



Carbon Markets for Greenhouse Gas Emission Reduction in a Warming World

An Evaluation of the World Bank Group's
Support to Carbon Finance



IEG
INDEPENDENT
EVALUATION GROUP

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1818 H Street NW
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November 29, 2018



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Careful observation and analysis of program data and the many issues impacting program efficacy reveal what works as well as what could work better. The knowledge gleaned is valuable to all who strive to ensure that World Bank goals are met and surpassed.

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abbreviations

A/R	afforestation/reforestation
ASA	Advisory Services and Analytics
BioCF	BioCarbon Fund
BioCF ISFL	BioCarbon Fund Initiative for Sustainable Forest Landscapes (World Bank)
CDCF	Community Development Carbon Fund
CDG	Carbon Delivery Guarantee
CDM	Clean Development Mechanism
CER	certified emission reduction
CF	carbon finance
CFE	Carbon Fund for Europe
Ci-Dev	Carbon Initiative for Development
CIF	Climate Investment Funds
CO ₂	carbon dioxide
COP	Conference of the Parties
CPF	Carbon Partnership Facility
CPLC	Carbon Pricing Leadership Coalition
DCF	Danish Carbon Fund
DNA	Designated National Authority
EBRD	European Bank for Reconstruction and Development
ERPA	Emission Reductions Purchase Agreement
ER	emission reduction
ERU	Emission Reduction Unit
ETS	Emissions Trading Scheme
EUA	European Union Emission Allowances (tradable)
FCPF	Forest Carbon Partnership Facility
GHG	greenhouse gas
GtCo ₂ e	gigatons of carbon dioxide equivalent
HFC-23	hydrofluorocarbon-23
ICF	Italian Carbon Fund
INCaF	IFC-Netherlands Carbon Facility
IPCC	Intergovernmental Panel on Climate Change

JI	Joint Implementation
LIC	low-income country
LMIC	lower-middle-income countries
MDB	multilateral development bank
MFD	Maximizing Finance for Development
MRP	Market Readiness Proposal
MRV	Monitoring, Reporting and Verification
NCM	Networked Carbon Markets
NDC	Nationally Determined Contribution
P4R	Program-for-Results
PAF	Pilot Auction Facility
PCF	Prototype Carbon Fund
PMR	Partnership for Market Readiness
PoA	Program of Activities
PPAR	Project Performance Assessment Report
P12CF	Post-2012 Carbon Facility (IFC)
SEforALL	Sustainable Energy for All
TCAF	Transformative Carbon Asset Facility
tCO ₂ e	ton of carbon dioxide equivalent
tCER	temporary certified emission reduction
UCF	Umbrella Carbon Facility
UMIC	Upper-middle-income countries
UNFCCC	United Nations Framework Convention on Climate Change

All dollar amounts are U.S. dollars unless otherwise indicated.

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highlights

Overview



First mover and multiple roles

- The World Bank Group was among the first players in the late 1990s to explore and demonstrate the potential role of carbon markets for reducing the costs of greenhouse gas (GHG) emissions under the Kyoto Protocol, exercising a degree of global leadership.
- The World Bank Group progressively assumed multiple roles: catalyzing and developing carbon markets; innovating and developing tools in carbon finance (CF); helping build capacity; and exercising thought leadership and convening power.



Success factors and limitations

- In the early 2000s, the World Bank Group catalyzed carbon markets and produced pioneering models for low-cost GHG emission reduction and helped operationalize the Clean Development Mechanism and Joint Implementation at the time of policy uncertainty and before the Kyoto Protocol came into force in 2005.

- The World Bank Group has also achieved success in mobilizing resources for CF and diversifying its portfolio of CF interventions. The World Bank was responsive to changes in markets and regulatory systems and to the needs and priorities of its client countries, including low-income countries.
- However, CF has remained largely a trust-funded and project-focused activity, leading to increased fragmentation and proliferation of carbon funds and limited integration of CF activities with development operations within the World Bank Group. Governance, record-keeping, monitoring and evaluation, accountability systems, and learning across carbon funds and instruments varied extensively.
- The success of the World Bank Group in catalyzing carbon markets and demonstrating CF in renewable energy, energy efficiency, methane and industrial gases has not been achieved yet in transport, forestry (REDD+), and agriculture.
- Despite the uncertain regulatory framework, which contributed to increase transaction costs and project risks, the World Bank Group contributed to the success of CF projects in achieving GHG emission reductions. Success factors included motivating Clean Development Mechanism projects; technical and financial support for challenging aspects of project design, validation, and verification; and serving as guaranteed buyer for projects to secure financial closure.



