation incentives are high enough to mitigate risks in the early development stage of new projects.
- Use of existing MRV structures and standards, such as CDM or Gold Standard, is recommended to increase efficiency and promote effectiveness of implementation and understandability by potential participants.

Lessons learned for (new) auction hosts:

- The WBG has a unique and impartial position to host new auctions, given: (a) their international convening power, (b) their access to climate change knowledge, (c) their ability to issue internationally-recognized financial contracts and to disburse funds, and (d) their direct experience in implementing PAF.
- Nonetheless, not all these elements are needed for a new host (i.e. it will depend on the auction characteristics). In the context of a national initiative, a local bank may be appropriate, in isolation or in partnership with other entities.
- The elements that any new host would need are: (a) credibility and impartiality in the specific market context, (b) access to appropriate climate change knowledge, (c) appropriate financial expertise and capacity for the specific components needed for that auction; and (d) ability to thoroughly investigate market potential in advance. Ideally, they would be able to draw upon the expertise of the WBG.

Lessons learned on how to design auctions to attract participants:

- Clear and simple bidding rules and extensive outreach to engage potential participants. In addition, small or less knowledgeable bidders will need additional support.
- Ensuring upfront financial requirements, such as the bid deposit and/or premium paid, are affordable for bidders.
- Auctions should be perceived as winnable with a reasonable range of price certainty so that participants feel they have a good chance of winning (thus attracting sufficient similarly-situated bidders); that the amount offered in the auction is tailored to the level of participation/competition expected; and that resulting prices give a good price signal to projects with similar characteristics.
- Institute regular auctions instead of one-offs as that facilitates bidder comfort and familiarity, as well as sending a price signal and increasing market stability.

Finally, in order to ensure a positive experience for bidders, auctions should consider the following:

- Simplifying the redemption process as far as possible.
- Provide channels to participants to communicate with auction host.
- Provide opportunity to participants to test the bidding platform before it goes live.
- Facilitate secondary trading process by sharing noteholders' contact details with potential buyers, and disseminate the auctions in other contexts to foster trading in other markets.

Recommendations

Finally, the evaluation has produced **three main recommendations** to help the PAF Secretariat further enhance its support to participants and increase its outreach to wider audiences to promote replication:

1. Make efforts to **further facilitate the redemption process** to PAFERN holders in the next 2 redemption rounds (and in any other future PAF-like instrument), by: providing information in other languages about the redemption process; organizing webinars just before and during redemption windows explaining the process; and providing additional information to bidders explaining relevant features of the CDM framework.
2. **Further support replication efforts**, by: promoting PAF and disseminating lessons learned to other funds such as the Green Climate Fund, donors active in climate finance and private funds that intend to support climate change projects in developing countries; offering support to Nitric Acid Climate Auctions Program (NACAP) and Environmental Price Assurance Facility (EPAF) by sharing lessons learned; promoting PAF among countries with an NDC component that could be supported by an auction; and delivering support to potential new auction hosts once future replication initiatives are more tangible.
3. **Initiate a new analysis** in 2020 (after UNFCCC COP 25) once the international context is clearer **to define PAF's role post-2020**.

1 Introduction

Ipsos MORI, in association with SQ Consult, was commissioned to undertake an evaluation of the Pilot Auction Facility for Methane and Climate Change Mitigation in June 2018. The evaluation was conducted between June and December 2018.

Ipsos MORI, the lead for this study, specializes in research, monitoring and evaluation, including complex multi-stranded policy evaluations. The evaluation was directed by Antonia Dickman, Research Director of Ipsos MORI's Environment & Energy Research Division, managed by Raquel de Luis Iglesias, Senior Consultant in Ipsos MORI's Policy and Evaluation Unit, and supported by Rebecca Wilson, Olivia Brajterman, Lore Bizgan and Elena Mastrogregori. SQ Consult specializes in energy and carbon markets, energy and climate change policies, climate change negotiations, climate finance, and sustainable production and consumption including renewable energy, energy efficiency and circular economy. Members of the evaluation team from SQ Consult were experts Julia Larkin and Monique Voogt.

The evaluation team would like to thank the PAF Secretariat, the WBG evaluation team, the Reference Group for this evaluation, and all those who were interviewed or who took part in the survey and the interviews for your participation and support of this evaluation.

This final report is structured as follows:

- **Section 1** introduces the purpose of the assignment, the methodology used to deliver the evaluation, and the limitations and challenges found.
- **Section 2** provides a descriptive overview of the PAF and the activities included within the scope of the evaluation.
- **Section 3** presents the key findings on five criteria used to carry out the evaluation: relevance, effectiveness, efficiency, impact and sustainability.
- **Section 4** summarizes the conclusions and lessons learned by the evaluation.
- **Section 5** presents the key recommendations that in the opinion of the evaluators would help the PAF Secretariat further enhance the delivery of PAF's outcomes.
- Finally, the **annexes** include a proposed revision of the logical framework and further detailed evidence gathered during this evaluation (e.g. the detailed survey responses) and reviewed during the evaluation (e.g. a summary of the previously commissioned lessons learned reports). The evaluation framework developed during the scoping phase and the terms of reference for the evaluation are also included in the annexes.

Evaluation aims and objectives

This Formative Evaluation of the Pilot Auction Facility for Methane and Climate Change Mitigation (PAF) is primarily focused on learning. The aim is to assess PAF's performance and results from September 2014 to December 2017, including how effectively it has met its objectives, its achievements, as well any challenges encountered. The evaluation also explores the experience of bidders and redeemers, with the objective of enhancing PAF going forward and extract lessons learned for any future PAF-like instruments.

This evaluation addresses the evaluation questions relating to the OECD DAC criteria of Relevance, Efficiency and Effectiveness, and explores early impacts to the extent feasible at this point in implementation. This evaluation also analyses the operational processes of the PAF as part of the assessment of its efficiency.

The evaluation also includes lessons learned and recommendations relating to the overall PAF approach, while leveraging research previously conducted or commissioned by the WBG, most notably the Lessons Learned: the First Auction of the Pilot Auction Facility, and Lessons Learned from Auctions 1 & 2 reports.

Methodology

An evaluation framework for the PAF was developed in 2016² in order to facilitate evaluating the PAF's performance in achieving its objectives. This evaluation builds on the existing framework, which provided suggested methodological approaches and evaluation questions. During the scoping phase the evaluation questions, indicators and data collection sources were refined and adapted to the objectives of this evaluation (see Annex IV). This evaluation also builds on the Theory of Change developed in 2016 (as part of the evaluation framework).

The data collection methods used were the following:

- Analysis of monitoring information and internal documentation provided by the PAF Secretariat;
- Wider literature review of sources of information that fall into the following four categories:
 - Climate finance activities and innovations in this area;
 - Developments of global carbon market activity;
 - Publications on environmental market auctions to identify any indications of replication of the PAF;
 - Market data.
- 27 in-depth interviews with the following stakeholders: donors, WBG staff (PAF Secretariat and other departments, including current and former staff); auction manager; verification agent; climate finance/carbon market experts; and auction participants (successful and unsuccessful participants).
- A survey of auction participants (successful and unsuccessful).

² Ecofys and Climate Focus (2016): "Pilot Auction Facility for Methane: Evaluation Framework"

Table 1.1: Number of interviews conducted per type of stakeholder³

Audience	Conducted
Donors	6
WBG Staff	5
Auction Manager	1
Verification agent	2
Climate finance/carbon market experts	6
Successful participants	8
Unsuccessful participants	2
Total	30

Table 1.2: Number of survey responses per type of stakeholder

Type of stakeholder	Respondents	Total population ⁴
Successful bidders Auction 1	8	12
Successful bidders Auction 2	6	9
Successful bidders Auction 3	2	5
Unsuccessful bidders	7	26
Total	24 ^(*)	48

(*) One respondent filled the survey once on behalf of two organizations. Given that it only expresses the opinion of one respondent, it is only counted once in the remainder of this report. Hence, the total number of respondents shown in tables and charts is 15, for those questions asked to successful participants only, and 23 for questions asked to all participants.

Challenges and limitations

This assignment has been subject to a number of challenges and limitations, which are summarized below:

- **Timeframe to assess impacts and sustainability:** This evaluation has covered the period 2014-2017, whereas the bulk of activities to promote replication started in 2018. Impact and sustainability, hence, are assessed to a limited extent.
- **Difficulty in engaging climate finance / carbon market experts to participate in the consultations:** A high number of experts consulted (five out of 14) declined an invitation to participate due to their (self-reported) low level of familiarity with the PAF. This has limited the ability of the evaluation to assess the relevance of the PAF in the climate finance market. It may also indicate that outreach and marketing activities to promote lessons learned and replication have, so far, been limited.
- **Difficulty in engaging bidders to participate in the survey/interviews:** Achieving a high participation rate that was representative of this group proved challenging. This was ultimately achieved by offering participants the possibility

³ Three interviews were conducted during the scoping phase (two interviews with WBG staff and one interview with a donor)

⁴ Total population refers to total number of participants in auctions. Some participants took part in more than one auction.

to respond in several languages and to answer by phone. It also required extending the consultation period and sending several reminders and requests to participate (both from the PAF Secretariat and from the evaluation team). This challenge, nonetheless, has not had an impact on the results of the evaluation given that high participation rates (40%) were finally achieved.

- **Limitations in calculating levels of PAF attribution:** This evaluation has assessed PAF's effectiveness partly by calculating the GHG emission reductions achieved. The percentage of emission reductions attributed to the PAF (additionality ratio) has been calculated based on self-reported data from successful bidders.⁵ Among surveyed participants, the total redemption of emission reductions amounted to 3.47 million tCO₂e (79% of total PAFERs redeemed for Auctions 1 and 2).

⁵ For more information, see Section 3 Effectiveness

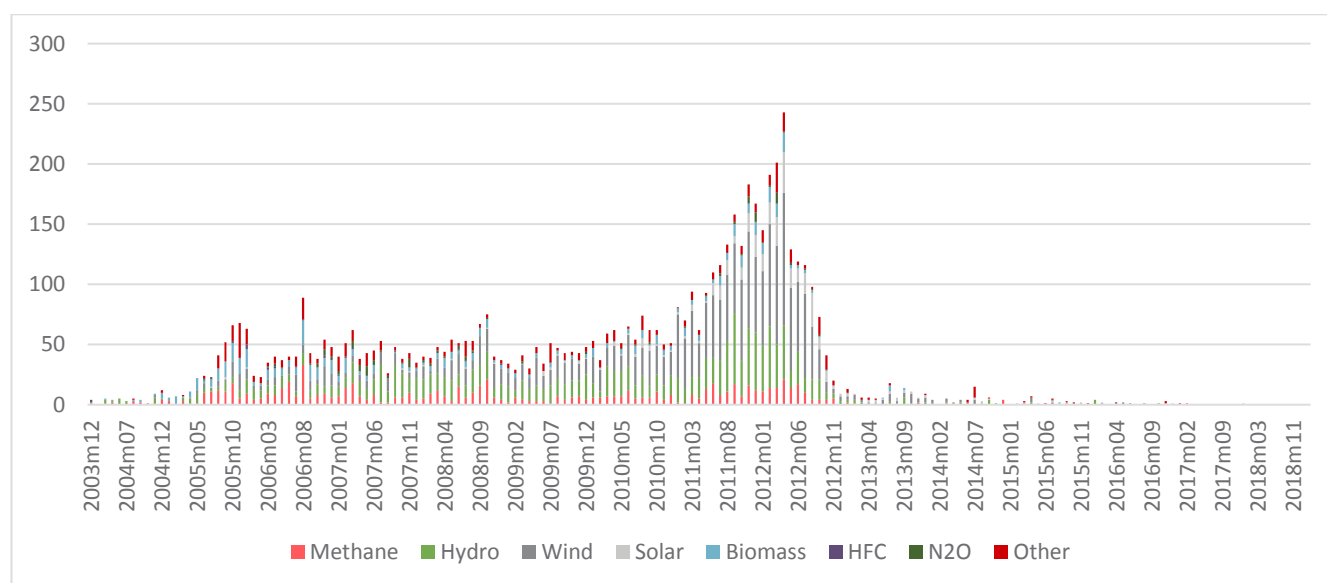
2 Overview of the Pilot Auction Facility

The Origins of the Pilot Auction Facility

The Clean Development Mechanism (CDM) was introduced by the Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC) as a flexible mechanism to help Parties cost-effectively meet their emission targets. Emission reduction projects in developing countries can generate Certified Emission Reduction units (CERs) that can be traded in emissions trading schemes in highly developed economies or can be used by the governments of these developed economies to comply with their national greenhouse gas (GHG) reduction target agreed in the Kyoto Protocol.

The CDM has grown into one of the most important carbon market instruments internationally. From 2001, which was the first year CDM projects could be registered, up to mid-2012 a robust market for CERs developed. However, due to a variety of factors, the market for CERs had collapsed by December 31, 2012. While they fluctuate somewhat, prices remain well under US\$2.00 in 2018. The Paris Agreement will establish a new mechanism that replaces CDM in the future, but the market until 2020 may well remain quite low and how the new market after 2020 will be operationalized is not yet clear.

Figure 2.1: Trend by type of CDM projects entering the validation phase before crediting 2003 – 2019



Source: UNFCCC (data retrieved from <https://cdm.unfccc.int/Statistics/Public/index.html/>)

The ongoing low prices for CERs since the end of 2012 pose a risk to the continuation of CDM and related projects, resulting in thousands of dormant or partially completed projects that do not have sufficient certainty of financing or future cost reimbursement to finish construction and/or for ongoing operation. The PAF is one of several initiatives designed to help these 'stranded' projects, in this case by providing a minimum price guarantee, which has a variety of benefits to help stranded projects stay online such as by helping attract external financiers and thus improving overall market conditions.⁶ By targeting these stranded projects, the PAF sought to test a new approach that adapted

⁶ The primary objective of the PAF is to test its price guarantee put options via auction concept to stimulate broader public and private investment in climate change mitigation. It initially targeted stranded projects to test this concept for a variety of reasons, including having a clear pool of existing project information for which to gauge potential participation.

characteristics from interventions in other sectors and applied them to in the carbon markets context. (See Box 1 for an overview of the origins of the PAF).

Box 1. The Origins of the PAF

At the request of the G8, the WBG in 2012 convened an international group of experts, the Methane Finance Study Group, to identify and pilot innovative pay-for-performance mechanisms that would incentivize investment in methane mitigation projects and reduce the risks associated with providing up-front financing.

The report identified 1,200 methane projects, capable of reducing 850 million tons of carbon dioxide equivalent, as dormant or stranded due to low prices in the carbon markets.

In 2013, the Methane Finance Study Group issued a report recommending the creation of a methane abatement facility that would auction put options to guarantee a price floor on independently verified emission reductions. The report introduced two features ultimately included in the PAF: the ability to sell verified emission reductions to the emission reduction certificate (carbon) markets and/or the methane abatement facility and tradability, or the right to transfer ownership of the option. Following these recommendations, the WBG began developing the PAF.

Source: PAF Evaluation Framework, Lessons Learned: The First Auction of the Pilot Auction Facility⁷ and Methane Finance Study Group Report: using pay-for-performance mechanisms to finance methane abatement⁸

Historically, donors addressing this issue have usually directly purchased CERs. For example, NEFCO⁹ operated a fund that has since been retired that purchased a large quantity of CERs for the Norwegian Government. Offering a price guarantee that may not be redeemed if the market recovers, or is otherwise not ultimately needed, potentially offers a much higher value for money for donors than CER purchasing funds.

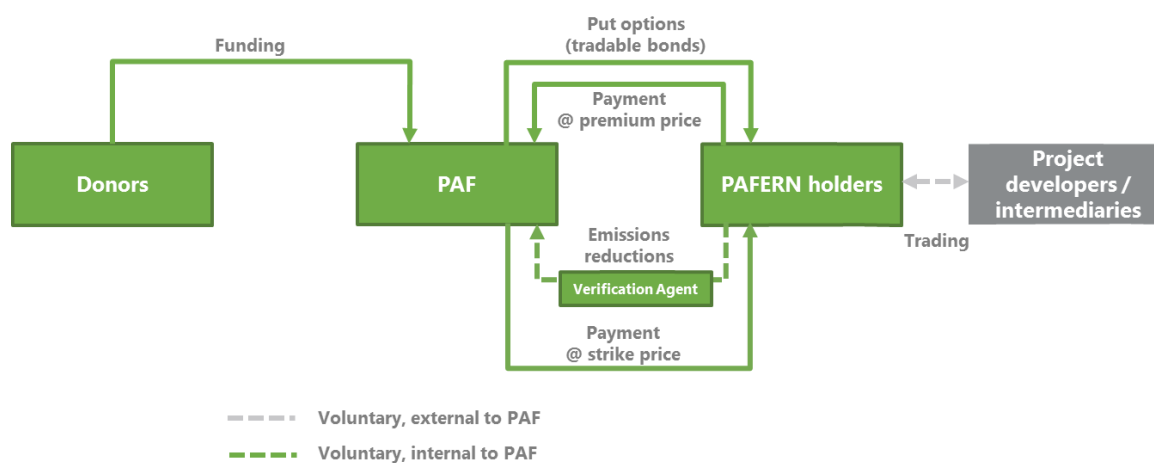
The PAF model

The PAF provides price guarantees in the form of put options, which provide holders the right but not the obligation to sell future emission reductions at a pre-determined price. The PAF allocates these put options and sets the guaranteed price level through an auction, revealing the true abatement cost of the projects while also ensuring that only the most cost effective projects receive financing. The figure below illustrates the functioning of the PAF.

⁷ Available at: <https://www.pilotauctionfacility.org/Lessons-Learned>

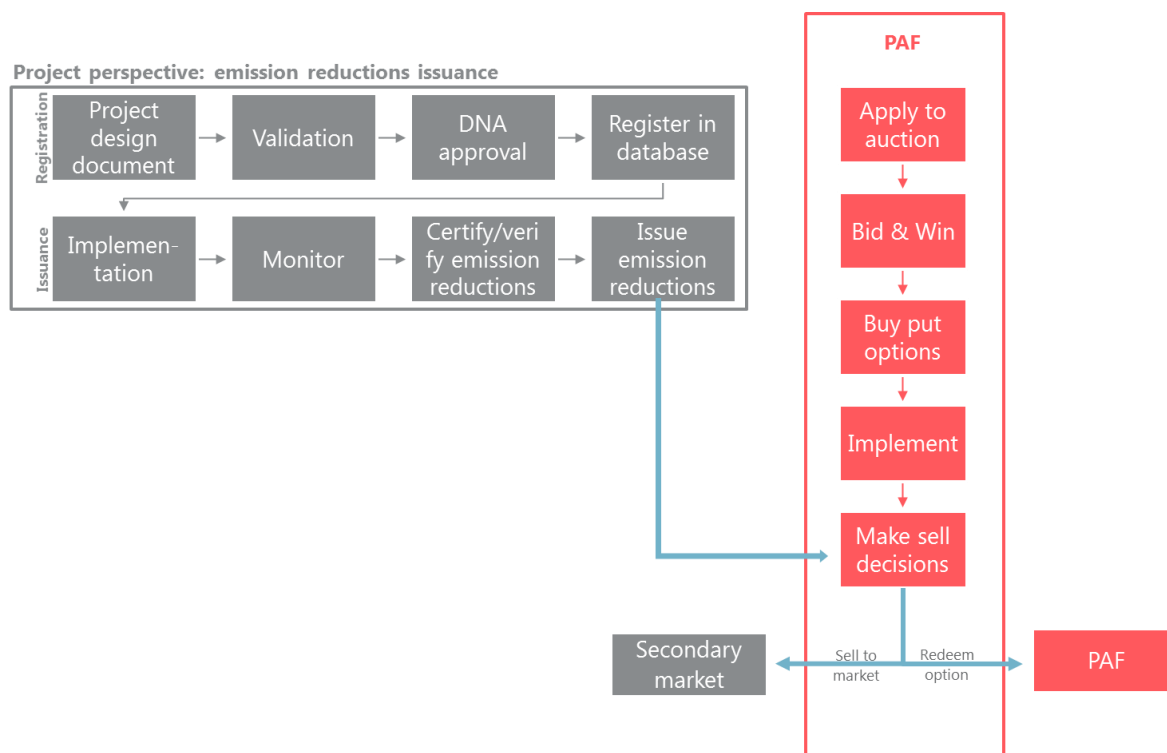
⁸ Available at: <http://documents.worldbank.org/curated/en/600031468148163877/Methane-finance-study-group-report-using-pay-for-performance-mechanisms-to-finance-methane-abatement>

⁹ Nordic Environment Finance Corporation (<https://www.nefco.org/>)

Figure 2.2: PAF Operation

Source: Ipsos MORI

Once these options (PAFERNs) reach maturity, option holders may present eligible carbon credits and redeem their options at the guaranteed floor price. PAFERN holders may also sell their emission reductions to the market if they find a higher price than the strike price offered by the PAF. The ability to choose whether or not to redeem depending on the market context and their project circumstances, gives an option holder great flexibility. The tradability component increases the likelihood of the funds being spent on emission reductions, therefore addressing under-delivery problems of past climate finance mechanisms.

Figure 2.3: Processes for auction winners

Source: Ipsos MORI

The success of the PAF is not necessarily contingent on the redemption of PAFERs. For example, the PAF, or other initiatives, may stimulate the continuation of mitigation projects to the point where the market for emission reduction credits recovers, thus precluding redemption activities.¹⁰

PAF objectives

The primary objective of the PAF is to demonstrate a new, cost-effective climate finance mechanism that:¹¹

1. Incentivizes private sector investment and action in climate change in developing countries by providing a guaranteed floor price on GHG reduction credits, and
2. Uses auctions to allocate scarce public resources for climate change mitigation in the most efficient manner.

Additional objectives of the PAF include incentivizing (rather than directly supporting) projects by:

- Providing a long-term price signal;
- Maximizing the direct engagement and expertise of the private sector;
- Achieving near-term mitigation;
- Informing the design of pay-for-performance climate finance approaches; and
- Promote learning and replication.

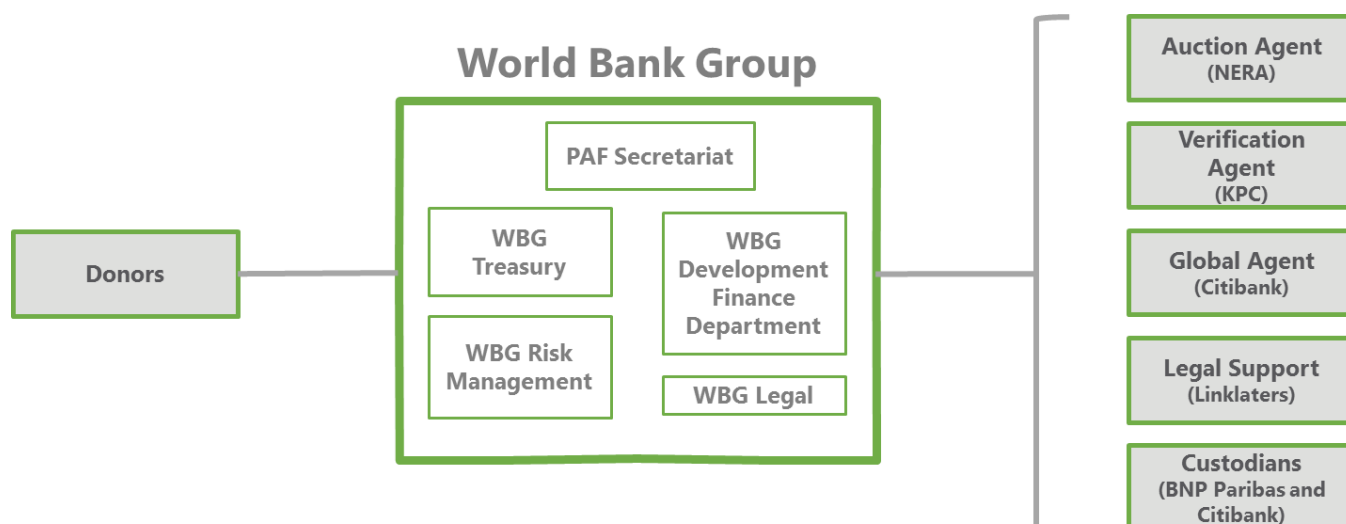
In its first two auctions, the PAF aimed to support projects that would cut methane emissions at landfill, composting and agricultural waste, and wastewater sites. The facility initially targeted the 1,200 methane reducing projects which were at risk of decommissioning due to the low price of carbon credits. The third auction aimed to allocate funds for emission reductions of N₂O from industrial nitric acid and caprolactam (specifically not adipic acid) production.

PAF structure and roles

The WBG serves as Secretariat and Trustee for the PAF. The PAF Implementation team consists of the PAF Secretariat and other WBG staff as well as direct partners or agents. The figure below illustrates the structure of the PAF.

¹⁰ PAF donors have committed to re-use unallocated/unredeemed funds towards other climate finance activities.

¹¹ As outlined in the PAF Evaluation Framework prepared in 2016 by Ecofys and Climate Focus

Figure 2.3: Structure of the PAF

Source: Ipsos MORI

Each agent, within and outside the WBG, has distinct roles and responsibilities:

- **PAF Secretariat:** The Secretariat within the WBG manages the overall delivery of the PAF, liaising with partners and agents and overseeing all aspects of delivery from auction design and implementation to the redemption of bonds and verification, outreach activities, PAF marketing and the production of knowledge products.
- **WBG Treasury:** The Treasury designs, manages and directs the issue of bonds for delivering finance to successful bidders.
- **WBG Development Finance Department:** This team manages donor relations and the structure of trust funds at the WBG, working alongside the PAF Secretariat. This includes negotiating agreements with donors, holding funds in trust and dealing with transfers.
- **WBG Legal:** This team oversees the legal agreements with contributors, legal agreements for the auctions, and bond terms.
- **WBG Risk Management:** It sets the standards for management of integrity risks and environment, health, safety and social risks.
- **Donors:** The PAF Contributors consist of the German Federal Ministry for the Environment, Nature Conservation, and Nuclear Safety (BMU); Swedish Energy Agency; Climate Cent Foundation (Switzerland); Swiss State Secretariat for Economic Affairs (SECO); and the United States Department of State. PAF Contributors have provided US\$53 million in total resources.¹² Representatives of these Contributors provide guidance to the PAF Secretariat and function as part of the decision-making body. They take part in the Participants' Committee meetings, which review activities and progress to date and focus on future and current fiscal year work plans, budget and potential

¹² The familiarisation interview carried out with donors confirmed that current contributions have increased to \$74 million as a result of the latest contribution by the German Federal Ministry for the Environment, Nature Conservation, and Nuclear Safety (BMU). This contribution will support the Nitric Acid Climate Auctions Program (NACAP). This latest Contribution Agreement has not been reviewed by the evaluation team as it is outside the scope of this evaluation. This document is publicly available.

strategic shifts, as well as governance of the PAF (including amendments to the PAF governance framework). The Climate and Clean Air Coalition (CCAC) is an observer of the Participants' Committee.

- **Auction agent:** The International Bank for Reconstruction and Development (IBRD) plays the role of auction manager under the PAF Governance Framework. The IBRD has outsourced this service to the firm NERA Economic Consulting (NERA). NERA provides the online auction platform, develops bidder rules, provides training on the auction platform itself and sends out the bidder package.
- **Verification agent:** Kommunalkredit Public Consulting (KPC) acts as the verification agent, to ensure credits are independently verified and meet the eligibility criteria, based on pre-defined criteria for the auction. KPC communicates verification results to the Global Agent and WBG.
- **Global Agent:** Citibank N.A. (Citi) is the Global Agent. Citibank hold multiple roles including issuing bonds on behalf of the WBG, acting as custodian for certain Auction 1 bidders, and acting as the intermediary for the payment of bonds to bond holders.
- **Legal Support:** Linklaters contributed legal support, for example by relating to the bonds associated with PAFERs.
- **Custodians:** BNP Paribas and Citibank provided custodian accounts to bidders for the first auction.

The specific activities for the PAF include: auction design, auction implementation, product development (price guarantee), knowledge product creation, and marketing and outreach to promote future auctions and replication efforts. Refer to Table 2.1 for more details on each category of activity within the PAF.

Table 2.1: Detail on PAF activities

Category	Sample Activities
Auction design	Establishing the objective, targeted groups, eligibility criteria, redemption requirements, auction parameters and format, e.g. bid units, minimum and maximum bid, bid deposit, starting price, fixed premium price/fixed strike price, increments/decrements
Product development (price design)	Determining the mode for providing a price guarantee, e.g. tradable put options for emission reductions issued through a zero-coupon bond
Auction implementation	Ongoing administration and internal processes, drafting forms and materials, soliciting auction participants, holding auctions, redemption activities, securing external support
Knowledge product creation	Develop lessons learned reports, draft or commission studies exploring potential for replication
Marketing and outreach to solicit participation and for replication	Emails, calls, personal meetings, conferences, workshops, webinars, and distribution of knowledge products designed to promote replication

PAF activities to date

The WBG has developed detailed protocols for the PAF and has tested the PAF model through pilot auctions. Table 2.2 summarizes the parameters and format for the three auctions conducted to date, one each in 2015, 2016, and 2017. Auctions 1 and 2 focused on “stranded” methane abatement projects and account for the majority of the PAF capitalization with roughly US\$40 million allocated. Auction 3 allocated US\$13 million and targeted nitrous oxide (N₂O) abatement projects. As part of the eligibility rules developed by WBG, potential bidders undergo an Integrity Due Diligence screening and pay a refundable deposit to participate in an auction. The PAFERNS issued pursuant to the first two auctions come to maturity at annual intervals until 2020 and the PAFERNS from the third auction come to maturity in 2020, with optional delivery dates at annual intervals before then.

Three redemption cycles have already occurred in November 2016, 2017 and 2018. Only the first two of these redemption periods are covered within the scope of this evaluation. Two further redemption cycles are forthcoming in Autumn of 2019, and 2020.¹³

Table 2.2: Parameters of auctions to date

	Auction 1	Auction 2	Auction 3
Auction date	July 15, 2015	May 12, 2016	January 10, 2017
Budget/allocated	US\$25 million / \$20.9 million	US\$20 million / \$20 million	US\$13 million / \$13 million
Eligible technologies	Methane abatement: landfill, composting and agricultural waste, and wastewater		N ₂ O abatement in nitric acid and caprolactam production plants
Monitoring, Reporting, and Verification Rules ¹⁴	Clean Development Mechanism (CDM) - 35 eligible methodologies	CDM, Verified Carbon Standard (VCS) or Gold Standard (GS) - 37 eligible methodologies	CDM, Verified Carbon Standard (VCS) - 4 eligible methodologies
Qualification criteria	Firms undergo an integrity due diligence screening and pay the refundable deposit		
Auction format	Single-product, reverse, multiple round clock	Single-product forward, multiple round clock	Two single product, reverse, multiple round clock ¹⁵
Bid Product	Strike price (payment under the terms of the PAFERN)	Premium (issue price)	Strike price (payment under the terms of the PAFERN)

¹³ Based upon the current evaluation schedule, the 2018 redemption period will happen after the data collection period is complete and is therefore outside the scope of this evaluation.

¹⁴ Additional information is provided in a Bidder Application Package and legal documentation that governs the PAFERNS. PAFERNS redeemed must also meet environmental, health and safety criteria. There are some minor differences in terms and operational issues between auctions.

¹⁵ 2 separate one product auctions: a “new segment” for facilities that had not purchased abatement equipment before the auction date, i.e., they would be new abatement projects., and “open segment” for new and operating projects.

Strike price	Cleared at: US\$2.40/CER. Started at: US\$8/CER*	Fixed at US\$3.50/tCO ₂ e	New: started at US\$6/tCO ₂ e Open: cleared at US\$2.10/tCO ₂ e; started at US\$5/tCO ₂ e
Premium	Fixed at US\$0.30/tCO ₂ e	Cleared at: US\$1.41/tCO ₂ e; Started at: US\$0.06/tCO ₂ e;	Fixed at US\$0.30/ tCO ₂ e
Volume	~8.69 million tCO ₂ e	~5.71 million tCO ₂ e	~6.2 million tCO ₂ e
Redemption period	2016 – 2020, redeemable in annual increments that expire if unused	2017 – 2020 redeemable in annual increments that expire if unused	2017 – 2020, redeemed at any redemption interval through 2020
No. of Bidders	28	21	13
No. of winners ¹⁶	12	9	5
No. of redeemers in 2016 and 2017	Nov. 2016: 5 Nov 2017: 6	Nov. 2017: 9	Nov 2017: 1

* A Certified Emission Reduction (CER) equates to one metric ton of carbon dioxide, or equivalent greenhouse gas (tCO₂e).

Marketing and outreach to potential participants

The PAF Secretariat has taken a number of steps to identify and reach project developers to encourage them to participate in the PAF auctions. Outreach activities to date have included:

- Reaching out to eligible CDM projects listed in the UNFCCC database of CDM projects¹⁷, based on their location and the technology projects use. Project owners were informed of the PAF and presented with the opportunity to take part in the PAF auctions.
- Working with the UN and their regional centres to promote the PAF to CDM project developers and owners. The PAF Secretariat carried out roadshows globally, based on geographic regions, where they interacted with potential bidders, answered questions about the PAF and facilitated a network of potential PAF clients.
- Reaching out to relevant trade associations and trade groups to run webinars on their platforms, to promote the PAF to their constituent members.
- Large webinars and meetings, prior to the first PAF auction, that brought together CDM projects and reached a large number of potential bidders.

¹⁶ Only 8 of the 28 bidders that participated in the first auction returned for the second auction, and only 4 of the 12 winning bidders from the first auction returned. Interestingly, of the 8 bidders that participated in both auctions, none were winners in both auctions. (NERA, 2017)

¹⁷ The list can be found here: <https://cdm.unfccc.int/Projects/index.html>

3 Main findings

Relevance of the PAF

This section of the report considers the rationale for, and relevance of, the PAF within the international context in which it operates. It also considers whether and how the design of the PAF contributes to reaching donor and WBG objectives.

Highlights: Evaluation Findings on the Relevance of the PAF

- The PAF **innovatively packages concepts** from other sectors and markets (e.g. capital markets and green certificates for renewable energy) and applies them to the climate change mitigation market.
- The PAF was **strongly aligned with the objectives of both the WBG and its donors at the time of funding** commitment, though **current priorities for some donors have evolved**. Regardless, donors consider that the PAF concept has been proven as an efficient way of deploying funding.
- **Participation in the auctions met expected levels**, reinforcing the relevance of its design to those targeted. There was good and diverse participation overall, including by small developers. Most bidders had specific projects, usually 'stranded', in mind. Some aggregators participated without having specific projects in mind. Also, several participants indicated the PAF provided an opportunity to start new projects. There is clear evidence, however, that some small developers found the financial and information barriers too high.
- The PAF approach of using auctions to allocate scarce climate finance is **viable and potentially relevant in a wide variety of contexts** (e.g. different sectors and measures, at different geographic levels).
- In summary, the **PAF has demonstrated it is relevant for the climate change mitigation market**. The future applicability of its approach is less clear, however, due to short-(until 2020) and long-term (post 2020) market uncertainty (but not due to issues with the PAF design).

Overall, the suite of activities delivered through the PAF have been found relevant for its targeted stakeholders. The PAF has successfully demonstrated its relevance in the climate change space as seen in the number of bidders that have participated in the auctions as well as the high percentage of PAFERs redeemed to date (See Section *Effectiveness of the PAF* for more on participation and redemption rates). This evaluation has found that PAF was well received by both market participants and expert stakeholders. PAF donors were also quite satisfied with the levels of auction participation and PAFER redemption achieved. (Refer to Section *Efficiency of the PAF and its operational processes* for more on feedback received from key stakeholders.)

The PAF in the climate finance context

Designers of the PAF engaged in an extended period of research and consultation before finalizing the approach and design for the PAF.¹⁸ Essentially, the PAF adapted concepts from other contexts and packaged them in a unique way and applied them to climate change mitigation. At the time of its inception there were numerous initiatives in other sectors or geographic levels with some similar characteristics, but none with the same combination. Distinct elements of the PAF are that it offers:¹⁹

- a. price guarantees
- b. that are tradable
- c. in the form of put options in the form of zero-coupon puttable bonds²⁰
- d. that were auctioned online in a clock format²¹
- e. targeting stranded climate change mitigation projects
- f. using existing internationally applicable MRV frameworks.

We were able to define universal terms for the [emission] credits that are eligible and then to offer these options to a variety of different private sector organizations who are able to mobilize and make those results happen and then deliver them to those facilities for payment. – WBG staff

For example, the principle pay-for-performance is common in the climate change context. However, the put option concept of having the right, but not obligation to redeem PAFERs is uncommon in carbon markets, though the use of put options is widespread in other contexts especially for hedging, e.g. commodities markets. Issuing put options in the form of puttable bonds is also not common for climate change. Yet, there are numerous examples of auctions relating to climate change, such as with Emission Trading Systems (ETs) or green certificates for renewable energy. In those cases, projects typically either enter the market once the emission reductions have been achieved or contracts for set prices have been negotiated in advance. Clock auctions specifically are in widespread use in deregulated electricity markets, such as in several of the United States, including New Jersey, Ohio, and Pennsylvania. Also, it is helpful but not critical to the PAF design that the price guarantee in form of the PAFERs are freely tradable until they are redeemed, though the actual market is tiny in this pilot phase.

This evaluation finds the PAF's approach of using auctions to allocate scarce climate finance is viable and relevant in a wide variety of contexts. While the PAF initially targeted 'stranded' projects, its potential application is much broader. Mining the CDM database provided the PAF with a rich source of information on the number of projects that could be

¹⁸ For example, in addition to extensive stakeholder consultations, the WBG commissioned Power Auctions to conduct a review of environmental auctions thus far, a review of auction theory as it related to the PAF context and to provide recommendations on the auction parameters and mechanics. All of the research material is publicly available on the PAF website: <https://www.pilotauctionfacility.org>

¹⁹ Each distinct element will be examined separately in various places in this report when relevant for learning.

²⁰ The PAFER is not a put option, it is a puttable bond that functions like a put option. As a zero-coupon bond, PAFERs do not pay owners any interest. Rather, upon bond maturity, owners can choose to receive a pre-defined payment per unit of verified GHG emission reductions.

²¹ Clock auctions help mitigate risk for participants and enable transparent price discovery when designed well.

eligible, which was an important component in developing a design that would solicit sufficient participation to appropriately test the PAF.

Yet, the evaluation team and many of the stakeholders consulted during this evaluation (including donors and market experts) recognize there are limitations on the PAF's current and possibly future relevance primarily due to external factors. Internationally, the prices for CERs remain low and this is unlikely to change in the next few years. There is also post-2020 uncertainty regarding the implementation of the Paris Agreement in general and Article 6 relating to carbon markets specifically as well as how nationally determined contributions (NDCs) will develop. Hopes that more detail on Article 6 implementation would come out of the 24th Conference of Parties (COP) in Poland did not materialize. Among other issues, this further delays the likelihood that there will be significant movement in the carbon markets at the international level in the short term. However, many countries and other jurisdictions continue to move forward with their own plans that may create more opportunities to adapt PAF concepts, which may well create further opportunities for the WBG and the PAF specifically to 'lead the way' forward. (For more on the potential for replication, refer to Section *PAF Impact and Sustainability: its potential for replication and scale-up*)

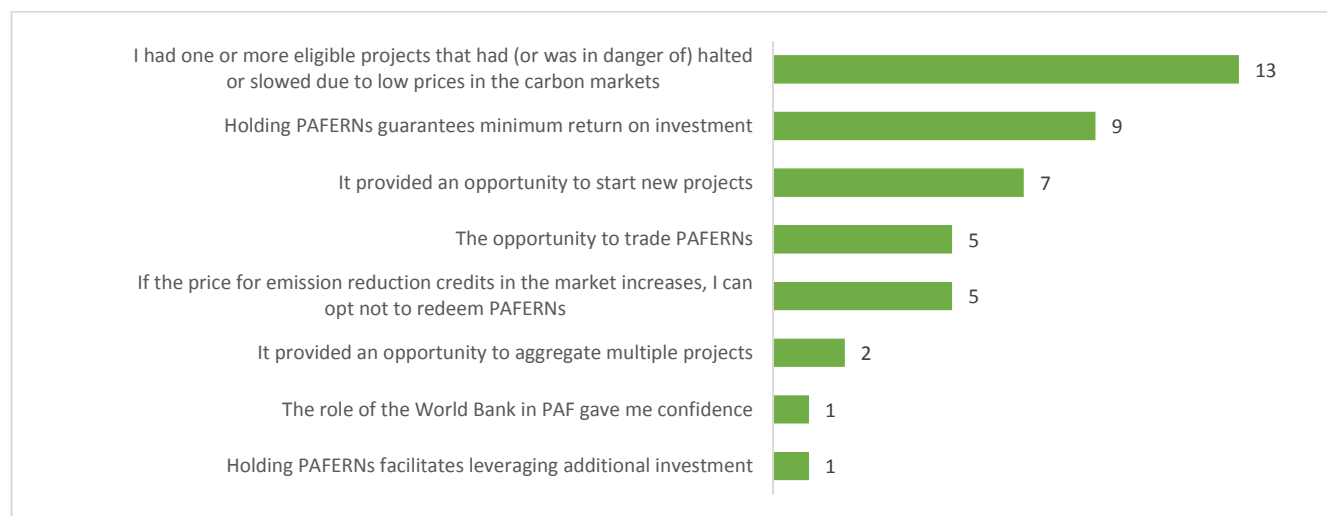
Relevance of the PAF design for project developers and other targeted project stakeholders

Participation in the auctions met expected levels, reinforcing the relevance of the PAF's design to those targeted. Feedback from participants indicated that the price guarantee was a key feature attracting participants to the PAF. Participants also valued the flexibility to either redeem or trade their PAFERs depending on how market conditions and their project's characteristics evolved. Figure 3.1 summarizes all reasons participants gave for participating in a PAF auction.

Data gathered by this evaluation also revealed that most auction participants had specific projects, usually 'stranded', in mind for any PAFERs secured. Yet, as might be expected, some aggregators participated without necessarily having specific projects in mind, which supports the PAF Secretariat's early hypothesis that aggregators could help increase the PAF's reach. It is also noteworthy that several participants indicated the PAF provided an opportunity to start new projects.

Figure 3.1: Reasons to participate in the PAF

Which of the following, if any, encouraged you to bid in the PAF auction? Please select up to three answers.



Source: Ipsos MORI, Survey of PAF Participants (n = 23)

While there was good and diverse participation overall, including by small developers, there is clear evidence that some small developers found the barriers too high; such as, the necessity for and/or amount of the bid deposit required, the overall complexity of the concept particularly for non-native English speakers, and the higher premium (upfront payment) under forward format (Auction 2). (Refer to Section *Effectiveness of the PAF* for more on participation characteristics). Generally, participation would be expected to be more difficult to generate in areas with limited or no experience in financial markets. One stakeholder noted that the fact that auction parameters changed between auctions was challenging, as once one had figured out how it worked, it changed – referring specifically to the difference between Auction 1 and Auction 2. The high uncertainty around what pricing could be expected was also mentioned as a barrier for small developers. While this would be relevant for larger developers as well, larger developers would be expected to be better able to absorb research and participation costs, even if they were ultimately unsuccessful.