Private sector, additionality, and co-benefits

- Engaging the private sector was a key component of the World Bank Group's CF activities leading to significant crowding-in of the private sector both on the demand and supply side of carbon markets. However, the World Bank Group lacked a clear strategy for exiting the carbon market and continued to participate in low-risk and mainstream carbon market transactions, possibly narrowing the space for the private sector during some periods and in some cases.
- The World Bank Group complied with the standard UN protocols and procedures, including third-party validation requirements for Kyoto projects for ex ante additionality determination and ex post verification of emission reductions. However, a global review of the United Nations Framework Convention on Climate Change (UNFCCC)-registered projects suggests that additionality in certain CF projects and technologies is questionable.
- Although the Clean Development Mechanism was launched with the dual objective of reducing the cost of compliance with Kyoto targets and contributing to sustainable development in host countries, and although the World Bank Group designed projects to meet these objectives, the flow of local development co-benefits has been uneven or weak in some cases.



Innovation and capacity building

- The World Bank Group has been largely effective promoting and achieving CF innovation and building capacity. Although the

International Finance Corporation (IFC) looked into opportunities across developing countries, it was unable to initiate activities in low-income countries because of limited private sector opportunities for large-scale emission reduction. IFC was also unable to scale up some relevant CF instruments, and eventually exited the carbon market. The Multilateral Investment Guarantee Agency (MIGA) provided the first political risk guarantees for CF investments but faced limited demand.

- The capacity building for domestic “market readiness” (including forests and landscapes) has been slow but has developed robust programs which have started to deliver results measured by monitoring, reporting, and verification systems and national readiness plans. Continued success will require scalable and country client-driven approaches that are aligned with Nationally Determined Contributions and able to demonstrate development impacts.



Future challenges and opportunities

- The World Bank has been generally effective in exercising thought leadership and convening power for carbon pricing. However, carbon pricing by itself will not be sufficient to achieve climate change mitigation ambitions. Greater programmatic integration and catalytic use of CF with development are relevant under the Paris Agreement.
- A future challenge for the World Bank Group is to contribute to building the next generation of carbon markets under the Paris framework. The World Bank Group could leverage its comparative advantages in CF to facilitate the transition from Kyoto to Paris and

support upscaling and the integration of CF with development operations. The World Bank Group's comparative advantages include: deep expertise, institutional memory, ability to mobilize and channel resources, integration of finance with technical know-how, and international convening power.

Climate change is a threat to global development and to the core mission of the World Bank Group.

With the recognition that human activity drives global warming, the World Bank Group has pursued a long-term commitment to curb global greenhouse gas (GHG) emissions for more than 20 years.

Carbon finance (CF) is a generic term used for the revenue streams that can be generated by low-carbon projects and activities from sale of their GHG emission reductions by sources, or GHG emission removals by sinks, or from trading in carbon credits. It has been one of the World Bank Group's first and longest engagements for mitigating climate change. The World Bank Group's engagement in CF started in the late 1990s, immediately after the signing of the Kyoto Protocol. The World Bank Group conceptualized carbon funds to experiment, pioneer, and demonstrate a "proof of concept" for a carbon market as an instrument for low-cost climate change mitigation, and as a global public good in support of the World Bank Group's development goals. Building on a precursor program of the United Nations Framework Convention on Climate Change (UNFCCC), Activities Implemented Jointly, the World Bank Group launched the world's first carbon fund in 2000, the Prototype Carbon Fund.

The Bank Group prepared its first CF strategy in 2003 to support carbon market development and increase the viability of project-based mechanisms; extend benefits of CF to low-income countries (LICs); and demonstrate CF for carbon sinks. The strategy was revised in 2006 to focus on building, sustaining, and expanding the carbon market; building capacity; and contributing to sustainable development. The World Bank Group's CF strategy was further updated in 2012 to mitigate the impact of the global carbon market crisis and enhance integration of CF with World Bank Group development programs and operations.

The World Bank Group's initial efforts to catalyze and develop carbon markets received a significant boost when the Kyoto Protocol entered into force in 2005. However, carbon prices collapsed in 2012, as supply exceeded demand, and the world community was unable to agree on the post-2012 climate policy framework.