Among those surveyed were organizations which had not participated in all three of the PAF auctions. These organizations provided feedback that they had taken this decision because the terms were not attractive enough (9 respondents) or because they did not have eligible or relevant projects (9 respondents). A few mentioned that the bid deposit and fees to open a custodian account were too high (5 respondents), or that they did not have enough time to make an informed decision (2).

When asked whether they were aware of initiatives that are similar to the PAF, participants and other stakeholders only mentioned one auction platform: Nitric Acid Climate Auctions Platform (NACAP), which is funded by the German government and grew out of the PAF. Other initiatives mentioned directly purchased CERs, e.g. the Nordic Environment Finance Corporation's (NEFCO) Carbon Procurement Facility (NorCaP), which issued two calls for proposals to purchase CERs under Emission Reductions Purchase Agreements (ERPAs).²²

²² NorCaP closed at the end of 2015. See <https://www.nefco.org/work-us/our-services/climate-funds/nefco-norwegian-carbon-procurement-facility>

Alignment with WBG and Donor priorities

WBG staff and other stakeholders universally reported that the PAF was well aligned with WBG objectives as well as being aligned with other WBG initiatives addressing climate change mitigation more broadly and carbon markets specifically. Through collaboration with several groups internal to the WBG, it allowed them to demonstrate a new approach to efficiently allocating resources to achieve GHG mitigation on a pay-for-performance basis in a way that helps reveal the incremental cost or 'true price' of carbon credits. The clock auction provides a way to identify least-cost opportunities, which also allows donor funding to be more efficiently targeted.

Interviews with stakeholders showed that the PAF was strongly aligned with the objectives of all donors as well. Donors became involved as they were interested in testing the concept and learning for future facilities or funds.

Overall, donors are satisfied with the process and the outcomes achieved and they believe the PAF has successfully proven it is an efficient way of deploying funding in a variety of contexts. Demonstrating additionality continues to be very important to donors and they continue to be curious about opportunities for replication and coordination with other funds, which will come in the next phase of the PAF [Refer to Section *PAF Impact and Sustainability* addressing potential for replication for more on these topics.]

We felt it was an exciting and innovative mechanism that could be used. It demonstrated proof of concept – a lot of potential for it to be used in a broader concept - Donor

The PAF Secretariat initially targeted securing \$100 million as a stretch goal to pilot test the PAF. While they achieved only about 55% of that goal, the initial funding obtained was sufficient to demonstrate the concept through three auctions with different characteristics. More funding might have allowed for more emission reductions and perhaps more bidders or trading activity, but would have been unlikely to affect the testing of the pilot or significantly change outcomes.

Readers should note that some potential donors declined to fund the PAF for reasons not fundamental to the PAF concept itself, but rather due to some design choices having insufficient alignment with their specific climate mitigation priorities at the time, such as how credits would be retired, or which gases were targeted in the specific auctions.

Effectiveness of the PAF

This section explores how effectively the PAF has been in its activities to date in meeting its core objectives. It considers the effectiveness of the PAF in: encouraging sufficient and appropriate participation in the auctions (in volume and composition of participants); driving additional emission reductions which would not have come about through other means; and in disseminating its results and knowledge gained with the aim of promoting lessons learned and replication.

Highlights: Evaluation Findings of PAF's Effectiveness

- In total 50 bidders participated in the PAF auctions (often in more than one auction) as a result of an **effective outreach effort**, with projects located in several countries in Latin America and Asia.
- The **level of participation of bidders in the PAF auctions was broadly in line with donors' expectations**. WBG staff and experts interviewed were also satisfied with the mixed composition of participation.
- Evidence indicates that the **PAF has generated additional emission reductions**, sustaining projects that would otherwise not have progressed at the same speed, scale or scope.
- PAFERNS equivalent to **4.7 million tCO₂e** were redeemed across the first and second redemption windows. Of these, **between 1.9 million tCO₂e and 2.6 million tCO₂e would not have been achieved without PAF**, according to extrapolations based on survey responses (Auctions 1 and 2 only).
- **High redemption levels** were achieved in the second redemption window (95% and 99% of PAFERNS from Auctions 1 and 2 were redeemed in 2017). The tradability element of the PAF contributed to the high redemption rates.
- The PAF appears to have come close to finding the **marginal abatement cost** of auction winners, with only two in 12 survey respondents (successful bidders) seeking and receiving additional funding.
- The PAF worked well as a proof of concept, contributing to demonstrate that the idea of an auction for tradable climate assets is viable and can function in the way it was designed to function. However, there is further potential for learnings from the PAF to be disseminated through outreach activity to wider audiences, other sectors and geographies.

Effectiveness of the PAF in encouraging participation in auctions

This sub-section discusses the extent to which the PAF's marketing and outreach activities have been successful in attracting bidders (i.e. whether participation in the auctions was in line with expectations).

Overall the outreach efforts are seen to have contributed to a large, targeted and diverse pool of bidders taking part in the three auctions. As discussed in the section above, the level of participation of bidders in the PAF auctions was broadly in line with donors' expectations. WBG staff and experts interviewed were also satisfied with the mixed composition of participation. One interviewee stressed that the level of auction participation was "*more than sufficient*" to undertake a successful auction and that the PAF marketing and outreach activities have been instrumental in ensuring such high levels of participation.

Characteristics of PAF participants

In total, 50 bidders participated in the PAF with projects located in several countries in Latin America, and Asia, according to survey respondents (see Table 3.1 and Table 3.2). Survey responses indicate that although carbon credit aggregators have participated in the auctions, they were not the majority. While 14 out of 23 respondents reported having multiple projects in mind when they bid for PAFERNS, seven of those were actually project owners²³, i.e. not carbon aggregators. In total, 12 out of 24 respondents were project owners.

²³ In the survey, "project owners" were defined as the entity which ultimately generates the emission reductions within the project scope.

There are indications that the PAF was effective in targeting stranded projects. In total, 13 out of 23 respondents reported that one of the reasons that encouraged them to participate in the auction was because they had one or more eligible projects that had (or was in danger of being) halted or slowed due to low prices in the carbon markets²⁴.

The survey results also indicate that there was a fair split between small and large projects that would be financed through the PAF: five out of 12 respondents said their project aimed to generate between 100,000 and 400,000 tCO₂e while the remaining seven had projects which aimed to generate over 1 million tCO₂e. The size of organizations was equally balanced, with 12 out of 22 respondents employing under 50 employees and ten employing over 100.

Table 3.1: Total participants per auction

Participants	Auction 1	Auction 2	Auction 3
Winner	12	9	5
Unsuccessful	16	11	11
Sub-total	28	20	16

Note: Some participants have participated in more than one auction

Source: Monitoring information provided by the PAF Secretariat

Table 3.2: Location of projects developed by survey participants

Country/Region	Auction 1	Auction 2	Auction 3	Unsuccessful	Total
Thailand	2	1	0	1	4
Latin America	1	0	0	1	2
Malaysia	1	1	0	0	2
Brazil	3	1	0	1	5
Mexico	0	2	0	0	2
Chile	0	2	1	0	3
Pakistan	0	0	0	1	1
Argentina	0	0	0	1	1
Don't know	0	0	0	3	3

Source: Ipsos MORI, Survey of PAF Participants (n = 23)

²⁴ See Figure 3.1 in the Section Relevance of the PAF, Respondents were asked to provide up to three reasons to participate in PAF. The fact that some did not select the option "I had one or more eligible projects that had (or was in danger of) halted or slowed due to low prices in the carbon markets" does not mean they did not have stranded projects, but that there were other characteristics of PAF that were more relevant to them.

Table 3.3: Number of employees in organizations participating in the survey

Number of employees	Total
Fewer than 10	7
11 to 50	5
51 to 100	0
101 to 249	4
250 to 499	1
500 to 999	0
1000 or more	5
Don't know	1

Source: Ipsos MORI, Survey of PAF Participants (n = 23)

While there were comparatively fewer participants in Auction 3, participation was still at the expected level for this auction, since a comparatively lower number of PAFERNS were made available, and that there were less of the targeted project type (N₂O abatement) available worldwide²⁵.

Role played by marketing and outreach activities to encourage participation

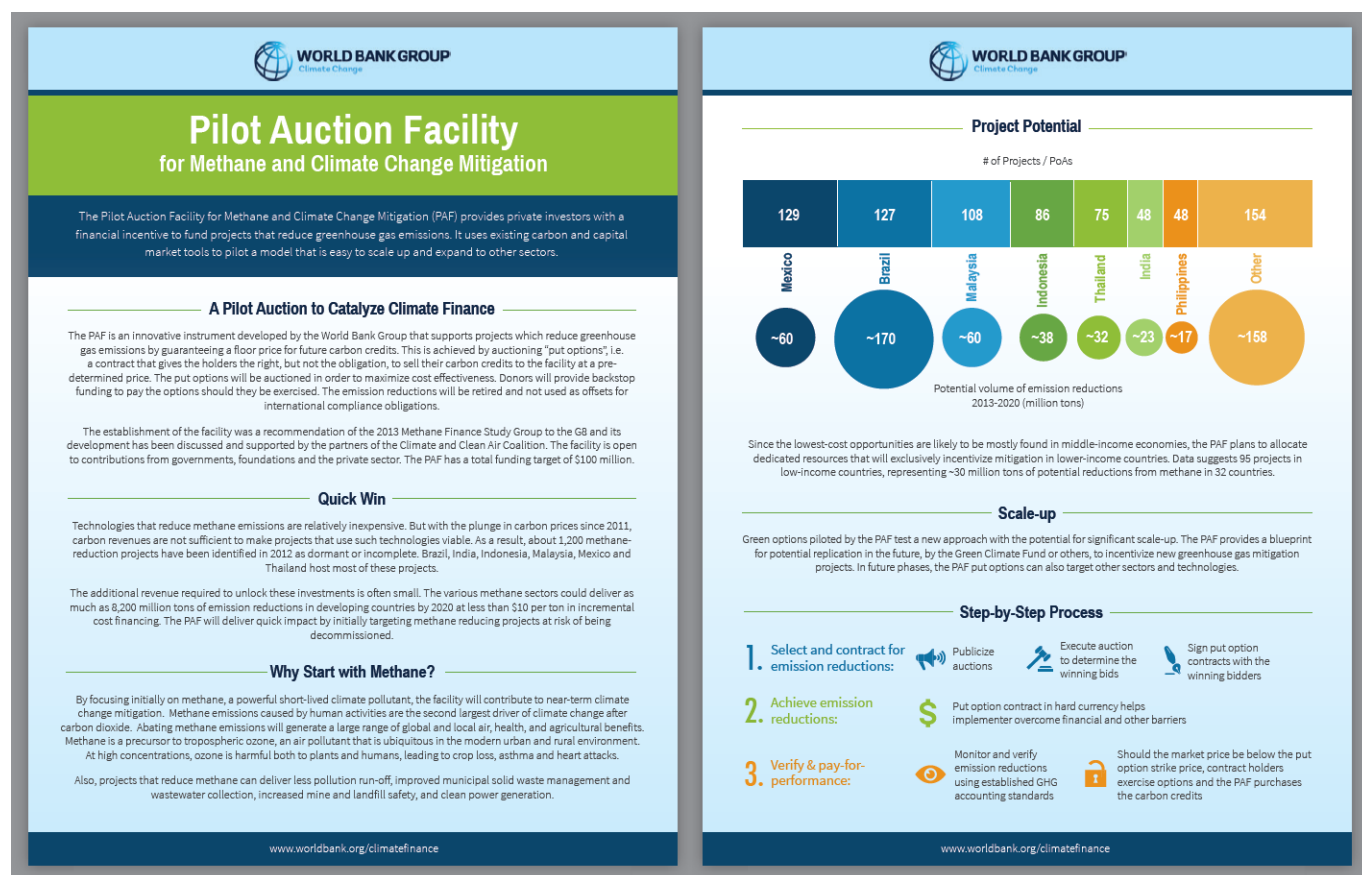
Across all types of stakeholders consulted for this evaluation there were positive views of the marketing and outreach activities carried out by the PAF Secretariat²⁶ to promote the PAF among potential bidders. In total 18 out of 23 participants surveyed reported at least one of the outreach activities to have been *fairly* or *very* useful. Webinars were particularly popular (18 out of 23 of those surveyed had participated in one of these) and were praised as effective in both engaging participants and promoting learning: 17 out of 18 who had participated in a webinar found it useful. Webinars were also highlighted by interviewed participants as a useful tool to clarify the objectives and operational processes of the PAF. The brochure summarizing the concept and operations of the PAF was also deemed useful by 13 out of 14 of the surveyed participants that were aware of it.

The brochure and website information makes it really easy to understand the mechanisms, and was suited for non-specialists, despite the scheme being so 'sophisticated' - Auction Participant.

²⁵ In total there were approximately 50 N₂O abatement projects registered on CDM eligible to the PAF, while for CH₄ avoidance there were approximately 500 registered on CDM, which were also eligible to the PAF (UNEP, 2019. UNEP DTU CDM/JI Pipeline Analysis and Database [Updated 1 January 2019]. Available at: <http://cdmpipeline.org/>).

²⁶ Please refer to the section on the Origins of the PAF for further detail on the role of the different WBG bodies in the PAF.

Figure 3.2: Initial PAF outreach Brochure



Source: The World Bank Group. "Pilot Auction Facility for Methane and Climate Change Mitigation". Available at: http://www.worldbank.org/content/dam/Worldbank/document/Climate/pilot_auction_facility_brochure_wbg.pdf [20 December 2018]

Among the very few limitations noted in respect of the PAF outreach activities, there was a view expressed by two stakeholders that "*some areas [regions] were underrepresented*" because "*they weren't sufficiently aware of [the PAF]*". Despite Latin America hosting the projects of 11 out of 23 surveyed auction participants, it was the view of one interviewee that there was a low participation from Latin American projects (other than Brazilian projects), due to language barriers and the comparatively low maturity of their financial markets. This could suggest the potential for yet wider auction participation in this region, should these barriers be addressed. One interviewee highlighted the importance of local champions, suggesting that the high participation of Brazilian projects in the auction was due to the outreach efforts of one single consultant. Finally, another interviewee suggested that the methane focus has limited the geographic outreach, since in regions such as South-East Asia, methane projects make up only a minority of the CDM-registered projects (UNEP, 2019)²⁷.

Effectiveness of the PAF as an instrument to reduce GHG emissions

This sub-section presents the estimated emissions that have been reduced by projects that redeemed PAFERs, and the role of the PAF in achieving those emissions reductions (i.e. the extent to which such emission reductions would have happened without PAF support. See Box 2 below). We also explore the extent to which the tradability element favored the redemption of PAFERs.

²⁷ UNEP, 2019. UNEP DTU CDM/JI Pipeline Analysis and Database [Updated 1 January 2019]. Available at: <http://cdmpipeline.org/>

The evidence gathered by this evaluation indicates that the PAF has generated additional emission reductions, sustaining projects that would otherwise not have progressed at the same speed, scale or scope.

Box 2. Disambiguation: additionality in the context of this evaluation

In the context of this evaluation, the use of the term “additionality” and its variants is different from the one used in the context of CDM.

Additionality is a key requirement for a project to be eligible to generate emission reductions under the CDM. To be registered to generate carbon credits under the CDM a GHG mitigation project must demonstrate that the emission reductions that it generates would not have occurred in the absence of the financial support obtained from the sale of the carbon credits. Therefore, any project registered under the CDM is necessarily additional – and hence any project that redeems PAFERNS under the PAF is also additional.

In the economic context, however, additionality refers to the extent to which an activity (and associated outputs, outcomes and impacts) is larger in scale, at a higher quality, takes place more quickly, takes place at a different location, or takes place at all as a result of intervention. Additionality measures the net result, taking account of deadweight, leakage, displacement, substitution and economic multipliers. In this case, the evaluation has calculated only the deadweight of the PAF, i.e. the proportion of total outputs that would have been secured without the PAF.

The PAF has been established to support those CDM projects which have not been able to sell their carbon credits in the market to a financially sustainable level and have become strained or halted because of that. Hence, in the context of this evaluation, we use the term additional emission reductions to designate those projects which, in the absence of the PAF, would not have gone ahead at all, would have gone ahead at a different scale, in a longer timeframe, or without the same focus in the emission reductions component.

Levels of redemption achieved

The redemption of PAFERNS provides evidence of emission reductions. The PAF achieved high redemption levels, with 4.7 million tCO₂e being redeemed across the first and second redemption cycles. Of these, 3.0 million tCO₂e corresponded to PAFERNS purchased in the first auction and 1.4 million tCO₂e corresponded to PAFERNS from the second auction. The remaining 0.3 tCO₂e corresponded to PAFERNS from the third auction. A total of 5.9 tCO₂e in PAFERNS from the third auction still await redemption.

In the first redemption window of Auction 1, 76% of PAFERNS were redeemed, while a higher rate was achieved in the second window (95%). In Auction 2, the redemption rate was 99%. The lower redemption levels in the first redemption window (Auction 1) can be attributed to²⁸:

- One PAFERN holder having their PAFERNS rejected due to the credit date being outside the eligible range.
- The format of the auction (reverse) meant that the loss of investment through missing a redemption opportunity was lower than in the case of a forward auction, where the premium, and hence the upfront cash payment, tends to be higher.

²⁸ For more information on issues experienced by participants to redeem PAFERNS, see Section Efficiency of the PAF and its operational processes

- There was a natural learning curve in the process of redeeming PAFERNS (shown through improving redemption rates over time).

The high level of redemption overall is likely to also have been, at least in part, due to the tradability element of the PAF. Of the 16 organizations that have redeemed PAFERNS, five had purchased PAFERNS from other auction participants. In total, 18% of all PAFERNS redeemed in the two redemption windows were traded beforehand. Among those bidders surveyed that had not yet redeemed their PAFERNS, two reported that they still aim to redeem them and another two expected to sell them to either other bidders or other organizations that did not participate in any auction.

No winners reported being unsuccessful selling PAFERNS. In one case, a successful participant in Auction 1 purchased additional PAFERNS to match their project issuance schedule in both trading windows. One of the sellers to this participant sold all of their PAFERNS. This could mean, for instance, that they were unable to generate the emission reductions, that they preferred to receive a return sooner (instead of waiting for redemption), or that they initially bought PAFERNS with the aim to trade with them. There is one known instance where PAFERNS from Auction 2 were sold to a non-participant in the PAF. On the other hand, one participant indicated difficulty obtaining winner contact details to inquire about a sale²⁹. The small number of PAFERNS overall, as well as lack of awareness about the PAF outside bidder population, despite education efforts, were potential limitations to trade.

Survey responses indicate that redeemed PAFERNS corresponded to emission reductions in at least five different developing countries. Just over a third of the emission reductions occurred between Brazil (23%) and Chile (16%). Other countries where emission reductions have occurred include Mexico (5%), Malaysia (3%) and Thailand (3%).

Attribution of emission reductions to the PAF

Feedback provided by surveyed auction participants provides indicative evidence on the extent to which the emission reductions discussed above can be attributed to the PAF, or whether these projects, and most importantly their associated emissions reduction components, would have been achieved anyway in the absence of the Pilot. A robust estimation of the level of additional emission reductions would require establishing a counterfactual group (i.e. a group of projects with similar characteristics to the projects supported by the PAF) and an analysis of other effects (such as displacement, substitution and crowding in/out), which was not within the scope of this evaluation.³⁰ Nonetheless, self-reported data obtained through the survey of participants can give an indication of the extent to which these emissions can be attributed to the PAF^{31, 32}.

Among surveyed participants, the total redemption of emission reductions amounted to 3.47 million tCO₂e (79% of total PAFERNS redeemed for Auctions 1 and 2). In total, 288 PAFERNS (equivalent to 720,000 tCO₂e) were redeemed by one or more organizations who declared they were aggregators/intermediaries and they did not have any project in mind when they bought PAFERNS. Instead, they bought ERs from external project developers/owners with the aim to redeem them. While these ERs have been generated and issued in accordance with the set of eligibility criteria established prior to each

²⁹ As per its mandate, the PAF Secretariat did not publicise winner contact information. A list was provided (of those that had agreed to sharing) when asked directly.

³⁰ See, for example, BIS (2009) Research to improve the assessment of additionality, available at https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/191512/Research_to_improve_the_assessment_of_additionality.pdf

³¹ In this case, the only effect estimated to calculate PAF additionality is the deadweight (the proportion of total outputs that would have been secured without PAF).

³² Auction 3 is excluded from this analysis given that the redemption in 2017 was optional and only one organisation redeemed PAFERNS.

auction (for example the ERs had to be issued after each auction date) it is not possible for the evaluation team to confidently assess whether these emissions would have happened without the PAF's financing. As a result, we have assumed an additionality rate of 0% for these emission reductions (as per the definition of additionality in the economic context described above). In this regard, it should be noted that this assessment has only calculated deadweight, and that there might be multiplier effects that facilitated these emissions to happen (for instance, the PAF increased the amount of total finance to buy emission reductions).

Survey respondents were asked whether, in the absence of the PAF, their projects would have gone ahead at all, and if so whether they would have had the same focus on GHG emission reduction and whether they would have gone ahead in the same timeframe. Respondents were also asked about the likelihood of their project(s) achieving the same level of emission reductions without PAF support. Both questions have been used to provide an estimative range of the PAF's additionality.³³

Table 3.4: Methodology | Percentage of emissions deemed additional based on survey responses to “What would have happened to the project if you had not been successful?”

Scenario	% of ERs deemed additional (*)
The project would not have gone ahead at all, in any form	100%
The project would have gone ahead but without the emission reduction component	90%
The project would have gone ahead but with less focus on the emission reduction component	75%
The project would have gone ahead but the implementation would have been delayed	25%
The project would have gone ahead in exactly the same way	0%
The project would have gone ahead with a larger emissions reduction component	0%

Table 3.5: Methodology | Percentage of emissions deemed additional based on survey responses to “How likely or not do you think your project would have been to achieve these emissions without PAF support?”

Scenario	% ERs deemed additional (*)
Very likely	0%
Fairly likely	25%
Not very likely	75%
Not likely at all	100%
Don't know	N/A (no respondents selected this answer)

(*) Estimated additionality rates proposed by evaluation team based on analysis of feedback provided in the interviews and review of methods to estimate deadweight.

Results from applying these additionality rates provide an **additionality ratio in the range of 44% to 59% of the total emission reductions achieved** by survey respondents' projects. Extrapolating the results to the total population provides estimated figures for the emission reductions that would not have been achieved without the PAF (Auctions 1 and 2 only). We estimate that these emissions are **in the range of 1.9 million tCO₂e to 2.6 million tCO₂e**.

³³ Additionality here is defined as the rate of emission reductions that can be attributed to the PAF.

In interviews, participants provided details on their projects' status and their likely situation if they had not obtained PAFERNs. Four out of eight interviewees commented that their projects would have come to a halt or would have continued but with sub-optimal operations had it not been for the PAF support. For instance, a landfill project would have continued to vent landfill biogas, instead of burning it, due to the lower costs involved. This was also the case for an N₂O destruction project, which now had funds to keep the project operating for at least another 2 years (2017 and 2018).

Survey respondents were also asked about the likelihood they would have attracted financial support from other sources in the absence of the PAF. Across surveyed auction participants, eight in 12 successful bidders reported that it is very unlikely (n=7) or fairly unlikely (n=1) that they would have attracted equivalent financial support from other sources, had they not been successful in the PAF. This factor has not been considered to assess the additionality of the emissions reduced given that most interviewees suggested that the PAF supported their business to keep operating rather than to invest in the facilities or leverage additional funding.

Effectiveness of the PAF in identifying marginal abatement costs

The PAF appears to have come close to finding the marginal abatement cost of auction winners. This is indicated through:

- Only four out of 15 survey respondents (successful bidders) seeking and receiving additional external funding. This might partially be due to the profile of projects applying for PAF: in general, these were existing stranded projects, which were *"about maintaining operations rather than leading to an investment"*, as put by one interviewee.
- Early indications from the interviews with successful bidders from Auctions 1 and 2 are that final price approached the marginal cost of operation.
- A few interviewees indicated they were not interested in selling PAFERNs because they thought they could not make any margin from it.

In the case of Auction 3, there is limited evidence on the effectiveness of the PAF in identifying the marginal abatement costs. Only one unsuccessful participant provided insights on this, indicating that the low price was the reason they dropped out of Auction 3.

Knowledge creation and knowledge sharing activities

This section describes the areas where the PAF has created new knowledge in the field of climate finance, by demonstrating a new mechanism to finance carbon mitigation projects. It also explores the extent to which such knowledge has been effectively disseminated to the relevant audiences.

The PAF has been effective in creating new knowledge in the field of climate finance, in the sense that it has successfully demonstrated a new, cost-effective climate finance mechanism. According to several interviewed donors, experts and auction participants, the PAF worked well as a proof of concept, demonstrating that the idea of an auction for tradable climate assets is viable and can function in *"the way we believed it would"* (Donor). One auction participant, who develops several landfill carbon projects praised the fact that *"the PAF was very important to keep the [carbon] market alive"*. The PAF also helped demonstrate which elements are needed for the auctions to succeed. For instance, the wide pool of bidders – achieved through successful marketing and outreach activities – were key to ensure that an optimum carbon price was achieved.

Furthermore, the PAF has generated knowledge in several fields, such as price discovery, auction formats, contexts where the concept can work, and attractiveness of the tradability option (see Section 4 *Conclusions and lessons learned*):

- **Price discovery.** Auctions 1 and 2 achieved a similar net benefit (\$2.1tCO₂e), generating information on abatement costs that was previously unknown. As highlighted by one expert, the auction helped “converge the market signal for carbon pricing”, which had before been determined by the willingness-to-pay by offset purchasers.
- **Auction formats.** The second PAF auction, where the bid product was the premium instead of the strike price, attracted fewer, larger bidders, as expected. This appears to reflect the higher cost of participation, and bidders unable to meet the upfront payment for PAFERs may have chosen not to participate. One project aggregator shared a view that “*when [the deposit] was too high it became a barrier, especially for small project developers*”.
- **Sectors and contexts where the concept can work.** The PAF is also felt to have provided further evidence that determining a sectoral focus for the auction is critical to its functioning. Experts highlighted, for instance, that one of the issues with the CDM is that some sectors (such as Hydrofluorocarbons (HFC) projects) generate extremely low cost ERs, which, if prices are pressured down, results in no other sectors being able to effectively participate.
- **Attractiveness of the tradability option.** As highlighted above, 18% of all PAFERs redeemed were previously traded, and there is possible room for further trading.

To support the dissemination of lessons learned, the WBG has commissioned and disseminated reports³⁴ across the relevant communities, primarily targeting donor and recipient countries, as well as private sector companies participating in the auctions. While donors were generally complimentary of the outreach efforts to disseminate the lessons learned, there is a desire for greater outreach moving forward as the PAF seeks to scale up and replicate what it has achieved so far. Donors, in thinking about the longevity and future scalability of the PAF, expressed the need for further outreach to avoid “*preaching to the choir*” (Donor) and to go beyond existing informed stakeholders to reach those with less awareness, expertise and engagement with the PAF concept. Overall, they feel that there is potentially more that could be done to celebrate the success of the pilot and draw upon existing connections available to the WBG.

The evaluation team acknowledges that the post-2020 uncertainty regarding the implementation of Article 6 of the Paris Agreement adds a layer of complexity in identifying and addressing the relevant audience for the PAF’s lessons learned (see Section *Relevance of the PAF* for further details on the uncertainties surrounding the future implementation of PAF-like instruments). That said, in spite of continued uncertainty around Article 6 implementation, countries and other jurisdictions that continue to move forward with their own plans may create more opportunities to adapt PAF concepts and could be targeted in future outreach activities.

Some donors feel unsure of the next steps that can, and will, be taken to ensure that PAF’s lessons are disseminated to the relevant audiences. Examples of outreach routes suggested by interviewees include leveraging contacts in other financial institutes and media organizations to help promote and garner interest in the PAF, as well as encourage cross-promotion with other initiatives (such as the Partnership for Market Readiness) to promote the success of the PAF and attract more publicity on the global stage. Members of the PAF Secretariat, while sharing a view that they have sufficient staff to run the auctions, acknowledged they would be likely to need to devote greater resources in order to scale up and expand these dissemination efforts.

³⁴ NERA (2017): Lessons Learned from Auctions 1 & 2” and World Bank Group: “Lessons Learned: the First Auction of the Pilot Auction Facility”

Lots of interesting, knowledgeable people but it felt a bit like preaching to the choir – people who are likeminded, which is a good first step but I'm not clear on broader outreach and replication to make sure that those who aren't already broadly familiar with these concepts are aware of it. ... I would like it to get it more on the radar of the global finance community. - Donor

Summary of the PAF's effectiveness at meeting its core objectives

A high-level summary of the evaluation's review of the PAF's performance is provided in Figure 3.3 below. Overall the evaluation has found the PAF to provide further confirmation that auctions are a viable mechanism to allocate scarce funding for climate change mitigation efficiently and that it has supported climate change mitigation in developing countries. The PAF generated additional emission reductions and has sustained projects that would otherwise not have progressed at the same speed, scale or scope. Although there is only very limited evidence that the PAF incentivized further private sector investment so far, due in part to the small scale of the auctions including limited opportunities to date for trading, the indications are that it could stimulate this type of investment on a larger scale [see Section *PAF Impact and Sustainability*]. While the PAF (through supporting stranded projects) has provided some new price information relating to targeted groups to the market, and generated learning for replication, the current uncertainty on how the international carbon markets will change post-2020 creates challenges for creating longer-term signals and applying the learning from the PAF in other contexts.

Figure 3.3: High-level review of the PAF against its core objectives

PAF Objective	Summary assessment across stakeholders	
Demonstrate a new, cost-effective climate finance mechanism	✓✓✓	All stakeholders agree PAF has achieved this.
Incentivise private sector investment and action in climate change in developing countries	✓✓	Supported action in developing countries, although little evidence of private investment leveraged ^(*) .
Allocate scarce public resources in the most efficient manner	✓✓✓	Auction approach provides efficient mechanism, particularly with right to redeem elsewhere.
Provide a long-term price signal	✓	Market has been provided with new price information, though long-term price signal limited.
Achieve near-term mitigation	✓✓	PAFERN redemption is evidence of emission reduction achieved.
Inform the design of pay-for-performance climate finance approaches and promote replication	?	Potential for this but dissemination of learning limited to date, and affected by external context.

Key: ✓ = Partially achieved; ✓✓ = Achieved; ✓✓✓ = Expectations exceeded; ? = Too early to assess

(*) Limitation due to the design of the PAF, which targeted stranded projects, rather than lack of effectiveness of the PAF.

Efficiency of the PAF and its operational processes

This section considers the efficiency of the PAF and its operational processes. The first section considers the suitability of the actors involved in the governance of the PAF, and the role played by the PAF Secretariat, explored mainly from the perspective of donors and stakeholders involved in the pilot's management. The rest of the section continues to explore the efficiency and effectiveness of the PAF's operational processes from the perspective of bidders (both successful and those who participated in the auctions); presenting a detailed view of the participant experience of the PAF.

Highlights: Evaluation Findings on the Efficiency of the PAF

- The **WBG is widely perceived to bring credibility to the PAF concept** through its existing financial structures, expertise in carbon markets, legal issues and risk management and global reach.
- Agents and partners involved in the implementation of the PAF praise the **technical skills, effective communication and internal processes of the PAF Secretariat** and report effective working relationships. The profile of the consortium of organizations involved in implementation is perceived as strong by the PAF Secretariat, bringing together relevant expertise crucial to the success of the concept.
- There are **high levels of satisfaction among donors** with the governance of the PAF, especially with the level of communication from the Secretariat and their management of meetings. Donors also feel they have an appropriate level of input into decision making.
- More than half of surveyed **participants were satisfied with their experience of PAF** (13 out of 23 respondents), referencing its innovative and efficient approach, the opportunity it provided to sustain or revitalize projects, and the helpful support provided by the WBG to auction participants.
- Participants reported that the **bidding platform was easy to use**, and that the opportunity to pilot the platform before the auction was particularly helpful.
- Some auction participants experienced difficulties in understanding the auction process, but bidders acknowledged the usefulness of the information that the WBG disseminated to explain the auction processes.
- Only a few participants expressed **dissatisfaction with their PAF experience** (5 out of 23 respondents), which they mainly **linked to challenges they had experienced in the redemption process** (11 out of 16 successful participants reported finding this process challenging, in spite of ultimately being able to redeem PAFERNS).
- **Tradability** contributed to attract potential bidders. Relatively low levels of trading, however, reflected the PAF being a pilot exercise (naturally involving small number of PAFERNS overall) and a lack of awareness about the PAF beyond the bidder population (four participants from the first auction were involved in trading, six from the second auction and two from the third auction).

PAF Governance

All stakeholder groups recognized that the WBG as an institution brought deep international credibility to the PAF concept. The suitability of the WBG to manage the PAF can also be linked to its global reach but without ties to any particular country, and its existing institutional structures in place to implement the concept (for example, the WBG has a

bond issuing platform). While there are other institutions that also have that function, stakeholders highlighted the ability of the WBG to put together a variety of functions internally to be able to make a facility, such as expertise in carbon markets, legal issues, and risk management while also being able to issue the actual financial instrument.

The organization hired as auction manager, NERA, was praised by the PAF Secretariat for its input into the implementation of the auction. While ultimate decision-making responsibility rested with the WBG and donors, NERA's expertise and input on decisions relating to auction design, including bid starting prices, informed by their experience in running similar types of auctions, were highly valued. CitiBank was also perceived by the PAF Secretariat as being a good fit for the initiative, having a keen interest in being active in the climate space and being proactive in developing effective processes for managing bonds. Additional expertise from KPC in verification helped ensure that, in the view of the PAF Secretariat, the implementation team had the right profile to deliver the PAF effectively.

We were very pleased with all of [NERA's] work on the auctions. They have a lot of expertise in auction design and can always give a rationale why they have designed things in a certain way. - WBG staff

Those working with the PAF Secretariat on its implementation shared a view that the Secretariat team are highly knowledgeable, communicate effectively and are easy to work with on the implementation of the PAF. It has been noted that the PAF Secretariat is a small team, which manages to efficiently implement the PAF through its technical skills, effective communication and working with other actors both internal and external to the WBG. **Agents involved in the implementation of the PAF generally felt that the level of support provided by the PAF Secretariat was ample and was appropriate for the requirements.** All reported effective working relationships with the Secretariat and felt there was a clear path for decision making. They also noted that learnings from previous auctions had been taken on board by all involved in the implementation to improve the delivery of subsequent auctions.

There are high levels of satisfaction among donors with the implementation of the PAF, the expertise of the Secretariat and communication from WBG staff. Donors reported that the PAF Secretariat was well-organized and conducted substantial research ahead of the rollout of the PAF, as well as undertaking outreach to potential participants and other stakeholders (as detailed in section *Relevance of the PAF*). Donors reported positively on the following areas of the PAF's governance:

- **Good communication with donors:** Donors report being very satisfied overall with the level, tone and style of communication from the PAF Secretariat. They consider communication channels (through in-person meetings, teleconferences, reporting procedures as well as ad hoc telephone and email communication) to be appropriate and designed in such a way as to allow them to provide sufficient feedback. Face to face meetings are seen as helpful to establish relationships between parties, and mentioned as especially useful for new staff within donor organizations to grasp the complexities of the PAF (although challenging to orchestrate across different time zones). Donors report that they receive the right level of information and materials ahead of meetings, and feel that the PAF Secretariat work hard to make meetings as useful and productive as possible. Donors are also satisfied with the quality and timeliness of updates provided to them by the Secretariat. This includes almost-live updates on auction results, which provided reassurance on auction progress that was especially welcomed in the very beginning of the initiative, as well as more broadly being responsive to donor comments and queries.

WBG has done a great job of trying to keep the lines of communication open. They're dedicated, hard-working and diligent, I respect what they've been able to accomplish, working within their own institutional constraints, reaching out to donors and being proactive in trying to understand our needs as individual and trying to make meetings as useful as possible. – Donor

- **Appropriate level of input into decision-making:** Overall donors are happy with the level of input they have into decisions relating to the PAF design and implementation. Donors report being heavily involved in the design and set up of the auction process via Participant Committee Meetings, reporting it to be a collaborative process that provided a lot of opportunity to engage and provide input into the design of the auctions. There is an acknowledgement that due to the technical nature of the PAF donor input into certain decisions may be less than with other funds they may be contributing to. However, for most this was not viewed as a shortcoming, rather a function of the set up that was needed. Indeed, a few donors commented that they appreciate the way some decisions have been taken by the PAF Secretariat due to their technical nature, requiring less donor time to review lengthy documentation. It was noted that occasionally donor input into financial decision making was not taken into account in a timely manner and that certain financial details were less detailed than hoped, but once flagged to the PAF Secretariat this was subsequently rectified, and overall donors felt empowered to provide comment on financial decisions.

Very satisfied [with PAF implementation], there were lots of opportunities to engage and provide input. Participant committee members were quite involved in the design of auction process from a methodological perspective ... it was a very intense but collaborative process. – Donor

Many PAF elements are technical. My feeling is that PAF as a WBG initiative is highly successful, but my involvement [as a donor] is rather limited. In the design there was involvement, to shape the approach, but from the moment it was given, donor guidance was no longer as important. This is not a shortcoming, just the set up. – Donor

- **Efficient processes exercised by a small team:** Some donors have compared the efficiency of the processes of the PAF with PMR and other programs within the WBG. The PAF was described by one donor as a 'role model', commenting on its straightforward donor communications, trouble shooting of emerging issues and general smooth management by a small central Secretariat team.

The remainder of this section explores the experience of bidders in the PAF auctions. It considers how activities implemented by the PAF in advance of, during and following auctions have been received by participants and comments on the effectiveness and efficiency with which participation has been encouraged and facilitated.

Overview of bidder experience

Among auction participants surveyed, more than half were positive overall with their experience of the PAF (13 reported being *fairly or very satisfied*), with only a few expressing dissatisfaction (5 reported being *fairly or very dissatisfied*). As shown in Figure 3.4 the remainder of the 23 participants surveyed (3) said they were neither satisfied nor dissatisfied with the PAF.

Figure 3.4: Overall level of satisfaction with experience of taking part in the PAF³⁵

Source: Ipsos MORI, Survey of PAF Participants (n = 23)

Participants who were satisfied commented on the opportunity the PAF provided to sustain the operation of projects through what they described as its “innovative” and “efficient” approach. Another contributor to positive participant experiences has been the support provided by WBG staff (especially through webinars and presentations) with participants describing the auction process as well communicated and transparent. Satisfied auction participants also mentioned that the PAF had helped to generate knowledge on bidding for emissions reduction credits and helped in earning company image. One participant also explicitly referenced the positive effects of the PAF on the market as the reason underpinning their overall satisfaction:

The PAF provided movement in a market previously at price points where further investment was not justifiable and revitalized projects that had been dormant or left without action – Participant.

Four of the five participants who expressed dissatisfaction reported this to be related to challenges they experienced during the redemption process, in spite of successful redemptions ultimately being achieved (see section below for further discussion of bidders’ experiences of the redemption process). A few dissatisfied participants also expressed a view that the **eligibility requirements** were too high and not easy to achieve, and the small organizations who expressed dissatisfaction linked this to the high cost associated with participating in the auctions.

³⁵ Full survey question wording was as follows: Taking everything into account, how satisfied or dissatisfied were you with your experience of taking part in the PAF? Please think about all aspects of the PAF you were involved in, including your experience before, during, and after the auction.

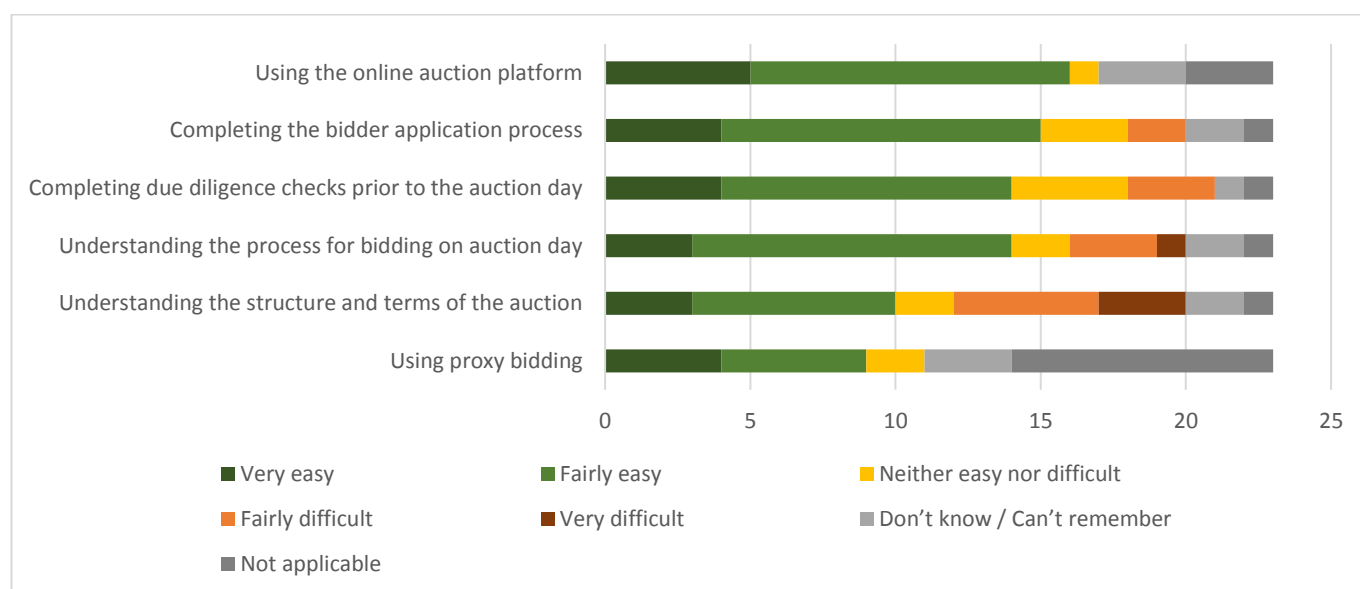
Bidder experience of activities carried out before and during the PAF auctions

All auction participants surveyed reported the bidding platform was easy to use³⁶. They found it particularly helpful to be able to pilot the platform before the actual auction. No issues were reported with the bidding process.

A test was organized in advance of the auction to see how the platform worked and test the timings in between rounds. This made the participation very easy. - Participant.

Despite acknowledging the usefulness of the marketing and outreach activities, there were, however, some processes which participants still found challenging, such as understanding the terms of the auction and the redemption process (see Figure 3.5 and Figure 3.7 below).