As the Bank Group learned more about the challenges of climate change, it developed strategies to mainstream mitigation and adaptation into its development assistance and financing mechanisms. The initial experience with carbon markets also led to the creation of multiple CF vehicles to acquire emission credits, filling financing gaps and leveling the field in underserved sectors, countries, and regions. Many of the initial carbon funds were designed to "catalyze" carbon markets, followed by the next generation of carbon funds and instruments aiming to "build and expand" carbon markets. During the evaluation period (2000–17), the Bank Group had more than 25 different CF vehicles supporting various carbon market development and capacity building activities.

In response to the collapse of the carbon market in 2012, the Bank Group reoriented its focus toward capacity building and designed initiatives for mitigating the impacts of the market crisis while supporting the Paris Agreement. This renewed focus includes new initiatives targeting Advisory Services and Analytics (ASA) activities for capacity building through domestic carbon pricing and market readiness;

nsuring against price risks; helping forest-rich countries cut emissions through reduced deforestation and forest degradation; and strengthening global and national partnerships for carbon pricing.

Through its many initiatives, the Bank Group has played multiple roles and functions in CF; these included catalyzing and developing carbon markets; innovating and developing new tools and methodologies; building capacity; and exercising thought leadership and convening global and national partnerships for carbon markets and carbon pricing.

Purpose

The purposes of this evaluation are to assess the role and contributions of the Bank Group in CF in relation to the needs and priorities of its client countries and its potential comparative advantages, and to draw lessons to inform the World Bank Group's future strategic direction in CF. The evaluation aims to answer the following overarching question:

What has been the strategic objective, nature of engagement, and contribution of the Bank Group in supporting CF? What lessons can be drawn from this to inform the Bank Group's strategic direction in supporting the next generation of market-based carbon mitigation activities, given its potential comparative advantages?

Evaluation Approach

This evaluation employs several methods and approaches. They include multilevel data collection and analysis. In drawing relevant conclusions, the evaluation benefits from triangulation of data and evidence generated from those different levels and methods, including (i) portfolio review and analysis covering 243 carbon market Emission Reduction Purchase Agreements (ERPAs) and 170 ASAs for capacity building and innovation; (ii) comparative analysis of World Bank Group and Clean Development Mechanism (CDM) and joint implementation data; (iii) econometric analysis of global CDM data; (iv) in-depth causal analysis of case studies; (v) country-level analysis of case studies, including interviews of stakeholders; (vi) desk reviews; (vii) structured literature reviews; (viii) review of World Bank Group country strategies; (ix) interviews of World Bank Group staff and management; (x) interviews of external experts; and (xi) selected independent project evaluations (Project Performance Assessment Reports; PPARs).

Main Findings and Recommendations

The evaluation identifies six major findings from past performance of Bank Group CF activities. Based on this experience and looking forward, it also identifies four timely and relevant issues which provide insights for the future of CF and the Bank Group's strategic direction in its potential support for the next generation of market-based climate mitigation.

Past Performance of CF

Responding to Needs and Priorities and to Market and Regulatory Challenges

The Bank Group mobilized a total of \$4.8 billion (\$4.4 billion in trust funds and the rest with International Finance Corporation [IFC] resources), and was generally responsive to changes in market and regulatory systems and the needs and priorities of its country clients, including LICs, as shown by targeted initiatives (for example, the Community Development Carbon Fund, the Carbon Initiative for Development) and the share of the CF portfolio. The World Bank, through its deep expertise and closer engagement with client countries and global stakeholders, was innovative in anticipating needs, developing new initiatives and instruments (for example, the Carbon Delivery Guarantee and Pilot Auction Facility), filling in gaps in carbon markets, and addressing underserved sectors, such as forests and landscapes (for example, the BioCarbon Fund and Forest Carbon Partnership Facility [FCPF]). It increased its support to LICs with a better balance in its project portfolio across sectors and regions compared with the non-World Bank Group global CDM portfolio. However, the success in catalyzing and developing carbon markets was not sustained following the collapse of carbon markets in 2012. In addition, the significant growth in CF and increased responsiveness of the Bank Group were accompanied by the fragmentation and proliferation of carbon funds and facilities, resulting in internal and external coordination challenges. The governance arrangements and monitoring and evaluation (M&E) frameworks across the multiple carbon funds and facilities remain uneven. Because CF has been largely dependent on external trust funding, governance and oversight are often provided through external entities rather than through the Bank Group Board of Directors. Many of the older Kyoto funds lacked M&E frameworks while some of the newer initiatives developed more inclusive and transparent governance and clearer results frameworks.