Figure 3.5: How easy or difficult did you find engaging in the following PAF processes?



Source: Ipsos MORI, Survey of PAF Participants (n = 23)

Pre-auction information: Webinars, conferences and the informal support provided by the WBG were key to foster participation. Most participants (16 out of 23) first heard about the PAF after being contacted by the WBG (via email or another form of communication), through their website or after attending one of the WBG's events. Participants were satisfied with information provided by the WBG, especially with webinars and explanation to those not familiar with the process and commented positively on the WBG's availability to answer all questions. 17 respondents were very or fairly satisfied with pre-auction information from the WBG.

Auction structure: Despite some auction participants reporting difficulty understanding the structure and terms of the auctions, they felt WBG staff disseminated information about the opportunity provided by the PAF very clearly.

³⁶ The auction platform was provided by NERA. NERA also developed bidding rules and provided training on the auction platform itself. Before each auction a bidder package was distributed which contained the participation agreement, bidding rules and parameters.

Participants commented that taking part in the auction required efforts to understand how it works, but this was not a barrier to participation.

The effort taken by the WBG to explain was good, and one could get quite a good overview. The more difficult part was understanding the bonds, the PAFERs. Webinars were useful, people from the WBG were well trained. - Participant.

Bidder experience of the PAF redemption process

PAF Redemption Activity to date:

The PAFERs generated so far from the three auctions come to maturity at staggered intervals until 2020. Three redemption cycles have already occurred in Autumn 2016, 2017 and 2018. Two redemption cycles are forthcoming in Autumn 2019, and the final one in 2020.

As detailed in the Effectiveness section, the redemption process has been successful; evidenced through the high redemption rates achieved - 95% of PAFERs awarded in the first auction were redeemed during two redemption windows. Similarly, 99% of the PAFERs awarded in the second auction have been redeemed.

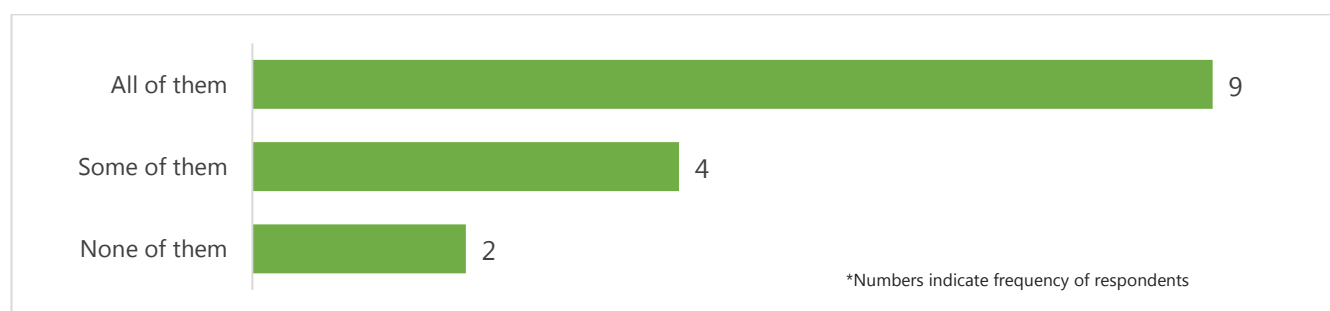
Table 3.6: Number of survey participants who have redeemed and traded, or who have intended to redeem or trade without success (multiple choice)

Q9. Which, if any, of the following apply to your project?	
I have successfully redeemed PAFERs	11
I have successfully traded PAFERs	5
I have tried to buy additional PAFERs without success	0
I have tried to sell PAFERs without success	0
I have tried to redeem PAFERs without success	2
None of the above	0

Source: Ipsos MORI, Survey of PAF successful Participants (n = 15)

The chart below shows the total number of respondents from across all PAF auctions that have traded or redeemed their PAFERs.

Figure 3.6: Number of PAFERs that were bought in the PAF auctions and were traded or redeemed?

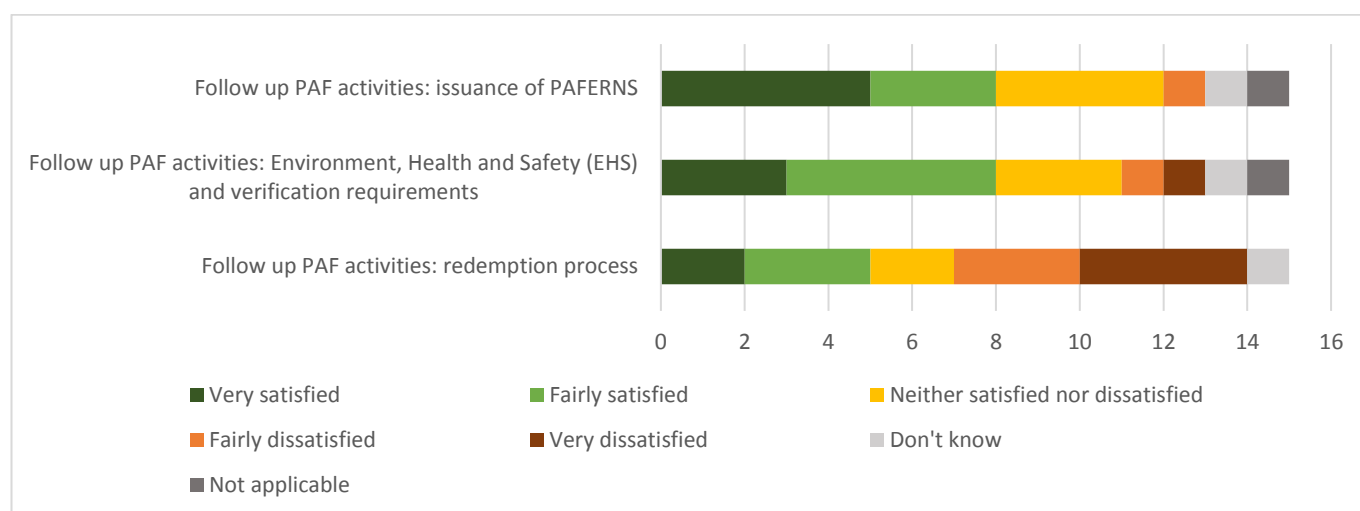


Source: Ipsos MORI, Survey of PAF successful Participants (n = 15)

Although the results suggest this has overall been a successful process, participants reported that the redemption process has been one of the lengthiest and challenging elements of the PAF.

From my point of view, this process [redemption] is very cumbersome. - Participant.

Figure 3.7: Participants' level of satisfaction with the various elements of the PAF



Source: Ipsos MORI, Survey of PAF successful Participants (n = 15)

11 out of 15 successful bidders surveyed reported it had been difficult to redeem PAFERNS. Below are some of the most frequently mentioned reasons by participants when describing the difficulties encountered in the redemption process:

- **Restrictions on the redemption process such as:** vintage periods being too short, the lack of ability to amend the application if verification fails³⁷, only being able to redeem options that are multiples of 2,000 (Auction 1) or 2.500 (Auctions 2 and 3), and the requirements on signatories of the redemption forms: "It was also not clear who was allowed to sign the redemption forms, I was listed as one of the authorized but actually our CEO had to sign it..." (Participant, Auction 2 and 3) In total, six survey/interview respondents experienced issues with elements related to the restrictions on the redemption process.
- **Communications and logistics:** one participant felt some of the more detailed elements of the redemption process lacked clarity upfront, leading to difficulties and potential delays on the redeemer's part: "I only found out during the redemption period that we needed the original EHS report, this was not clear from the beginning (...) had to physically exchange the package and physically send the package to Citibank in London." (Participant, Auction 2). Another participant had been surprised to find out that the original certificates needed to be sent out on paper and not as digital copies, and expressed concern for the associated risks (such as packages being lost in the mail): "I found [it] strange to send them on paper, not very sustainable also" (Participant, Auction 2 and 3). In total, four survey/interview respondents raised difficulties to redeem linked to communications and/or logistics.
- **Tight deadlines for redemption:** one participant reported having missed the first redemption window due to having limited time left for the verification of the emissions and their submission; another reported almost missing one

³⁷ This feature is due to: a) a capital market contract with pre-defined deadlines; a pay-for-performance mechanism where verification was outsourced to an independent verification agent, preventing flexibility for certain Noteholders.

redemption cycle due to difficulties understanding how to complete the redemption notice. Two survey/interview respondents reported difficulties linked to tight deadlines for redemption.

Other examples of challenges faced were not related to the design of the PAF itself, but rather to other restrictions, for example those associated with the transfer of carbon credits between Annex 1 and non-Annex 1 countries under the CDM Framework. Although this is not within the control of the PAF to change, it is noted here as difficulties with this part of the implementation may be reflected in the overall feedback provided by PAF participants.

Regardless of the difficulties encountered during the redemption process, 16 out of 21 respondents reported that they would be willing to participate in a future PAF auction. This, and the high redemption rate achieved so far, demonstrates that despite needing some improvements, the redemption process remains a successful implementation activity in the PAF.

Bidder experience of the PAF trading process

One of the elements that made the PAF attractive for some participants was the flexibility offered to either trade or redeem PAFERs. This particular feature of the mechanism has been a main focus in the PAF Secretariat outreach efforts.

Summary of PAF trading activity to date:

Trading was limited in 2016 with three organizations out of 11 trading PAFERs from the first auction. However, in 2017, trading activities were significantly higher with four participants from the first auction involved in trading, six from the second auction and two from the third auction. Most of the trading happened within the PAF and between PAF participants. There is limited evidence of trading outside of the PAF: there is one known example of cross-auction trading (e.g. participant in one auction bought PAFERs from another) and one instance where PAFERs were sold to a non-participant in the PAF.³⁸

There is evidence of appetite for trading PAFERs; participants reported that they have been contacted by many companies wanting to buy their PAFERs. One participant reported being able to sell their PAFERs fairly soon after winning them:

We sold some of the PAFERs to raise capital because we had an initial high investment and we are a small firm. Sold fairly soon – after a couple of months. - Participant.

The overall small number of PAFERs, as well as lack of awareness about the PAF outside bidder population, were identified as potential limitations to trade. One participant indicated difficulty obtaining winner contact details to inquire about a sale. However, this is to be expected as the PAF Secretariat can only publicize information about successful bidders with the participants' consent. The PAF Secretariat, in keeping with its mandate, provides a list of participants that have consented to share their details with other bidders or parties interested to engage in trading.

³⁸ Direct observation of trading activity was not possible. However, Citi tracked changes to holders of PAFERs. Interviews and a survey with participants also explored trading activity.

PAF Impact and Sustainability: its potential for replication and scale-up

In considering the outcomes and impacts the PAF has achieved so far, this section explores the initiatives existing to date that build upon the PAF the likely sustainability of such impacts in terms of the PAF's potential for replication.

Highlights: Evaluation Findings on PAF's Impacts and Sustainability (defined as its potential for replication)

- The PAF model is viable and has **potentially broad applicability in many other contexts** e.g. in other sectors and/or geographies.
- In spite of this potential, there are **only a few examples of replication to date** (e.g. NACAP, and EPAF), given ongoing market uncertainty.
- The PAF model consists of several modular components that can be packaged in the same way or with different permutations when considering replication.
- **Existing WBG-commissioned reports are also rich resources** to inform replication.

Results: PAF Outcomes and Impacts to date

The evaluation has found that the PAF provided further confirmation that auctions are a viable mechanism to allocate scarce funding for climate change mitigation efficiently. The PAF was successful at attracting bidders, generating additional emission reductions and sustaining stranded projects. While the PAF has generated learning for replication, the current uncertainty on how the international carbon markets will change post-2020 creates challenges for scaling-up and replicating the PAF in other contexts.

The Theory of Change for the PAF included several expected outcomes and impacts in terms of scaling up the PAF and delivering emission reductions (outcomes), and catalyzing public/private market and replicating the model (impacts). Table 3.7 summarizes the evaluation team's assessment of the PAF's progress toward reaching the anticipated outcomes and impacts to date.

Table 3.7: PAF's progress toward achieving its anticipated outcomes and impacts

Anticipated PAF Outcomes per PAF ToC	Summary assessment	
New funding sources for PAF (scale-up)	✓✓	An existing funder (Germany) provided new funding for a spin-off of the PAF that will use essentially the same structures: the Nitric Acid Climate Auctions Program.
Increased project activity	✓✓	PAFERN redemptions is evidence of increased project activity and additional emission reductions and project co-benefits achieved
Projects deliver emission reductions (and other co-benefits)	✓✓	
<i>Any unforeseen outcomes leading to unforeseen impacts (positive or negative)</i>	?	<i>No significant unforeseen outcomes or impacts have been reported to date.</i>
Anticipated PAF Impacts per PAF ToC	Summary assessment	
Catalyze public/private market to increase climate finance	?	PAF concepts are known to have already influenced the design of the Environmental Price Assurance Facility. In addition, other national entities are reportedly assessing whether the PAF concepts will work in their contexts. Stakeholders are confident there will be more examples of replication once Paris rules are clear.
Replication of PAF Model in other contexts, investors, etc.	?	
New initiatives build upon PAF model – testing related concepts	✓	
Increased emission reductions (and other co-benefits) from new initiatives	?	

Legend: ✓ = Partially achieved; ✓✓ = Achieved; ✓✓✓ = Expectations exceeded; ? = Too early to assess

The achievement of outcomes was partly discussed in Section *Effectiveness of the PAF*, which provides estimates of the emission reductions achieved by projects supported by the PAF. That section, however, did not cover the scale-up phase or the impacts of the PAF. This sub-section, hence, explores the extent to which the PAF has been scaled-up and replicated, accounting for the timeline to observe outcomes and impacts.

As the PAF model has proven to be viable, it is expected to be replicated for other GHGs and other sectors (the “scaling-up phase”) once the long-term market conditions become more clear. The WBG envisages that the PAF model could also be adapted in the future, depending on donors’ interests (public and private climate finance providers). For example, the model could be operationalized by the Green Climate Fund, governments seeking financing for Nationally Determined Contributions (NDCs), and/or private funds that intend to support climate change projects in developing countries. The PAF could also be adapted by countries currently developing their carbon pricing mechanisms, such as emissions trading schemes and/or carbon taxes or by other jurisdictions or private entities as is discussed in other WBG publications.³⁹

When the PAF was initially designed, there was no indication of what a post-2020 agreement might look like and no particular reason to assume there would be an overhaul of existing mechanisms such as the CDM and Joint Implementation (JI). Currently, the carbon finance community is collectively waiting for increased certainty coming out of UNFCCC negotiations on how the Paris Agreement, and especially Article 6 which addresses carbon markets, will be

³⁹ The PAF Secretariat has already commissioned several studies addressing replication, particularly exploring different sectors, all of which are posted on their website as they become available at: <https://www.pilotauctionfacility.org/>. See for example: “Opportunities Beyond the Piloting Phase” (Climate Focus et al, 2016), “Briefing Note: PAF-like mechanism for the oil and gas sector” (Carbon Limits, undated), and “Study: Using the Climate Auction Model to Catalyse Energy, and Resource Efficient Buildings” (Carbon Trust, 2018)

implemented. Aspects of the negotiations still to be clarified heavily influence in which contexts the PAF may be relevant.⁴⁰ This shift creates an opportunity to further increase the relevance, efficiency and effectiveness, and therefore impacts of carbon markets, yet creates significant uncertainty in the short term. Therefore, it is only fair, within the timing of this evaluation, to expect to see early evidence emerging of whether the PAF's activities to date have already delivered, or set it on the path to achieving, the impacts anticipated in its Theory of Change.

Despite the limited efforts to actively replicate the PAF conducted by the PAF Secretariat and other stakeholders within the timeline of the evaluation, there are already examples of replication directly building upon the PAF's success to date. The Nitric Acid Climate Auctions Program (NACAP) is being implemented in collaboration with the Nitric Acid Climate Action Group.⁴¹ Similar to Auction 3 of the PAF, the NACAP will support price guarantees for eligible nitrous oxide emission reductions from nitric acid plants with existing or new abatement projects adapting PAF structures created within the WBG. The NACAP auctioning program is supported by the German government, which is also a donor of the PAF. In addition, the Climate Trust, a conservation and carbon finance organization based in the United States, announced its planned Environmental Price Assurance Facility (EPAF)⁴², inspired by the PAF. The EPAF will aim to provide price guarantees for environmental credits in the United States and anticipated running its first auction in the coming months. One stakeholder also mentioned that the International Civil Aviation Organization (ICAO) has been looking at the PAF model in regards to the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA).

Given the market uncertainty, it is too early to appropriately assess the PAF's ability long-term to catalyze the public/private market to increase climate finance, or to replicate or adapt PAF concepts in other contexts that would lead to a significant increase in emission reductions. However, the WBG, donors and expert stakeholders all expressed confidence that the model is viable. The challenge now comes in identifying the most appropriate contexts, once the Paris implementation parameters as well as the pathways for implementing individual country's NDCs, are clarified.

Sectors and contexts where the PAF could be replicated

The PAF model is clearly relevant for a variety of **climate change mitigation sectors**, as long as the design is handled appropriately for that context. The evaluation team invited views from participants on the project types that could be targeted by the PAF in the future. The diversity of responses supported WBG and donor expectation's that the PAF can be relevant in a wide variety of sectors. The three top scoring areas included Renewable energy – energy industry, Land use and land use change, and Industrial process emissions, but every sector/sub-sector mentioned received multiple responses. [Refer to Annex II for the full results, and various other WBG publications including the Climate Focus and Carbon Trust reports⁴³ for details on how the PAF could be replicated in specific sectors for climate change]. It was also highlighted by one market expert that the PAF model could also be replicated in areas where GHG emissions are not the core metric, for example supporting Sustainable Development Goals (SDGs) using the SD Verified Impact Standard or certified metrics for green buildings.

The evaluation team, and market experts consulted (including some donor representatives), recognize that an auction approach can also be **viable for national governments**. This would be in support of NDC implementation or other

⁴⁰ In the Paris context, project host countries where the emission reductions are produced would have to authorise the transfer of any credits or outcomes. This transfer of credits presents some issues with regard to accounting that need to be carefully considered as more clarity emerges from the UNFCCC CoP process.

⁴¹ <https://www.worldbank.org/en/programs/climate-auctions-program#3>

⁴² <http://www.environmentalpriceassurancefacility.com/>

⁴³ Climate Focus et al, (2016) Opportunities Beyond the Piloting Phase, and Carbon Trust (2018) Study: Using the Climate Auction Model to Catalyse Energy, and Resource Efficient Buildings". Both are available for download at www.pilotauctionfacility.org

jurisdictions (such as national or subnational in developed and/or developing country contexts), but with the condition that there is a large enough bidder pool to generate sufficient competition. The specific relevance and parameters that are appropriate will depend on the selected sector, geographic location, and type of funding support that is needed in that market. To be viable, a country would need a clear and ambitious NDC for which the auction can support one component.

Section 4 on Lessons Learned provides further discussion of the elements of the PAF that may be best suited to replication in other contexts.

Considerations for auction hosts

As already discussed in this report, the WBG supported by its subcontractors, was highly suited to host the PAF due to alignment with its mission, synergies with existing initiatives, as well as the types of expertise from which it can draw from internally. Stakeholders reported that the way the WBG worked to design and then implement the PAF was quite pivotal to its success. In addition, the WBG is quite unique in that it is not tied to any one single country, but can be a conduit for multiple countries. Some expert stakeholders shared that the WBG is perhaps even uniquely suited to perform the hosting function due to both the internal expertise as well as the international credibility and reach. What is clear is that it would be most efficient to use the WBG as host, or at least heavily leverage their expertise. Several stakeholders consulted by this evaluation questioned whether other financial institutions would even be in a position to do something similar on an international scale.

4 Conclusions and lessons learned

Conclusions

This section discusses the conclusions and lessons learned from this evaluation; firstly, to maximize participation and improve the bidder experience of PAF or PAF-like auctions, and secondly for those considering replication of the PAF model. A series of recommendations for consideration by the PAF Secretariat and other stakeholders is then presented in a final section of this report.

The PAF has demonstrated its relevance for the broader climate change market as well as for the targeted participants. Participation levels in the three auctions overall met expectations given the number of PAFERs available in each. It successfully tested different auction formats and generated lessons learned that will inform future efforts for scaling-up and replicating the concept. While it primarily targeted stranded projects, the model could potentially be applied to new projects too⁴⁴.

In total 50 bidders participated in PAF auctions (often in more than one auction) as a result of an effective outreach effort, with projects located in several countries in Latin America and Asia. PAFERs equivalent to 4.7 million tCO₂e were redeemed across the first and second redemption windows. It is estimated that between 44% and 59% of these emission reductions (1.9 million tCO₂e to 2.6 million tCO₂e) would not have been achieved without the PAF. Redemption rates were high, and trading appears to have been key to achieve these high redemption rates.

The PAF worked well as a proof of concept, effectively demonstrating the viability and functionality of an auction process for tradable climate assets. However, there is further potential for learning from the PAF to be disseminated through outreach activity to wider audiences, other sectors and geographies.

The PAF Secretariat managed the auctions in an effective and efficient way. Overall, donors, participants and stakeholders involved in the management of the action were satisfied with the work carried out by the WBG. The information provided before the auctions was useful, helpful and sufficient for bidders to understand the terms of the auction. The auctions ran smoothly, with good collaboration between NERA and the PAF Secretariat, and bidders did not experience any issues during the auctions themselves. Marketing and outreach activities were appreciated by bidders and fundamental to attract a large pool of participants. Webinars were particularly praised by interviewees as they helped them to understand technical concepts in an efficient and engaging way.