Catalyzing and Developing Markets for Climate Mitigation

The World Bank Group acted proactively, conceptualized and catalyzed carbon markets, developed pioneering models, tested the proof of concept and demonstrated the potential of markets for low-cost GHG emission reductions. The World Bank Group was one of the first movers into CF, providing a timely and relevant contribution. It took risks at the global level and drove the process of creating the global carbon market. Responding to the urgent need at the time, following the signing of the Kyoto Protocol in 1997, the World Bank Group provided global leadership to demonstrate and help operationalize CDM and Joint Implementation as the market-based mechanisms of the Kyoto Protocol. Following the proof of concept, the World Bank Group's effort to "build, expand and sustain markets" led to significant growth in the carbon markets, as evidenced by the evaluation's causal analysis, interviews, and desk studies. The annual global primary CDM and joint implementation market grew from \$2.47 million in 2000 to \$7.9 billion at its height in 2007, while the Bank Group's market share declined from 100 percent in 2000 to 2 percent in 2007. However, the strong success in catalyzing and developing carbon markets was not sustained because of external factors. Given the regulatory uncertainty beyond 2012, the Bank Group's effort was not enough to stem the decline and "save" the carbon market; credit prices collapsed in 2012. The post-2012 situation has undermined private sector interest and confidence in these markets although the

signing of the Paris Agreement has re-ignited this interest. Nevertheless, the World Bank continued to support markets and sustained transactions at low level, often paying fixed prices and honoring existing contracts.

Effectiveness in Reducing Emissions

Despite the uncertain global regulatory framework, the Bank Group has contributed in supporting projects to reduce emissions. It operated a complex architecture under the Kyoto Protocol's requirement that each project activity must show that the emission reductions it produces are additional to what would have happened without the project. CDM and joint implementation have globally generated more than 1.9 billion Certified Emission Reductions (CERs) and 0.9 billion emission reduction units (ERUs) to date. Based on emission reduction issuances up to August 2017, a total of 210 million tons of carbon dioxide equivalent verified units were produced by the World Bank (97 percent) and the International Finance Corporation (IFC) (3 percent). This constitutes 80 percent of the planned emission reduction targets for the World Bank and 32 percent for IFC, and 76 percent jointly for the Bank Group. The evaluation evidence shows that registered Bank Group projects produced higher CERs and had higher likelihood of positive issuance than other CDM projects. However, a few sectors dominate the supply of emission reductions: industrial gases (58 percent), energy efficiency (16 percent), and renewable energy (12 percent). Agriculture, forestry, and transport sectors jointly account for less than 5 percent. The emission reductions from certain technology types (for example, large hydro power, wind, energy efficiency) are also unlikely to be additional, notwithstanding some context dependence and variability. In addition, despite the increased engagement and higher representation of LICs, the share of the LICs in the emission reduction issuances remains less than 1 percent, mainly because many of the projects are small and some are still ongoing. The markets collapsed as LICs were just beginning to engage in markets, limiting their benefits from the World Bank Group's support.

Effectiveness in Generating Local Co-Benefits for Sustainable Development

The Bank Group has been less successful in generating sustainable development co-benefits, and faced challenges in documenting development results from its CF activities. The CDM was launched with the dual objective of reducing the cost of compliance with Kyoto targets and contributing to sustainable development in developing countries. The Bank Group designed CF projects to meet these dual objectives of the CDM, but there was significant variability in generating development benefits, and in some cases climate mitigation was achieved without clear local-level social and economic development outcomes (for example, some hydropower, industrial energy efficiency, and industrial gases). In addition, many of the Bank Group's interventions were small prototypes and not integrated with the development investments in client countries. Furthermore, the Bank Group did not systematically monitor the sustainable development outcomes and the social and environmental benefits—in stark contrast to environmental integrity and additionality which were routinely checked through the CDM process. However, the Bank Group could build on examples of transformational (but small) and innovative initiatives that contributed to both mitigation and local economic development, especially in the LICs (for example, the Carbon Initiative for Development, the Community Development Carbon Fund).

Effectiveness of Innovation and Capacity Building for Clients

The Bank Group has been largely effective in innovating CF and in building capacity for its clients. It developed multiple methodologies and financial instruments that helped to expand and deepen markets and reduce delivery and price risks. The IFC developed new financing instruments but was unable to scale up because of the market collapse, which led it to exit the carbon market. The Multilateral Investment Guarantee Agency (MIGA) provided the first risk guarantees for CDM projects against political risks, demonstrating that such cover could work for CF projects, though uptake has been limited. The World Bank has increasingly reoriented its capacity building support toward domestic carbon pricing (for example, Partnership for Market Readiness) and readiness plans for forests and landscapes (for example, FCPF and the BioCarbon Fund Initiative for Sustainable Forest Landscapes [BioCF ISFL]). The recent launch of the world's largest domestic emissions trading system in China demonstrated the significant potential of national market initiatives for transformative change. In future, further innovation and capacity development are needed to address underserved sectors (for example, agriculture, transport, and urban development). There is also a growing need to scale up mitigation efforts in response to the ambitious targets of the Paris Agreement. The green funds (FCPF and BioCF ISFL) are moving in this direction for piloting upscaled and jurisdictional initiatives in forests and landscapes. Continued success will require more fine-tuned, integrated, and country-led approaches.

Effectiveness in Thought Leadership and Convening for Carbon Pricing

The World Bank has been generally effective in thought leadership and convening for carbon pricing. However, carbon pricing by itself will not be sufficient to increase mitigation to meet the Paris targets. The World Bank has been a key thought leader and convener in CF, and in this role it has been more dynamic and flexible than it has been in other roles. The World Bank has catalyzed new forms of partnerships and initiatives and has stimulated global and national dialogue on carbon pricing instruments. This has allowed developing countries to experiment with their own carbon pricing instruments and identify relevant mitigation opportunities. However, the World Bank has been both proactive in anticipating and responding to identified needs and priorities and reactive in addressing observed conditions ex post. Experts and stakeholders interviewed for the evaluation stress the need to move from small projects supporting low-cost mitigation for compliance to integrated programs linking climate and development goals, to catalyze partnerships that create space for other market actors (especially the private sector), and to work at scale. In addition, given the current global policy landscape of low carbon prices, carbon pricing by itself is unlikely to provide the solution to scale mitigation and increase ambition unless it is supported by other complementary nonmarket efforts and domestic policy reforms.

Key Issues to Consider for the Future of CF

Programmatic Integration and Scaling Up

Greater programmatic integration and catalytic use of CF with development and climate finance are pertinent under the framework of the Paris Agreement. CF has largely remained a trust-

funded, project-focused and small-scale activity with limited integration with Bank Group financing operations. Although the Bank Group has actively supported the move from projects to Programs of Activities, only about 20 percent of its ERPAs were blended with World Bank financing operations. This has reduced the synergy with the Bank Group's core business. Though analytical studies on how CF may be leveraged to upscale mitigation are limited, CF has been more successful in integrating with operational programs in the energy and environment sectors. Integration may be encouraged through larger CF funding with lower transaction costs to allow piloting and developing replicable mitigation approaches that lead to large-scale mitigation and development outcomes. Given that additionality remains relevant under the Paris framework, identifying new ways to use CF as catalytic funding to unlock transformational approaches and low-carbon technologies would be vital.

Attracting and Leveraging Private Investments

Attracting and leveraging private investments will be key to Maximizing Finance for Development. The CDM was conceived as an instrument for governments and the private sector, so private engagement was limited in the beginning. Despite the success of the Bank Group in engaging the private sector in its CF activities (both on the side of the buyers and as project developers or sellers of carbon credits), and in carbon pricing efforts through the Carbon Pricing Leadership Coalition (CPLC), the regulatory uncertainties and high transaction costs, and the post-2012 situation, undermined private sector incentives. The World Bank Group has also been criticized for not leaving the market once it became operational, as was indicated in its 2006 strategy, potentially crowding out the private sector in some cases. Greater participation of the private sector will be required as the Bank Group moves toward large-scale and sectoral crediting approaches. The incentives for the private sector are stronger when CF improves returns and bankability of the investment, especially when frontloading of carbon revenues is possible or when the ERPA helps in securing financial closure. However, the potential for frontloading is often affected by the higher perceived risks for carbon projects. Along with blended finance and de-risking instruments, creating financial products that go beyond ex post payments and help address the bankability and upfront financing issues would be pertinent.

Global Positioning of the Bank Group and Its Comparative Advantages

The World Bank Group has certain advantages in CF which distinguish it from other institutions. Relative to other actors, the Bank Group has deep expertise in CF and has retained its technical and operational capacity over the years. Its strength in translating donor support into results in the field, its ability to integrate finance with technical know-how, and its institutional memory are also seen as advantages. Its convening power, thought leadership, and ground-level global presence also enhance its ability to play the bridging and catalytic functions. However, the Bank Group is also seen in some cases as being too rigid, too procedure- and instrument-driven, and tending toward being public sector-driven. With its reduced engagement at the country level after 2012, institutional capacity and experience are being lost. The opportunity for the future would be to leverage its strength to build and cement new forms of effective partnerships, and to create sufficient space for the private sector and other players.