There have been examples of trading, not only between auction winners, but also with an organization that did not participate in auctions (or if it did, it was unsuccessful) and with one winner from another auction.⁴⁵ Trading was facilitated to the extent possible by the PAF Secretariat, although some argued that this feature was limited by the difficulty to trade PAFERs outside of PAF participants. Redemption was the most difficult process for winners, who experienced varied

⁴⁴ Auctions 1-3 all addressed existing projects. Auction 3 had one component that addressed new projects.

⁴⁵ Direct observation of trading activity was not possible. However, Citi tracked changes to holders of PAFERs. Interviews and a survey with participants also explored trading activity.

issues (problems meeting deadlines, and difficulties in understanding the CDM framework process, among other issues). However, high redemption rates indicate that despite being challenging, the process was effective.

It is too early to assess the impacts and sustainability of the PAF, understood as the scale-up and replication of the pilot. Nonetheless, the concept has proved to be an effective mechanism to allocate scarce funding to reduce GHG emissions and mitigate climate change. It has provided lessons learned and indications of contexts where the concept may be applied.

Lessons learned

Lessons learned on features of the PAF's design

As outlined in the Relevance section, the PAF bundles several distinct elements into a unique package. Specifically, the PAF provides (a) price guarantees (b) that are tradable (c) in the form of put options in the form of zero-coupon puttable bonds (d) that were auctioned online in a clock format (e) targeting stranded climate change mitigation projects (f) using existing internationally applicable MRV frameworks. There are numerous potential permutations of these characteristics and the specific objectives will determine which features of the PAF bundled are relevant in other contexts.

It is noted that the WBG has commissioned two reports detailing lessons learned⁴⁶ from the first two auctions as well as several studies examining the potential for replicability for the PAF in different sectors and contexts, including national or regional auctions or targeting new projects outside of existing crediting schemes.⁴⁷ As such, details on the mechanics of auctions and options for the specific parameters⁴⁸ of the auctions themselves e.g. the pros and cons of forward versus reverse auctions and specific information on how the PAF may be applied in selected sectors or NDCs are dealt with in these other reports. To add value and minimize duplication, the discussion presented in this section therefore focuses on new stakeholder feedback gathered for this evaluation. A summary of the headline findings of the two lessons learned reports commissioned by the WBG to date is presented in Annex III.

Below, each of the distinct features of the PAF is reviewed to consider what has been learned about their potential value, and applicability, in other contexts.

- Offering a **price guarantee via put option**, i.e. the 'right, but not obligation' for future transaction(s). The put option approach to providing a price guarantee has been found to be helpful amidst significant project or market uncertainty. It would be less useful when market prices are stable and easily predictable, but could still play a role in risk mitigation or pre-financing. This provides substantial additional value to project developers relative to other common funding options, e.g. loans, as it allows them to secure a price guarantee prior to actual project implementation for only the price of the premium.⁴⁹

⁴⁶ See "Lessons Learned Report" (WBG, undated, includes lessons after the first auction), and "Lessons Learned from Auctions 1 & 2" (NERA, 2017). Both are available at: <https://www.pilotauctionfacility.org>

⁴⁷ See for example: "Opportunities Beyond the Piloting Phase" (Climate Focus et al, 2016), "Briefing Note: PAF-like mechanism for the oil and gas sector" (Carbon Limits, undated), and "Study: Using the Climate Auction Model to Catalyse Energy, and Resource Efficient Buildings" (Carbon Trust, 2018). All of these reports and related resources are published on PAF's website as they become available, see: <https://www.pilotauctionfacility.org>

⁴⁸ The auction parameters include the auction budget, the bid unit, the premium or bid unit price, the first round's strike price, the maximum and minimum bid units, the bid deposit, and the decrement.

⁴⁹ The Methane Finance Study Group Report that initiated the discussions that resulted in the PAF's development contains a detailed discussion on structuring result-based finance and discusses three design options for a price guarantee approach: (a) direct purchase, such as with Emission Reduction Purchase Agreements common under the CDM, (b) top-up instruments the funder commits to paying the difference between a fixed price agreed with the project implementer and the market price and (c) put options, as was selected for the PAF.

- **PAFERN tradability** between winners as well as (potentially) external parties was shown to be helpful, but not critical to achieving good redemption rates. Tradability can attract additional participants who, for whatever reason, did not participate in the original auctions and also helps increase efficiency by increasing the likelihood that all PAFERNS are redeemed. Also, tradability encourages aggregation and speculation; but can distort price signals by reducing market price for emission reductions. Depending on objectives, it may be important to restrict trading to similarly situated groups. The Climate Focus report notes that “the decision on whether or not to include the element of tradability should be based on whether there is clear value added through the transferability of the price guarantee, and if so, the costs associated with adopting or developing a trading platform.... it may be desirable to allow for trading of price guarantees only under strict conditions. For instance, bidders participating in an auction with ‘carved-out’ products that offer price guarantees at a discount for certain participants (e.g. small business owners located in a certain region) should only be allowed to sell allocated price guarantees to other project developers that would have qualified for the same discount. In other cases, where price guarantees are auctioned to bidders internationally, limitations on fungibility may be required to avoid arbitrage situations.” See “Opportunities Beyond the Piloting Phase.” (Climate Focus et al., 2016)
- **Puttable bonds** (PAFERNs) that function like a put option as the delivery mechanism are a solid, but complex option. Other formats may be suitable in other contexts (for example, options contracts, though they may incur significant transaction costs). Most other potential donors, including developing country governments or private sector entities, likely lack the necessary infrastructure and may need to opt for more simplified issuance and transferability protocols to manage costs. For more on this issue see “Lessons Learned Report” (WBG, undated).
- **Online clock auction** (e.g. versus an RFP or silent auction) of price guarantees. The options as well as choices to be made regarding mechanics of any auction are discussed in detail elsewhere, such as in “Blueprint for Operational Structure” (Power Auctions 2014). To summarize, a clock auction has a variety of benefits relative to other options, e.g. in increasing efficiency and allows price discovery. What is clear from the current evaluation activities is that while the PAF model has broad potential, it is only viable where sufficient competition is anticipated between bidders with similar characteristics. A key implication of this is that designers should thoroughly investigate the market potential and relevant parameters e.g. whether subgroupings are needed for different project profiles.

Auction hosts designing initial clock auctions in an unstable and/or uncertain market environment face a key challenge in determining how to allocate the right amount of risk as communicated in the auction rules and parameters. It is critical to understand the supply and demand dynamics and level of potential participation. For more on this issue, refer to other reports addressing auction mechanics for more on this complex topic as well as related issues in technical design and pricing.⁵⁰

As noted in the Climate Focus report, unless collusion is a serious concern, the clock auction format is generally recommended for PAF-like auctions. The PAF results for the forward and reverse auctions were almost identical. One key benefit of using a reverse auction is increased access for bidders with limited upfront capital due to a lower upfront premium. However, which is most appropriate will depend on the specific objectives. For more on this issue such as the pros and cons of forward or reverse auctions or types of auctions other than a clock option, see for example “Lessons Learned from Auctions 1 & 2” (NERA, 2017), “Review of Relevant Auction Theory” (Power Auctions, 2014), and “Opportunities Beyond the Piloting Phase” (Climate Focus et al, 2016).

⁵⁰ See for example: “Blueprint for Operational Structure” (Power Auctions, 2014), “Review of Relevant Auction Theory” (Power Auctions, 2014), and “Lessons Learned from Auctions 1 & 2” (NERA, 2017).

- By primarily **targeting existing ‘stranded’ projects**, the PAF had a convenient and rich source of potential market data. However, targeting existing projects is not necessary for the success of the concept, as long as sufficient research is done on the targeted market to ensure sufficient participation and appropriate auction parameters in that context. The PAF model appears to more naturally fit with existing projects, yet has potential viability for new projects where there is sufficient competition and the participation incentives are high enough to mitigate risks in the early development stage of new projects.⁵¹ However, the auction parameters would likely need to shift to better fit the financing expectations of new projects.⁵² For further information refer to “Opportunities Beyond the Piloting Phase” (Climate Focus et al, 2016).
- **Use of existing MRV structures and standards** such as CDM or Gold Standard is recommended by stakeholders in this evaluation as well as all of the other related reports. While it is not absolutely necessary, it substantially increases efficiency and promotes effectiveness of implementation and understandability by potential participants. It is also useful to avoid duplication of efforts where appropriate and relevant standards are widely used.⁵³ For more on this issue see “Opportunities Beyond the Piloting Phase” (Climate Focus et al, 2016).
- **The PAF targeted projects in countries across all regions,⁵⁴ but geographically-specific auctions are also possible.** A geographically-specific auction could be linked to national or regional efforts, or simply be a subset of international efforts. Having something more focused with specific rules regionally could reduce complexity and therefore would be more accessible to smaller or less sophisticated bidders, as would having information in the local language(s) available and having national or more focused outreach. However, as the focus narrows there is increasing risk that there will be insufficient bidders and risk of decreasing efficiency in other ways in terms of the global ambition of stimulating emission reductions at the minimum cost.

Lessons learned for (new) auction hosts

With regards to **hosting another PAF-like model**, it would be efficient to use the WBG as host, given their unique and impartial position, including their international convening power, access to climate change knowledge, ability to issue internationally-recognized financial contracts and to disburse funds, as well as their direct experience in implementing the PAF. However, it is not necessary to use the WBG. PAF-like auctions could be replicated by any entity that has the appropriate capacity and credibility needed for the specific auction characteristics proposed. For example, a new initiative may or may not include a tradability component. If trading was envisioned, then the appropriate capacity and credibility would be necessary.

⁵¹ Auction 3 included a component for new projects. While there was good bidder participation, there was insufficient initial demand to proceed beyond one round in the auction. Therefore, the conclusions that can be drawn regarding new projects are very limited.

⁵² The Climate Focus report explored the potential for PAF for new projects, stating for example: “There are a number of challenges associated with incentivizing new abatement opportunities. These relate, for instance, to identifying metrics that are simple enough to be used in an auction and that can also function as proxies for estimating the overall mitigation impact. Due to the investment needs of new projects, the PAF model must also send a strong enough price signal not only to maintain existing activities, but also to help trigger new ones. This requires a good understanding of actual abatement costs of the mitigation activities and fine tuning of the level of incentives, potentially combining price guarantees, up-front finance, and suitable risk mitigation instruments.”

⁵³ The Climate Focus report noted that “Future auctions can opt for any MRV framework that assures funders of the validity of the payment metric. [...] For projects outside the existing crediting schemes, MRV frameworks based on tons of carbon dioxide equivalent are typically not available. [...] Moving beyond current carbon market MRV frameworks introduces the possibility for developing more practical MRV approaches that are built on parameters inherent to measuring a project’s performance, and are perhaps even routinely collected by project developers or other institutions. [...] Substantial abatement potential remains in sectors where existing carbon market methodologies and MRV procedures have proven too complex or burdensome to be applied. [...] Another option is to align with standards that certify low carbon practices without directly reporting tons of carbon dioxide equivalent emission reductions, such as those developed for the building sector.”

⁵⁴ See, for example, eligibility criteria in Auction 1 (<https://www.pilotauctionfacility.org/content/first-auction-criteria>)

In the context of a national initiative, a **local bank** may be appropriate, in isolation or in partnership with other entities, as they would not necessarily need to demonstrate international characteristics the WBG has, but would still need to demonstrate other elements such as access to climate change knowledge, financial capacity and credibility as well as a sufficient ability to assess the market conditions and market effectively. However, other entities would have a steep learning curve and ideally would be able to draw directly on WBG expertise at least initially especially from climate and carbon specialists.

Some aspects or actions that are needed from the auction host are: (a) credibility and impartiality in the specific market context, (b) access to appropriate climate change knowledge, (c) appropriate financial expertise and capacity for the specific components needed for that auction (b) ability to thoroughly investigate market potential in advance. What is also valuable is to synergize or link to other funds and initiatives, within or external to the WBG as appropriate for the targeted market and auction purpose. **Collaboration with other funds** or relevant entities can increase reach by building upon what is already there as well as minimize duplication or working at cross-purposes. As both capacity in a country and in the host organization to be able to run it is needed, it will be quite difficult in the most challenging sectors where the reduction and climate action has been undertaken by the least sophisticated actors. It is important that sufficient participation is expected to generate competition and that auction rounds are conducted amongst similarly situated bidders. These features ensure a sufficiently liquid market and the opportunity for good price finding. The significant advance research on the market conducted and/or commissioned by the PAF Secretariat facilitated the success of the pilot. For this reason, **auction hosts should thoroughly investigate market potential in advance.**

Lessons learned on how to design auctions to attract participants

As noted above, a wide base of participants is key for the success of any future auction. This evaluation has provided lessons learned on some characteristics that any future PAF-like instrument need to have to attract participants:

- **Clearer and simpler bidding rules** with less complicated documents, which is particularly relevant for smaller or less knowledgeable bidders. At a minimum, auction hosts should clearly articulate all parameters and limitations to reassure potential bidders of what to expect, including providing materials in the local language(s) as feasible. Evaluators note that participants found the information on how auctions work and the mock auctions conducted by the PAF very helpful.
- **Provide clear information on bidding rules in local languages**, including (but not limited to) information on redemption. Webinars were especially relevant to communicate effectively with bidders and promote the PAF, and these should be carried out at different timings (to accommodate to different time zones) and in several languages if the auction targets different regions.
- **Reducing the upfront financial requirements** to be more affordable, such as the bid deposit and/or premium paid. This is especially relevant for smaller bidders with less access to upfront capital. However, auction experts are clear that some type of bid deposit is important, e.g. to help ensure only serious bidders participate. Premiums are also a core component of these types of auctions. However, if the demand is sufficient, one idea could be to have a parallel auction for small or otherwise more financially constrained bidders with a smaller bid deposit and/or different treatment of the premium, and potentially smaller maximum amounts auctioned.
- **Extensive outreach to engage potential participants is key.** This is not only to stimulate sufficient participation, but also to inform and educate potential bidders to increase their comfort with the processes. In this regard, facilitate information in local languages is key to engage potential participants.

- **Small or less knowledgeable bidders will need additional support.** In addition to targeted outreach and training efforts, seek to simplify and streamline as feasible to promote engagement of smaller bidders, as desired. The PAF could therefore consider a separate auction specifically targeting smaller projects/bidders or other special characteristics.
- **Auctions should be perceived as winnable with a reasonable range of price certainty.** To be successful, PAF-like instruments should ensure that participants feel (a) they have a good chance of winning (thus attracting sufficient similarly-situated bidders); (b) that the amount offered in the auction is tailored to the level of participation/competition expected, and (c) that resulting prices give a good price signal to projects with similar characteristics.

Related to this point, a few stakeholders suggested instituting a floor price, or minimum amount participants would receive. However, this could tend to undermine the auction itself. Yet it could be considered as a temporary offer for a new auction where no one knows what the approximate winning price will be. There are two separate but related concepts here. The first is potential bidders want to minimize the uncertainty involved when deciding to participate and want a clear signal indicating the potential outcome. The second is guaranteeing a minimum for any successful bidder. However, this would interfere with price discovery if set too high and increasing certainty is likely more effectively and efficiently handled in other ways, such as by subgrouping or by holding regular auctions to increase familiarity. This is also only really an issue in the early stages in a new market area; when regular auctions are conducted the information from prior auctions can provide this signal.

The incremental cost of mitigation measures varies widely not only by sector and geography, but also within measure classes. Designers need to appropriately group potential bidders through the rules and eligibility criteria while ensuring there will be sufficient bidders to avoid overpaying, yet also distributing and maximizing the stimulation effect.

- **Institute regular auctions, avoid one-offs.** Holding regular auctions with similar characteristics facilitates bidder comfort and familiarity as well as sending a price signal and increasing market stability. Bidders prefer that auctions happen at predictable intervals where the rules parameters don't change significantly from one auction to the next. Having one-time auctions makes it difficult for potential participants to plan. This also increases overall efficiency of the auction system, yet would also require sufficient ongoing demand for that offering (e.g. subsector/region combination). The implication of this suggestion is to have a recurring auction, such as a few times a year, that bidders can rely on and then look forward to participating.

Lessons learned for improving participants' experience of taking part in auctions

Overall PAF participants were satisfied with the processes undertaken before, during and after the auctions. Survey and interview respondents have provided information on certain features and elements of the PAF that have made processes smooth, and have suggested ways to improve other aspects that worked less well.

- **Simplifying the redemption process and extending the deadlines for noteholders in the redemption process as far as possible.** As noted elsewhere most participants reported that the process for redemption was quite challenging. Some of the complexity that challenged participants is due to using the CDM framework, rather than related to components of the PAF itself. However, the auction hosts may be able to provide more clear information upfront now that there is a better understanding of where participants struggled (e.g. webinars, direct communication via email/phone, brochures and factsheets, etc.) One of the elements that prevented some participants to redeem their

PAFERNs successfully were the tight deadlines, so these should be extended as much as possible to provide enough time to redeemers to familiarize themselves with the process and amend the redemption form if needed.

- **Provide channels to participants to communicate with auction host.** PAF participants strongly appreciated the direct communication and formal and informal support provided by the PAF Secretariat before and after the auctions.
- **Provide opportunity to participants to test the bidding platform before it goes live,** as this was an element highly appreciated by PAF participants and it helps to bring them to similar positions of understanding and readiness before the auction.
- **Facilitate secondary trading process** (if allowed in the PAF-like instrument, and as far as is permissible) by sharing noteholders' contact details with potential buyers, and disseminate the PAF (or similar instrument) in other contexts to foster trading in other markets.

5 Recommendations

These recommendations build on the findings and conclusions resulting from this evaluation. Whilst recognizing that, by and large, the PAF has proved to be an effective and efficient model to allocate funding to reduce emissions and the PAF Secretariat has effectively and efficiently engaged participants, donors and other stakeholders, the following recommendations have been designed to help the PAF Secretariat further enhance its support to participants and increase its outreach to wider audiences to promote replication.

Recommendation 1: Make efforts to further facilitate the redemption process to PAFERN holders in the next 2 redemption rounds (and in any other future PAF-like instrument)

Addressed to: PAF Secretariat

This evaluation has found navigating the redemption process to have been the most challenging element of the PAF for bidders, and their experience of it has affected their overall perception of the PAF. Whilst acknowledging that the PAF Secretariat has made strong efforts to support this process and that some of these difficulties are inherent to the CDM framework procedures, there are some actions that the PAF Secretariat could take to further facilitate this process for redeemers, such as:

- **Provide information in other languages about the redemption process.** Translations could be made, for example, of documents summarizing the whole process or for specific processes (e.g. how to fill out the final redemption notice⁵⁵, main requirements for redemption, etc.).
- **Organize webinars just before and during redemption windows** to communicate the steps required to redeem PAFERNs. Webinars have been highly appreciated by participants as the most helpful tool to understand the PAF.
- **Provide additional information to bidders explaining relevant features of the CDM framework.** While the PAF Secretariat cannot improve or facilitate these processes, it could provide additional information on elements such as: the need to redeem from an Annex I country; and the need to verify emissions well in advance. This could be done by providing links to relevant information on the CDM framework or producing a summary of the key information related to CDM that PAF participants need to know.

Recommendation 2: Further support replication efforts

Addressed to: WBG, PAF donors, other donors supporting climate finance actions

This section offers recommendations on the platforms through which the PAF could be disseminated and the ways in which the WBG and donors could offer support to stakeholders seeking to replicate the PAF:

⁵⁵ Some bidders found it particularly difficult to complete the final redemption notice and noted that the technical information, only available in English, was difficult to understand.

- **Promote the PAF and disseminate lessons learned to other funds** such as the Green Climate Fund, donors active in the climate finance landscape (e.g. PAF donors like Germany or Sweden as well as non-PAF donors such as the EU, Japan, Norway or UK) and private funds that intend to support climate change projects in developing countries.
- **Offer support to NACAP⁵⁶ and EPAF by sharing lessons learned** given the success of the initiatives replicating or inspired by the PAF will influence future replication efforts (including lessons learned from this evaluation on key elements to ensure a smooth bidder experience).
- **Promote the PAF among countries with an NDC component that could be supported by an auction.** This could help national governments implement and achieve their NDC target but also, in the earlier phase, give these governments the trust and comfort to actually define ambitious NDC targets to facilitate success. For example, potential donors and the WBG could disseminate the PAF and promote learning such as through workshops or targeted assistance among countries participating in PMR and/or TCAF, also hosted by the WBG.
- **Deliver support to potential new auction hosts** (once future replication initiatives are more tangible) to help facilitate successful replication efforts (e.g. by providing direct communication to solve queries, organizing a training program, producing factsheets with main requirements to host auctions, etc.).

Recommendation 3: Conduct further analysis to define PAF's role post-2020

Addressed to: PAF Secretariat

Post-2020, depending on how the rules and parameters relating to Article 6 of the Paris Agreement evolve, the PAF could provide a demonstrably effective tool that can play a role in building trust in a new post-2020 market for developers as well as investors. For example, public money could be used in the beginning to establish the core auction structures and publicize the offering, yet there could also be room for private financiers to play a low-risk role over time. Essentially the PAF or similar facility could facilitate a secondary market or parallel auction for buyers. If robust international carbon markets are unlikely due to lack of progress on Article 6 negotiations or how it is interpreted, the PAF could still be relevant at the national or subnational level. Evaluators suggest that the PAF Secretariat initiate a new analysis in 2020 (after the UNFCCC COP 25) once the international context is clearer.

⁵⁶ NACAP is also hosted by the WBG.