The New Framework to Revitalize Carbon Markets

A key strategic challenge for the Bank Group is the possibility of contributing to building the next generation of carbon markets under the new framework of the Paris Agreement. The Nationally Determined Contribution (NDCs) of many countries calls for markets and carbon pricing mechanisms, including emissions trading systems and carbon taxes, as tools for meeting NDC commitments. International trade can lower the costs of implementing NDCs and help countries meet their commitments or even increase their ambition. However, such gains are not guaranteed. The future of CF will be built on a different foundation and policy environment from the past. A global approach to carbon markets requires a coherent long-term strategy. Policy clarity, long-term demand, and attractive and stable prices are essential. The draft World Bank Group climate markets strategy (2017–20) identifies various approaches for catalyzing markets and piloting the new market-based approaches under the Paris Agreement. However, the funding and the effort required to pioneer the new market mechanisms remain limited and narrowly focused (primarily on Article 6.2). Many CF projects piloted in client countries also require support to transition from Kyoto to Paris. This is particularly relevant to projects in LICs facing the threat of closure or lack of support in commercializing their emission reductions. Avoiding local fragmentation and enabling sectorwide and global progress in mitigation through national and international policies while exploiting the “bottom-up” structure of the Paris Agreement to catalyze state and local climate change actions would be key in moving forward.

Recommendations

Based on the main findings and lessons of experience and the key issues identified for the future of CF in this evaluation, and assuming the World Bank Group will continue to play an important role in developing the next generation of carbon markets, assuming that IFC will re-engage in carbon markets, and considering the current uncertainty until the regulatory frameworks for the market mechanisms under the Paris Agreement have been clearly defined, the following recommendations suggest a series of decisions that the World Bank Group could take to further enhance performance in its CF support in future, including the potential to scale up mitigation.

Recommendation 1. The World Bank Group should further strengthen coordination among its different CF initiatives and instruments to enhance complementarity, avoid fragmentation, and harmonize their results frameworks. The World Bank Group should strive for complementarity between the relevant instruments and emphasize development of fewer, more harmonized, and consolidated carbon vehicles with shared vision, common governance systems, simpler rules, and well-functioning and consistent results frameworks for enhanced accountability and learning. For IFC, it should deepen its coordination and complementarity where and when it engages in CF (for example, coordinate Forests Bonds with FCPF, BioCF ISFL), just as MIGA can strengthen the complementarity of any relevant guarantees. Learning from the Kyoto experience, this may require donors and other stakeholders to support such harmonization and consolidation, and to avoid proliferation of carbon funds and facilities under the new framework of the Paris Agreement.

Recommendation 2. The Bank Group should increase its use of CF instruments to attract and mobilize finance that supports transformational activities and leverages private investments. The Bank Group should identify new ways to use CF as catalytic funding for enabling transformational approaches (low-carbon technologies and policies) which may not otherwise be feasible or commercially viable under “business as usual” conditions (for example, innovative low-carbon investments in technologies currently limited by bankability and other barriers). Through its selective and catalytic use of CF for climate mitigation to support such transformational interventions that meet the relevant additionality criteria (under the Kyoto or Paris mechanisms), the Bank Group should also continue to use CF to crowd-in or leverage private sector finance (for example, by packaging CF with climate finance to provide some upfront financing or mitigate risks), where possible, in line with Mobilizing Finance for Development objectives and the Cascade Approach, seeking private sector solutions and minimizing the use of scarce public finance resources. If and when IFC re-engages in carbon markets, it should build on its recent (for example, Forests Bonds) and prior experience to leverage private finance and investments. MIGA should identify opportunities to enhance demand for its guarantees to support transformational projects.

Recommendation 3. The Bank Group should strengthen the client country focus of its CF activities, integrating them with country programs, in accordance with client demand and international agreements, enhancing their economic development benefits in client countries, and especially promoting poverty reduction co-benefits in LICs. This is consistent with both the continuing commitment of the Paris Agreement to development co-benefits and the World Bank Group’s own developmental goals. CF must be host country client-driven and increasingly streamlined into country programs and financing operations, with a vision toward bundling or packaging of all CF activities in host countries with other relevant World Bank Group operations. The design for integrating CF into country development programs and operations should be flexible, consider unique features of CF operations and associated legal commitments and risks, engage the private sector for scaling up successful pilots, and ensure delivery of development results, especially in LICs. Sustainable social and economic development co-benefits should be systematically targeted and promoted. Conditional on client demand, this would also apply to future IFC activities, if and when it re-engages in CF activities with the private sector in client countries, and MIGA guarantees, to strengthen support for climate mitigation and development efforts in client countries.

Recommendation 4. The World Bank Group should identify complementary and country-specific interventions that enhance the GHG emission reduction impact of carbon pricing solutions, consistent with countries’ NDCs. Many client countries are unlikely to implement carbon prices that will be high enough to provide strong price signals to bring significant changes in emissions soon. At the country level, low carbon prices mandate identification and structuring of complementary and synergistic programs, policy and institutional reforms and instruments (for example, removal of fossil fuel subsidies, energy efficiency standards, and so on.) closely aligned or synchronized with carbon pricing approaches (for example, carbon taxes, emission trading schemes). Initiatives to remove any binding constraints at the country, market, or sector level offer the potential to improve the efficiency and effectiveness of the carbon pricing approaches and create

an enabling environment for private sector solutions. Where relevant and when they are active, IFC, through its engagement with the private sector under the Bank Group's Carbon Pricing Leadership Coalition, and MIGA should coordinate in the identification of constraints and complementary approaches to carbon pricing in client countries.

Recommendation 5. The Bank Group should continue to pilot new market-based and scalable approaches for reducing GHG emissions, including those that focus on underutilized sectors and underserved countries. To do so the Bank Group should further sharpen the focus of its capacity building, technical assistance, and innovation on scalable approaches that contribute to raising the mitigation ambition. This includes piloting of new and scalable financial products as well as programmatic, sectoral, and policy crediting approaches that are useful to support the transition to the new market mechanisms under the Paris framework. IFC and MIGA could also pilot scalable business models and de-risking instruments to support upscaled crediting approaches. The Bank Group should identify and scale up innovative crediting approaches for carbon assets from forests, agriculture, land use and transport, and urban building infrastructure.

management response

World Bank Group Management Response

Management of the World Bank Group Institutions thanks the Independent Evaluation Group (IEG) for its extensive and informative evaluation on carbon finance. The evaluation provides a good summary of the operations and activities of the World Bank Group and supports the view that the World Bank Group needs to continue its strong role in carbon finance. It also provides helpful lessons to inform the future direction of carbon finance in the World Bank Group, as it may be relevant for the different organizations within the Group.

World Bank Management Response

World Bank Management welcomes the IEG evaluation, *Carbon Markets for Greenhouse Gas Emission Reduction in a Warming World*. The report provides a useful review of the World Bank Group's carbon finance portfolio—a large and complex portfolio—covering the years 2000 to 2017. Management appreciates the comprehensive analysis, including the econometric and country case study analysis. Overall the report provides a historical view of activities undertaken by the World Bank Group in carbon finance. The evaluation is also useful in helping to identify lessons from experience and issues for Management's attention going forward.

Management appreciates the report's many positive findings, in particular the recognition that the World Bank Group has exercised global leadership in this field. The report acknowledges the World Bank Group's role as first mover, exploring and demonstrating the role of carbon markets at a time of high policy uncertainty, and its significant contributions through multiple roles and functions: (i) catalyzing and developing carbon markets, (ii) innovating and developing new tools and methodologies, (iii) building capacity, and (iv) exercising thought leadership and convening power. The report also recognizes that the World Bank Group was responsive to changes in markets and regulatory systems and in the needs and priorities of its client countries, including low-income countries. According to the report, the World Bank Group also achieved results in mobilizing resources for carbon finance, diversifying the portfolio across regions, sectors, and technologies, and achieving greenhouse gas emission reductions.

General Comments

Carbon finance in the context of the broader World Bank climate action. As the report notes, the World Bank has pursued its commitment to curb global greenhouse gas emissions for more than 20 years. Today the data and impacts are clear: climate change is an acute threat to global development and will particularly affect the poorest and most vulnerable people. The financial needs are in the trillions of dollars, and partnering with the private sector is paramount. Carbon finance, in which the World Bank has been engaged since 1999, was one of the first engagements to mitigate climate change. This experience shows that carbon finance can be a vehicle for catalyzing private investment in mitigation activities. However, carbon finance as a results-based payment mechanism represents only one tool in the World Bank's work on transformational climate action in the broader context of climate finance.