6 Annexes

Annex I: Revision of the logical framework

This chapter sets out to assess the most appropriate means of measuring the performance of the PAF, including an assessment of the suitability of the existing indicators within the PAF's logical framework. The section concludes with a table presenting the current indicators against proposed (new) indicators that, in the view of the Evaluation team, may effectively support monitoring of the PAF's implementation going forwards. These indicators could also serve as an example for the designers or evaluators of any future PAF-like instruments.

The rationale for monitoring an initiative such as the PAF in this way is to generate evidence on its activities and impacts over time, and to allow for an assessment of how the intervention has been delivered, what it has delivered and whether there are any improvements that could be made in the future. The evidence generated through such monitoring is essential for comprehensive evaluation to be undertaken in the future.

The PAF's current theory of change and logical framework are included in Annex B of the PAF Evaluation Framework developed by Ecofys and Climate Focus in 2016. The high-level Theory of Change diagram and its rationale are still valid for the remaining years of the PAF. The main uncertainty, how Paris Article 6 will be operationalized, is an external factor to the PAF.

The logical framework sets indicators, data sources and assumptions for the expected impacts, outcomes and outputs, as well as for the inputs, activities and external factors. We note that the logical framework is designed to be used by evaluators rather than being designed primarily as a monitoring tool for the WBG. As a result, some indicators are defined as assessment criteria (i.e. they are not measurable), e.g. "global carbon market activity", "environmental auction activity", "narrative/list of activities".

There are several sets of guidelines on how best to define monitoring-style indicators within a logframe. For example, the European Commission uses the 'RACER' criteria⁵⁷, as defined in the European Commission Better Regulation Toolbox. However, the most standard system is the 'SMART' criteria, which is the system recommended by the World Bank Independent Evaluation Group.⁵⁸ The SMART standard includes the following characteristics of effective indicators:

- **Specific.** Indicators should reflect simple information that is communicable and easily understood.
- **Measurable.** Indicators should capture changes that are objectively verifiable as far as possible.

⁵⁷ RACER stands for Relevant, Accepted, Credible, Easy to measure and Robust.

⁵⁸ World Bank IEG (2012): Designing a Results Framework for Achieving Results: A How-to Guide, available at: http://siteresources.worldbank.org/EXT/VACAPDEV/Resources/designing_results_framework.pdf (accessed on 27 June 2018)

- **Achievable.** Indicators and their measurement units must be achievable and sensitive to change during the life of the project.
- **Relevant.** Indicators should reflect information that is important and likely to be used for management or immediate analytical purposes.
- **Time bound.** Progress can be tracked at a desired frequency for a set period of time.

When considering indicators to measure performance against the different objectives, it is also worth distinguishing between different levels of results (as shown in the intervention logic in section 1.2), namely:

- **Output indicators:** These are indicators that relate to the direct outputs or deliverables of the intervention (e.g. number of participants engaged, number of reports disseminated). Data on these indicators would contribute evidence towards the output level of the theory of change for the intervention, but would not provide evidence of its impact.
- **Outcome indicators:** These measure the direct or indirect results and benefits of the intervention. Examples include reductions in energy consumption.
- **Impact indicators:** These relate to the ultimate desired effects of the intervention, in terms of its economic, social or environmental benefits. They follow from the outcomes, but the existence of external factors that also play a role in the evolution of these metrics makes it difficult to ascertain to what extent any changes that can be observed (e.g. in the reduction of emissions) were caused by the intervention of interest.

Outputs, outcomes and impacts of the PAF are identified in the Theory of Change⁵⁹. In addition, a monitoring framework may include indicators on operational costs with the aim to assess the efficiency of the program.

To use the current PAF logical framework in a monitoring capacity, it is recommended that the indicators are developed to follow the guidelines presented above; that is, to be specific (i.e. clearly defined), measurable and time bound (i.e. with an indication on how frequently they should be tracked). For example, making an assessment of “Increased co-benefits from targeted projects” requires a definition of possible co-benefits. In addition, it is recommended that the monitoring framework avoids indicators which do not depend on PAF activity (for example, avoiding measures such as “CDM reforms and activity, also for voluntary market standards”).

These indicators as they stand do, however, provide valuable assessment criteria to answer the evaluation questions proposed in the evaluation framework (and, indeed, have fed into the evaluation framework used by this evaluation). In addition, they set up a base to design a monitoring framework which could be a useful tool for the PAF Secretariat, facilitating them to periodically report PAF results to donors and other stakeholders, and to monitor performance. Such a framework, with the inclusion of targets set ex-ante, would have also provided a useful tool for assessing the PAF’s effectiveness in this evaluation (enabling a comparison of actual numbers of bidders against the target).

⁵⁹ See Ecofys and Climate Focus (2016): “Pilot Auction Facility for Methane: Evaluation Framework”

The table below takes on board this learning and proposes alternative indicators to measure PAF's performance. Where feasible (i.e. where indicators are not qualitative assessment criteria), figures for the current indicators have been provided (2017 data).

<i>Description</i>	<i>Current Indicators</i>	<i>PAF Baseline/Results (2017)</i>	<i>Recommended revisions to create monitoring indicators</i>
<u>Impacts</u>			
<i>Increased emission reductions and other co-benefits</i>	<p>Increased active mitigation projects</p> <p>Increased GHG emission reductions from targeted projects</p> <p>Increased co-benefits from targeted projects</p> <p>Other contributing factors</p>	<i>Beyond scope of current evaluation timeline</i>	Suggested indicator: number of emission reductions achieved by projects replicating PAF
<i>New initiatives build upon PAF model and/or test related concepts</i>	<p>Characteristics of new initiatives (in initial planning through fully- operational)</p> <p>Other contributing factors</p>	<i>Beyond scope of current evaluation timeline</i>	Suggested indicators: number of initiatives building upon PAF model in planning stage; number of initiatives building upon PAF model in design stage (design stage considered when funds have been secured); number of initiatives building upon PAF model in implementation stage (implementation stage considered when at least one auction round has taken place).
<i>Replication of PAF Model in other contexts</i>	<p>Characteristics of new initiatives (in initial planning through fully- operational)</p> <p>Other contributing factors</p>	<i>Beyond scope of current evaluation timeline</i>	Suggested indicators: number of initiatives replicating PAF in planning stage; number of initiatives replicating PAF model in design stage (design stage considered when funds have been secured); number of initiatives replicating PAF model in implementation stage (implementation stage considered when at least one auction round has taken place).
<i>New funding sources for PAF beyond pilot phase or for PAF Model (replication)</i>	List and characteristics of donors, funders and/or investors	<i>Beyond scope of current evaluation timeline</i>	Suggested indicators: number of donors contributing further funding for PAF beyond pilot phase; total funds committed for PAF beyond pilot phase; total funds committed to initiatives replicating PAF.
<i>Catalyze public/private market to increase climate finance</i>	Characteristics of climate finance activity (e.g. amount, sources, type, funding mechanism, targeted activities)	<i>Beyond scope of current evaluation timeline</i>	<i>Indicators to monitor climate finance initiatives building upon PAF model and funding committed have been proposed against the indicators above.</i>

Other contributing factors

*Beyond scope of current evaluation timeline***Outcomes***Increased project activity*

Increased active projects

Increased GHG emission reductions from eligible projects**4,680,500 tCO₂e**Suggested indicator: **Number of projects used to redeem PAFERs and number of GHG emission reductions achieved** (measured by PAFERs redeemed)

Increased co-benefits from eligible projects

External Factors*Evolving market context. [This is not directly associated with the PAF, but will influence the outcomes impacts of the PAF.]*

Targeted mitigation activities as well as other technologies/sectors

Climate finance activity and innovation

Global carbon market activity

Environmental auction activity

*Within a monitoring framework for PAF or a future PAF-like instrument, it is not recommended that external factors are monitored on an ongoing basis. While this will influence PAF's performance, we recommend only monitoring external factors when evaluations take place (principles of relevance and achievability)***Outputs***Knowledge products***Knowledge products (e.g. lessons learned reports, replication studies)****5**Suggested indicators: **Number of knowledge products created, Number of downloads of knowledge products**

	[Links with marketing and outreach for knowledge dissemination]		
<i>Projects/entities redeem PAFERs</i>	Number and characteristics of PAFERs redeemed	2,173 (1,490 Auction 1; 567 Auction 2; 116 Auction 3)	Suggested indicators: Number of PAFERs redeemed; Number of organisations redeeming PAFERs
<i>Track overall market and PAFER trading activity [expected to directly influence targeted projects]</i>	Aggregate status of targeted projects Pricing for CERs, VERs, etc. CDM reforms and activity, also for voluntary market standards Relevant technology transformation [Linked to ongoing administration]		<i>Within a monitoring framework for PAF or a future PAF-like instrument, it is not recommended that external factors are monitored on an ongoing basis. While this will influence PAF's performance, we recommend only monitoring external factors when evaluations take place (principles of relevance and achievability)</i>
<i>Projects/entities issued PAFERs (auction winners)</i>	Number and characteristics of PAFERs issued		Suggested indicators: Number of PAFERs issued (and equivalent in tCO₂e); Number of noteholders

Activities

Marketing and outreach for knowledge dissemination

Overall recommendation for indicators on activities: these indicators should be reframed as output indicators

Outreach activities to disseminate knowledge and promote replication (email blasts, webinars, conferences, events, word-of-mouth, website)

Narrative/list of activities (including number reached)

Suggested indicators: **Number of webinars, conferences and other events carried out to promote replication; Number of attendants to webinars, conferences and other events carried out to promote replication**

Knowledge product creation

Feedback/lessons learned for each auction

List of success factors, issues, solutions, and recommendations

No additional indicators are recommended (see outputs level - knowledge products)

Document auction activity (e.g. timeframe, participants, results)

Timeframe

Funding available/allocated

Number and characteristics of auction participants

[Linked to ongoing administration]

Auction 1: USD 25 million (budget); 20.9 million (allocated)
Auction 2: USD 20 million (budget); 20 million (allocated)
Auction 3: USD 12,993,600 (budget); USD 12,978,000 (allocated)

Auction 1: 28 bidders;
Auction 2: 21 bidders;
Auction 3: 13 bidders

Suggested additional indicators:
 - **Number of auctions carried out**
 - **Number of successful bidders** (organisations will be counted as many times as they succeed)
 - **Number of successful participants** (e.g. an organisation successful in two auctions will be counted once)

Develop or commission additional studies or products, including lessons learned, replication studies

Narrative/list of internal activities

List/summary of studies commissioned

No additional indicators are recommended (see outputs level - knowledge products)

Participant solicitation

Training activities for potential participants (e.g. mock auction, webinars, workshops for anticipated participants)	Narrative/list of activities		Suggested indicator: Number of participants in training activities (per type of activity carried out)
Outreach activities to solicit interest in auction participation (email blasts, webinars, events)	Narrative/list of activities		Suggested indicator: Number of organisations reached via outreach activities
Introductory material, website	Package of materials and outputs associated with PAF outreach & training		Suggested indicator: Number of organisations receiving the package for bidders; Number of downloads of the package for bidders
Implementation and administration			
WBG Staff and subcontractor administration	Narrative/list of roles, responsibilities, activities		Suggested indicators (to best reflect PAF's performance/achievements): - Number of applications received to participate in PAF auctions - Number of eligible applications to participate in auctions - Number of applications assessed to redeem PAFERNs
Materials – applications, contracts, forms, internal manuals	Package of materials associated with PAF implementation		
Processing redemption requests (including verification and payment)	Narrative/list of activities [Linked to ongoing administration]		
Price guarantee and auction design			

Research and design activities (internal & external)	Narrative/list of internal activities		Suggested indicator: number of research studies conducted / commissioned to design the auctions
	List/summary of studies commissioned		
	External sources leveraged		
	Narrative summarizing options considered		
Design, format and parameters each auction	Auction objective		Suggested indicators: - Number of auction formats tested (e.g. reverse, forward) - Number of sectors/targeted groups where the PAF is tested
	Eligibility criteria/targeted groups		
	Redemption requirements		
	Auction parameters/format		
Inputs			
Staff/Experts with CDM & climate finance knowledge	Administrative costs including expenses, subcontractors and WBG FTEs broken out by internal/external by broad function (design/research, ongoing administration, legal, technical expertise, outreach/training, direct auction activities, redemption activities)		
Pooled (donor) funding	Total funding, also broken out by broad category of use. Supporting narrative should include any restrictions placed by the funder.	US\$53 million	
WBG market position and credibility and desire to test new mechanisms	[Not separately tracked]		
[Existing market context: stalled (methane) projects, other climate funds, CDM reforms, COP21 outcomes, use of auctions]	[Not separately tracked]		

Annex II: Summary of the survey results

Respondents' characteristics

Q1. What sector(s) does your business operate in? Please select all that apply by choosing or writing 'Y' in the relevant box.	Auction 1	Auction 2	Auction 3	Unsuccessful	Total
Oil and gas	0	0	0	1	1
Agriculture	1	0	0	0	1
Waste management	5	2	0	1	8
Climate finance	3	2	1	4	10
Environmental organisation	2	0	0	2	4
Other (please specify)	1	2	2	3	8

Q2. In which country is your business headquartered?	Auction 1	Auction 2	Auction 3	Unsuccessful	Total
Thailand	1	0	0	1	2
Brazil	4	0	0	1	5
Singapore	2	0	0	0	2
Mexico	0	1	0	0	1
Switzerland	0	1	0	1	2
Norway	0	1	0	0	1
Chile	0	0	1	0	1
Austria	0	0	1	0	1
Pakistan	0	0	0	1	1
Germany	0	0	0	2	2
Portugal	0	0	0	1	1
New Zealand	0	0	0	1	1
India	0	0	0	1	1
Malaysia	0	1	0	0	1
Netherlands	0	1	0	0	1

Q3. In which country or countries does your business operate in? Please write in the box on the right as many answers as apply.

Participants' operating regions	
North America	1
Latin America	25
Asia-Pacific	18
Middle East and Africa	8
Europe	9

Q4. How many employees does your business have? Please choose just one answer.	Auction 1	Auction 2	Auction 3	Unsuccessful	Total
Fewer than 10	4	0	1	2	7
11 to 50	0	1	0	4	5
51 to 100	0	0	0	0	0
101 to 249	1	2	0	1	4
250 to 499	0	0	0	1	1
500 to 999	0	0	0	0	0
1000 or more	2	1	1	1	5

Successful and unsuccessful participants

Q1. Which of the following describes your role in the project/s for which you bid for PAFERs?	Auction 1	Auction 2	Auction 3	Unsuccessful	Total
Project owner - entity which ultimately generates the emission reductions within the project scope	3	2	2	5	12
Project developer - entity that participates in the project by providing technical, in-kind or financial support	6	3	1	3	13
Project intermediary - entity that trades carbon emission certificates from one or more projects	1	3	0	3	7
Project advisor – entity that provides advise and non-financial support to projects	3	1	0	0	4

Q2. Did you have a specific project(s) in mind when you bid for the PAFERs?	Auction 1	Auction 2	Auction 3	Unsuccessful	Total
Yes, one project	4	2	0	1	7
Yes, multiple projects	0	3	2	4	9
No, we were planning to aggregate or sell PAFERs	0	0	0	3	3

Q3. Which country or countries is your PAF-related project(s) based in? Please write in the box on the right as many answers as apply. Please put a comma between answers if more than one.	Auction 1	Auction 2	Auction 3	Unsuccessful	Total
Thailand	2	1	0	1	4
LATAM	1	0	0	1	2
Malaysia	1	1	0	0	2
Brazil	3	1	0	1	5
Mexico	0	2	0	0	2
Chile	0	2	1	0	3
Pakistan	0	0	0	1	1
Argentina	0	0	0	1	1
Unsure	0	0	0	1	1
Don't know	0	0	0	2	2

Q6. What percentage of the financing needed for your project(s) is going to / has been covered by the PAFERs you hold or have already redeemed (by auction or trading)?	Auction 1	Auction 2	Auction 3	Total
50%	4	1	0	5
70%	0	1	0	1
100%	0	0	2	2

*A2 Didn't know - traders only

*A2 intermediary - Didn't develop the project. Buy units and then put them into the auction.

Q11. Now please imagine what may have happened if you had not been successful in the PAF auctions. How likely or not do you think it is that you would have been able to attract equivalent financial support from other sources, within a year of the auction

	Auction 1	Auction 2	Auction 3	Total
Very likely to have attracted equivalent financial support from other sources	0	0	0	0
Fairly likely to have attracted equivalent financial support from other sources	0	3	0	3
Fairly unlikely to have attracted equivalent financial support from other sources	1	0	0	1
Very unlikely to have attracted equivalent financial support from other sources	4	1	2	7
Not relevant, would not have attempted to attract equivalent financial support from other sources	0	0	0	0
Don't know	0	1	0	1

Q12. Still thinking about what may have happened if you had not been successful in the PAF auction(s). Which, if any, of the following best describes what you expect the progress of your project to have been?

	Auction 1	Auction 2	Auction 3	Total
The project would not have gone ahead at all, in any form	1	0	1	2
The project would have gone ahead but without the emission reduction component	0	0	0	0
The project would have gone ahead but with less focus on the emission reduction component	3	2	1	6
The project would have gone ahead but the implementation would have been delayed	1	1	0	2
The project would have gone ahead in exactly the same way	1	1	0	2
The project would have gone ahead with a larger emissions reduction component	0	0	0	0

A2: Would likely continue to burn the methane, but would not be monitoring it.

Q15. How likely or not do you think your project would have been to achieve these emissions without PAF support?	Auction 1	Auction 2	Auction 3	Total
Very likely	0	2	0	2
Fairly likely	3	2	1	6
Not very likely	0	0	0	0
Not likely at all	3	1	1	5
Don't know	0	1	0	1

Successful participants

Q4. How many, if any, emissions reductions units (tCO ₂ e) did you intend to cover with PAFERs when you signed up for the auction? Please choose just one answer from the drop down list. As a reminder, one PAFER provides the option to sell 10,000 tCO ₂ e emissions	
Less than 100,000	1
100,000 to 249,000	2
250,000 to 499,999	1
500,000 to 749,999	3
750,000 to 999,999	2
1 million to 1.49 million	0
1.5 million to 1.99 million	1
2 million to 2.99 million	2
3 million to 4.99 million	1
More than 5 million	0
Don't know	0

Q5. How many emissions reductions units (tCO₂e) did you win in Auction 1? Please choose just one answer from the drop down list. As a reminder, one PAFERN provides the option to sell 10,000 tCO₂e emission reductions (ERs).

Less than 100,000	0
100,000 to 249,000	4
250,000 to 499,999	2
500,000 to 749,999	3
750,000 to 999,999	0
1 million to 1.49 million	1
1.5 million to 1.99 million	2
2 million to 2.99 million	1
3 million to 4.99 million	0
More than 5 million	0
Don't know	1

Q7. How many of the PAFERs you bought in Auction 1 have you traded or redeemed?

All of them	9
None of them	2
Some of them	4

Answers: 315000, 590000, 621 and 50%

Q8. If you have not redeemed / traded all of your PAFERs, what do you plan to do with the PAFERs you still hold? Please choose just one answer from the drop down box.

I will let them expire without trading or redeeming	0
I will try to sell them to another bidder	2
I will try to sell them elsewhere	1
I will try to redeem them for known project(s)	2
I will try to redeem them, but I do not yet know for which project(s)	0
A mix of several options above	1
I don't know / too early to say	1

Q9. Which, if any, of the following apply to your project? Please choose as many answers as apply by choosing or writing 'Y' in the relevant box.

I have successfully redeemed PAFERs	11
I have successfully traded PAFERs	5
I have tried to buy additional PAFERs without success	0
I have tried to sell PAFERs without success	0
I have tried to redeem PAFERs without success	2
None of the above	0

Q10. Around the time you participated in the auction, what other sources of finance did you seek and receive for this project? Please mark 'Y' all that apply and 'N' all that do not apply.

	Finance Sought	Finance Received
Retained profits	4	3
Grants	1	0
Venture Capital	0	0
Debt (Loan)	3	3
Other carbon finance mechanisms	1	0
Other (write in)	0	0
None	2	0

Q13. How many emission reductions was/is your project aiming to achieve, either verified or non-verified? Please write in the box on the right, using only whole numbers (please do not include commas or full stops). Please answer in tCO₂e (tonnes of carbon)

0	1
100000	1
200000/year	0
250000	1
400000	1
1000000	4
2000000	1
Don't know - traders only	1
I don't understand the question	1

Q14. How many, if any, emissions reductions (ERs) has your project achieved so far, either verified or non-verified yet? Please answer for all ER achieved to date. Please write in the box on the right, using only whole numbers (please do not include comma

0	1
92,000	1
650,000	1
1,000,000	1
1,200,000	1
3,469,619	1
12,000,000	1
I don't understand the question	1
Don't know - traders only	1
Rather not say	2

Q16. How satisfied or dissatisfied were you with the following elements of the PAF? Please select just one answer per option.

	Very satisfied	Fairly satisfied	Neither satisfied nor dissatisfied	Fairly dissatisfied	Very dissatisfied
Follow up PAF activities: issuance of PAFERNS	5	3	4	1	0
Follow up PAF activities: Environment, Health and Safety (EHS) and verification requirements	3	5	3	1	1
Follow up PAF activities: redemption process	2	3	2	3	4

A2, very dissatisfied with redemption - It was arduous, restrictive, difficult, wasn't v transparent, really difficult process to get through.

Q17. How easy or difficult did you find engaging in the following PAF processes? Please choose just one answer per option.	Very easy	Fairly easy	Neither easy nor difficult	Fairly difficult	Very difficult	Don't know / Can't remember	Not Applicable
Obtaining the PAFERs from the World Bank after the auction	3	7	1	1	1	1	1
Meeting verification and EHS requirements	2	6	2	1	1	2	1
Redeeming PAFERs with the World Bank	1	1	1	6	5	1	0
Trading PAFERs	0	4	0	1	0	3	6

A2, about trading PAFERs - Not easy, not difficult, fairly simple actually. Trading PAFERs was pretty simple.

Q19. How did your experience of taking part in the PAF compare between the different auctions? Please write your answer in the box on the right.

Have not participated in other auctions

More barriers to entrance cause more capital required

Unsuccessful participants

Q4. How many, if any, emissions reductions units (tCO₂e) did you intend to cover with PAFERs when you signed up for the auction? Please choose just one answer. As a reminder, one PAFER provides the option to sell 10,000 tCO₂e emission reductions (ERs).

Less than 100,000	0
100,000 to 249,000	1
250,000 to 499,999	2
500,000 to 749,999	1
750,000 to 999,999	0
1 million to 1.49 million	1
1.5 million to 1.99 million	1
2 million to 2.99 million	0
3 million to 4.99 million	0
More than 5 million	0
Don't know	0

Q5. Which of the following, if any, explains why you dropped out from bidding in the auction?

Guaranteed floor price was too low	4
Strike price was too low	2
The amount of PAFERs available in later rounds was too low	0
The premium price was too high	1
Issues with the auction platform	0
Other (Price per CER very low)	1
Other (Not applicable)	1

Q10. Around the time you participated in the auction, what other sources of finance did you seek and receive for this project? Please mark 'Y' all that apply and 'N' all that do not apply.

	Finance Sought	Finance Received
Retained profits	2	1
Grants	2	1
Venture Capital	1	0
Debt (Loan)	2	0
Other carbon finance mechanisms	3	1
Other (write in)	1 (\$46,582)	0
None	1	2

Q7. Which, if any, of the following best describes what has happened to your emissions reduction project (s) since the PAF auction? *Please tick as many answers as apply.*

The project did not go ahead at all (or has not yet gone ahead), in any form	3
The project went ahead but without the emission reduction component	2
The project went ahead but with less focus on the emission reduction component	2
The project went ahead but the implementation was delayed	0
The project went ahead as planned, in exactly the same way	3
The project went ahead with a larger emissions reduction component	0
Other (please, specify)	0
Not sure	1
Not applicable, no specific projects in mind	2

Q8. How many emission reductions was/is your project expecting to achieve ? *Please write in the box on the right, using only whole numbers (please do not include commas or full stops). Please answer in tCO₂e (tonnes of carbon dioxide equivalent).*

250000	1
1000000	1
3-4 Million	1
Rather not say	4

Q9. How many, if any, emissions reductions (ERs) has your project achieved so far, either verified or non-verified yet? Please answer for all ER achieved to date. Please write in the box on the right, using only whole numbers (please do not include commas)

0	2
100000	1
2000000	0
Over 3000000	0
Not applicable	1
Rather not say	1

Experience of participating in PAF

Q1. How did you first hear about the PAF? Please select as many answers as apply by choosing or writing 'Y' in the relevant box.

World Bank website	4
World Bank marketing event	5
Received an email from the World Bank	11
Through another form of communication from the World Bank	3
Through another contact (not from the World Bank)	6
Climate finance industry event	1
Other (please specify)	2
Don't know / Can't remember	1

Q2. What other initiatives are you aware of that are similar to what the PAF offers (if any)? Please write in the box to the right.

Participants' awareness of initiatives similar to PAF	
Not aware of any initiative	12 out of 22 participants* were not aware of any initiatives similar to PAF
NEFCO	4 out of 22 participants mentioned NEFCO (NEFCO CfP, NEFCO Norway, NEFCO 2 nd public calls)
Other initiatives mentioned	6 out of 18 participants mentioned other initiatives similar to PAF: <ul style="list-style-type: none"> <input type="checkbox"/> Public call from Norway, Switzerland, Germany and South Korea; <input type="checkbox"/> Operationalization of article 6 of Paris Agreement, Green Climate Funds, Tenders from Norwegian Government and UNOPS <input type="checkbox"/> Norway Government <input type="checkbox"/> Nitric Acid Climate Auctions Program (NACAP) <input type="checkbox"/> Transformative Carbon Asset Facility (TCAF)

*1 participant did not answer

Q3. And which, if any, of these other initiatives that are similar to PAF have you participated in? Please write in the box to the right.

Participation in initiatives similar to PAF	
Didn't participate in any initiative	13 out of 18 participants* did not participate in any initiative similar to PAF
NEFCO	2 out of 18 participants mentioned they participated in NEFCO (NEFCO CfP, NEFCO 2 nd public call)
Other initiatives mentioned	3 out of 18 participants mentioned they participated in other initiatives similar to PAF: <ul style="list-style-type: none"> <input type="checkbox"/> Public call from Norway, Switzerland, Germany and South Korea <input type="checkbox"/> Participation in a few of them

*5 participants did not answer

Q4. Which of the following, if any, encouraged you to bid in the PAF auction? Please select up to three answers by choosing one response at a time in the boxes to the right.	Participants
If the price for emission reduction credits in the market increases, I can opt not to redeem PAFERs	5
I had one or more eligible projects that had (or was in danger of) halted or slowed due to low prices in the carbon markets	13
The opportunity to trade PAFERs	5
Holding PAFERs guarantees minimum return on investment	9
It provided an opportunity to start new projects	7
It provided an opportunity to aggregate multiple projects	2
Holding PAFERs facilitates leveraging additional investment	1
The role of the World Bank in PAF gave me confidence	1

Q5. Which of the following, if any, explain why you have not participated in all three PAF auctions? Please select up to three answers.	Participants
Did not have eligible projects	7
The terms were not attractive enough	9
Difficulties associated with meeting the eligibility criteria or due diligence for bidders	0
The bid deposit was too high	3
The fees to open a custodian account were too high (only applicable to Auction 1, held in July 2015)	2
I won enough PAFERs in previous auctions	1
Other auctions were not relevant to my project(s)	2
Lack of knowledge about how to participate in the auctions	0
Lack of time to make an informed decision as to whether participate or not	2
I wasn't aware of other auctions	2

Q6. Taking everything into account, how satisfied or dissatisfied were you with your experience of taking part in the PAF? Please think about all aspects of the PAF you were involved in, including your experience before, during, and after the auction (if	Auction 1	Auction 2	Auction 3	Unsuccessful	Total
Very satisfied	4	0	1	2	7
Fairly satisfied	0	1	1	4	6
Neither satisfied nor dissatisfied	1	1	0	1	3
Fairly dissatisfied	0	2	0	0	2
Very dissatisfied	1	0	0	2	3

Q7. Why do you say this?

Participants' comments on overall experience	
Satisfied participants	<p>Participants that were satisfied with their experience in taking part in the PAF mentioned this was because:</p> <ul style="list-style-type: none"> <input type="checkbox"/> It is a great opportunity to sustain the operation of projects and revitalise projects dormant or left without action <input type="checkbox"/> It helped aggregating knowledge and earn company image <input type="checkbox"/> It is an innovative and efficient tool <input type="checkbox"/> It provided movement in a market previously at price points where further investment was not justifiable <input type="checkbox"/> The auction process was transparent and well communicated through webinars and presentations, and the World Bank team answered questions
Dissatisfied participants	<p>Participants that were dissatisfied with their experience in taking part in the PAF mentioned this was because:</p> <ul style="list-style-type: none"> <input type="checkbox"/> There were difficulties and too many steps to redeem PAFERs <input type="checkbox"/> Low PAFERN price. The auction rules allowed for all kinds of participants which didn't have access to carbon credits, and this drove the price down <input type="checkbox"/> The eligibility requirements were too high and not easy to achieve. <input type="checkbox"/> The cost for participating was too high for a struggling business <input type="checkbox"/> The auctions on their own are not enough to stimulate the carbon market

Q8. How satisfied or dissatisfied were you with the following elements of the PAF? Please choose just one answer per option.	Pre-auction information from the World Bank	The bidder process	The auction structure	The auction implementation (on the day) e.g. experience of multiple rounds
Very satisfied	12	5	4	7
Fairly satisfied	5	12	11	5
Neither satisfied nor dissatisfied	2	2	2	4
Fairly dissatisfied	2	1	2	2
Very dissatisfied	1	0	1	1

Q9. How easy or difficult did you find engaging in the following PAF processes? Please choose just one answer per option.	Completing the bidder application process	Completing due diligence checks prior to the auction day	Understanding the structure and terms of the auction	Understanding the process for bidding on auction day	Using the online auction platform	Using proxy bidding
Very easy	3	4	3	3	5	4
Fairly easy	11	10	7	11	11	5
Neither easy nor difficult	3	4	2	2	1	2
Fairly difficult	2	3	5	3	0	0
Very difficult	0	0	3	1	0	0

Outreach

Q1. Which of the following PAF activities/resources...? Please choose as many answers as apply by choosing or writing 'Y' in the relevant box.	Were you aware of (before today)?	Have you made use of (i.e. attended, read, used)?
PAF webinars	19	18
PAF conferences (in person)	14	10
PAF Lessons Learned reports (from Auctions 1 & 2)	8	8
PAF brochures	14	13
Other (please specify)	1	1
None of these	0	0

Q2. How useful or not did you find the following PAF activities / resources? Please choose one answer only for each option using the drop-down box.	PAF webinars	PAF conferences (in person)	PAF Lessons Learned reports (from Auctions 1&2)	PAF brochures or factsheets	Other
Very useful	12	5	3	4	0
Fairly useful	5	3	5	9	0
Not very useful	0	1	0	1	0
Not at all useful	0	0	0	1	0
Don't know/Can't remember	0	0	0	0	0
N/A-did not use	2	10	10	3	2

Q3. How likely or not are you to take part in future PAF auctions? Please choose one answer only.	Participants
Very likely	11
Fairly likely	5
Not very likely	3
Not likely at all	2
Don't know	0

Q4. Why do you say this?

Participants' comments on likelihood to participate again	
Participants likely to participate again	<p>Participants that are likely to participate again in a future PAF auction mentioned as reasons:</p> <ul style="list-style-type: none"> <input type="checkbox"/> It is a good instrument to allow projects in trouble to continue <input type="checkbox"/> Allows business generation in the carbon market <input type="checkbox"/> There is monetary value in PAFERs <input type="checkbox"/> They still have projects that require capital to grow the GHG abatement potential
Participants unlikely to participate again	<p>Participants that are unlikely to participate again in a future PAF auction mentioned as reasons:</p> <ul style="list-style-type: none"> <input type="checkbox"/> There are too many steps to redeem PAFERs <input type="checkbox"/> The risk-revenue relation is not in their favour <input type="checkbox"/> Too strict rules <input type="checkbox"/> There is too much uncertainty around the future of international carbon markets <input type="checkbox"/> Too low prices in the project context <input type="checkbox"/> High participation costs and complexity

Q5. As you may know, the PAF auction so far has only focused projects enabling the reduction of methane and nitric acid emission. In your opinion, which if any of the following project types could be targeted through the PAF in future? Please choose as many as you like	Y
Renewable energy – energy industry	14
Renewable energy – manufacturing industry	4
Renewable energy – buildings	5
Energy efficiency – energy industry	8
Energy efficiency – buildings	5
Energy efficiency – manufacturing industry	7
Transport (energy efficiency)	6
Transport (low-carbon fuels)	7
Carbon capture and storage (CCS)	6
Bio-carbon capture and storage (Bio-CCS)	7
Land use and land use change	9
Industrial process emissions	9
Fugitive emissions from fuels	6
Fugitive emissions from industrial gases	6
Other (please specify)	0
None	1

Q6. How do you think the PAF experience can be improved for future participants?

Participants' comments on improvements	
Redemption process	<input type="checkbox"/> Simplifying the redemption process as redeeming PAFERs is tricky and needs a clearer structure <input type="checkbox"/> One final date for redemption and option to redeem earlier
Bidding rules	<input type="checkbox"/> Clarify the bidding process, it was very slow <input type="checkbox"/> Less complicated documents and more flexible rules
Participation	<input type="checkbox"/> Making the bid deposit more affordable <input type="checkbox"/> Have a larger scale
Minimum price	<input type="checkbox"/> Better to have a floor price which will ensure minimum financing <input type="checkbox"/> Minimum price should be at least \$5 per tonne

Annex III: Summary of lessons learned reports

Summary of key lessons learned after Auction 1, authored by WBG:

- Careful design decisions ensure a successful auction.
- Project eligibility should be based on existing standards and systems.
- Webinars, in-person events, and professional networks are critical to attracting bidders.
- Risk management ensures positive auction and delivery outcomes.
- Bonds offer an inexpensive and accessible put option delivery mechanism, but settlement presents some small hurdles.

Summary of key lessons learned covering Auctions 1 & 2, authored by NERA, the Auction Manager:

- The featured bid product attracted different types of bidders, but both bid products given the auction format were equally effective in achieving price discovery.
- A well-paced auction that is sufficiently short may render moot the need to provide proxy bidding as an optional feature.
- If a primary objective is to transact for a greater quantity of potential emission reductions quicker, then the bid product and auction format of the first auction should be preferred.
- If a primary objective is to maximize the allocation of the budget while keeping bidding rules simple, the option's premium should be preferred as the bid product.

Extracted from "Lessons Learned Report" (WBG, undated), and "Lessons Learned from Auctions 1 & 2" (NERA, 2017).

Annex IV: Evaluation framework

Evaluation questions	Assessment criteria	Literature and market data	PAF document review	Interviews: managers	Interviews: other stakeholders	Interviews: auction participants	Interviews: non-participants	Questionnaire
RELE1: Is the PAF objective of using auctions to allocate scarce public resources relevant for the market?	<ul style="list-style-type: none"> Perceived relevance of the PAF by participants (bidders and redeemers) and non-participants. Perceived relevance of the PAF by carbon finance experts Perceived relevance of PAF by all stakeholders as an efficient way to allocate public resources Perceived relevance by survey respondents of using PAF to buy/sell/trade ERs Proportion of survey respondents who participate in PAF because it leverages additional investment Proportion of survey respondents who select: "the amount of PAFERs in later rounds was too low" as the reason to drop out from bidding in the auction 	•			•	•	•	•
RELE2: Was the suite of activities conducted relevant for the PAF objectives and for project developers or other project stakeholders?	<ul style="list-style-type: none"> Reasons for entities to participate in PAF: <ul style="list-style-type: none"> Reasons to participate in auctions Reasons to participate in trading Reasons to participate in PAFERs redemption Main reasons selected by survey respondents to participate in PAF 			•	•	•	•	•
RELE3: Is PAF consistent with priorities and policies of the WBG?	<ul style="list-style-type: none"> Alignment between PAF objectives and WB policies. Complementarities with other WB programmes. 	•	•	•	•			
RELE4: Is PAF consistent with priorities and policies of the donors/funders/investors?	<ul style="list-style-type: none"> Alignment between PAF objectives and donors/funders/investors priorities Donors views on how well PAF design meets their needs 	•	•	•	•			
EFCV1 & EFCV2: How effective was the auction design (including price design) at meeting PAF objectives?	<ul style="list-style-type: none"> Proportion of survey respondents who select the put options format as a reason to participate in PAF. Proportion of survey respondents who select the possibility to trade as a reason to participate in PAF. Proportion of survey respondents who select the possibility to verify emissions through multiple methodologies as one of the reasons to participate. Proportion of survey respondents who select: difficulties associated with meeting eligibility criteria / bid deposit being too high / premium being too high as one of the reasons not to participate in auctions Stakeholders' views on effectiveness of the auction design and the price guarantee design. Participants' views on reasons to participate related to the auction design and the price guarantee design Lessons learned on the different auction formats and parameters tested. 		•	•	•			•

EFCV3: How effective were the auction implementation activities; including participant solicitation, conducting due diligence, and administering auctions; at meeting PAF objectives?	<ul style="list-style-type: none"> Stakeholders' perceptions on how projects were stimulated to produce emission reductions. Stakeholders' perceptions on how trading was stimulated to achieve emission reductions. Proportion of PAFERs redeemed. Satisfaction of level of redemption by WBG staff and donors in comparison with expectations Proportion of survey participants who are very or fairly satisfied with the pre-auction information from the WB, the application process, the auction implementation and/or follow up activities Risks (not) identified through due diligence that have taken place 		•	•	•	•	•
EFCV4: How effective were the knowledge creation activities at meeting PAF objectives?	<ul style="list-style-type: none"> Stakeholders perception on the usefulness of lessons learned reports and other outputs. Number of interviewees who have used the studies developed exploring potential for replication. Number of downloads of knowledge products 	•	•	•	•	•	•
EFCV5: How effective were the marketing activities for publicising PAF among potential participants; and outreach activities for communicating results, lessons learned, and related information?	<ul style="list-style-type: none"> Number of conferences, workshops and webinars carried out and number and profile of attendants Stakeholders' perceptions on how marketing and outreach activities reached the targeted groups Non-participants' (but targeted by outreach) views on reasons not to participate in the auction Proportion of survey respondents who select: lack of knowledge to participate in auctions / lack of time to make an informed decision / lack of awareness of other options as one of the reasons not to participate in auctions Survey responses rating the following materials as (not) useful: PAF webinars, conferences, lessons learned reports, brochures 		•	•	•	•	•
EFCV6: How was the tradability of PAFERs utilized, and to what extent?	<ul style="list-style-type: none"> Participants perceptions on the benefits of tradability (e.g., in facilitating liquidity in a secondary market) versus the costs of tradability (e.g., transaction costs). Number of survey respondents who have tried to trade with PAFERs and have (not) managed to do so Number of survey respondents who plan to trade with PAFERs Number of survey respondents who intended to buy more PAFERs than they finally got from the auction, compared to number of survey respondents who have tried to buy additional PAFERs 		•	•		•	•
OPER1: Was the implementation team appropriately suited for PAF implementation activities (broken out by each actor as well as overall)? (e.g. staff internal to WBG, NERA, KPC, Citi)	<ul style="list-style-type: none"> Analysis of roles and responsibilities between different groups/organizations within the PAF implementation team (extent to which roles and responsibilities are agreed on documentation and understood by interviewees). Stakeholders' views on adequacy of human resources allocated at WBG to manage the PAF. 		•	•	•	•	
OPER2, OPER3, EFCN1 & EFCN2: How efficient were the auction design activities (including price guarantee design)?	<ul style="list-style-type: none"> Cost of administering PAF per PAFER allocated and comparative within the three auctions 		•	•		•	•

	<ul style="list-style-type: none"> Proportion of survey respondents who rate as easy/difficult the following processes: completing the application, completing the due diligence, understanding the process for bidding 							
OPER4, EFCN3, EFCN6: How efficient were the auction implementation activities? (e.g., participant solicitation, conducting due diligence, administering auctions, trading activity, redemption)	<ul style="list-style-type: none"> Participants' views on contractual and due diligence requirements PAF managers' views on contracting and due diligence requirements Comparative of experience for participants that were required to open custodian accounts to hold the PAFERs (first auction) vs. experience for those who had PAFERs delivered as certificates via a registry (second auction). Percentage of survey respondents who select the following as barriers to participate in PAF: the fees to open a custodian account were too high; lack of time to make an informed decision as to whether participate or not. Number of formal/informal training activities that were needed to prepare auction participants Suitability of application materials (participants' views on the package for bidders) Participants' views on easiness/difficulty to go through the different processes. Proportion of survey respondents who rate as easy/difficult the following processes: using the online auction platform, obtaining PAFERs, verifying ERs, redeeming PAFERs, trading PAFERs		.	.		.		.
OPER5 & EFCN4: How efficient were the knowledge product creation activities?	<ul style="list-style-type: none"> Stakeholders' views on adequacy of resources allocated to knowledge creation activities. Analysis of commissioning processes to create knowledge products (check whether open process existed and/or reasons not to open the process). Cost per knowledge product created Cost per download of knowledge products 		.	.				
OPER6 & EFCN5: How efficient were the marketing and outreach activities? (including communicating results, lessons learned, and related information)	<ul style="list-style-type: none"> Stakeholders' views on adequacy of resources allocated to marketing and outreach activities. Cost per participant and per event Stakeholders' views on how efficiency could be improved	.	.	.	.
IMPT1 & IMPT2: What outcomes and impacts did the PAF achieve (as expected in the theory of change)? Has the PAF successfully raised interest in auctions as a vehicle for delivering climate finance?	<ul style="list-style-type: none"> Emission reductions achieved so far Emission reductions that project developers aim to achieve Number of interviewees who show interest in replication or indications of replication efforts under development in other contexts, or with investors, etc. Identification and analysis of market changes (positive/negative) that might have influenced the outcomes and impacts achieved. Estimation of number of projects (survey respondents) that would (not) have gone ahead without PAF Estimation of number of emissions reduced that would not have been achieved without PAF Number of projects that would not have received additional funding without PAF	.		.	.	.		.

SUST2 & SUST3: What indications are the PAF is or will be replicable for climate finance in other sectors? Which elements are likely to successfully translate to other contexts (replication)?	<ul style="list-style-type: none"> • Identification and analysis of ways in which PAF has been adapted (based on analysis of literature review and consultations). • Indications of unique conditions of PAF that may (not) translate to other sectors or contexts (analysis of contextual factors and stakeholders' views on elements that are more likely to be transferable to other sectors/contexts). • Stakeholders' views on sectors/markets where PAF could be replicated (including at the regional level) • Lessons learned from the evaluation on: <ul style="list-style-type: none"> - price guarantee design - auction design - auction implementation - marketing and outreach - knowledge product creation - scale up and replication 	•	•	•	•			
SUSTX: What are the lessons learned to design and implement auctions to allocate ERs?		•	•	•	•	•	•	•

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