The report could more explicitly recognize that, for its country work, the World Bank must secure demand from client countries. In requesting World Bank support, country authorities must balance a range of objectives—such as human development, governance reform, debt management and sustainability, gender equality, regional integration, institution building, and others. Country programs, outlined in Country Partnership Frameworks (CPFs), reflect the selectivity process and choices made by client country authorities.

Several aspects of carbon finance are determined by global actors and mechanisms. Carbon finance is a complex area that is evolving rapidly, and the World Bank is only one actor among many. A number of aspects of carbon finance are determined by global actors and international treaties and mechanisms and are not under the World Bank's control. The World Bank actively engages as a convener and through technical assistance but participates only as an observer in international negotiations.

Additionality as a standard and methodology is established and governed through international treaties. The evaluation concludes that the World Bank complied with UN protocols and procedures under the Kyoto Protocol. However, the IEG global review of Clean Development Mechanism (CDM) projects registered under the UN Framework Convention on Climate Change (UNFCCC) suggests that the additionality of certain carbon finance projects and technologies is questionable. We would like to note that “additionality” is a standard and methodology established outside the World Bank and included in international treaties, and is regulated by the modalities and procedures of the CDM and Joint Implementation and by methodologies approved by the various UNFCCC bodies. The UNFCCC and the carbon finance mechanisms under it, including third-party auditors, are the determinants and arbiters of additionality. Even so, additionality is very important, and the World Bank works continuously to improve the operationalization of additionality in moving more and more to objective criteria where possible and appropriate—for instance, by using ambitious benchmarks derived from host countries' Nationally Determined Contribution (NDC) targets. Guidance from the Paris rulebook, which is expected to be available soon, will be valuable in this regard.

The treatment of social and economic co-benefits under the international legal framework is evolving. The evaluation states that local development co-benefits from World Bank carbon finance projects have been uneven or even weak in some cases—for instance, in monitoring sustainable development results. Not only was such monitoring not required under the Kyoto Protocol, but it also would not have been acceptable to many host countries that deemed this to be an exclusively sovereign decision. In specific cases, when carbon fund participants and project developers agreed to quantify, monitor, and pay for sustainable co-benefits, the World Bank carried out this function. New approaches are now being piloted in relation to the Paris Agreement, and the pre- and post-2020 markets are increasingly focusing on multiple co-benefits related to carbon finance operations and outcomes.

Response to Recommendations

The World Bank broadly agrees with all the recommendations. In some ways the uncertainty in the global regulatory, financial, and political landscape in 2017 is reminiscent of that landscape in 1999, at the launch of the Prototype Carbon Fund. The World Bank can build on and learn from

the infrastructure, methodologies, and experiences of the past. However, the relevance of the lessons from the past may only be fully determined once the regulatory frameworks for the market mechanisms under the Paris Agreement have been clearly defined.

Recommendation 1. The World Bank Group should further strengthen coordination among its different carbon finance initiatives and instruments to enhance complementarity, avoid fragmentation, and harmonize their results frameworks. The World Bank strives continuously to enhance complementarity and is working closely with development partners on consolidation and harmonization. Especially since 2013, the World Bank has focused on a few larger and targeted instruments and trust funds that aim to scale up climate mitigation action. In addition, it has established a Climate Change Group with a dedicated Senior Director to further strengthen strategic focus and coordinate across the World Bank sectors and Regions. Within the Climate Change Group a dedicated Climate Change Fund Management Unit has been established to oversee and help harmonize the results frameworks of instruments and trust funds. In terms of results frameworks, carbon finance is a results-based payment mechanism and therefore by definition strongly correlates performance (measured in tCO₂e) and payment.

Recommendation 2. The World Bank Group should increase its use of carbon finance instruments to attract and mobilize finance that supports transformational activities and leverages private investments. The World Bank continues to recognize the critical importance of mobilizing private sector investments in climate action to get the scale, scope, and speed needed to reach the Paris Agreement commitments and the Sustainable Development Goals. The World Bank has started to apply the Maximizing Finance for Development approach in climate. Developing carbon markets, carbon pricing, and results-based carbon finance are all among the tools for mobilizing transformational climate finance.

Recommendation 3. The World Bank Group should strengthen the client country focus of carbon finance activities, integrating them with country programs in accordance with client demand and international agreements, enhancing their economic development benefits in client countries, and especially promoting poverty reduction co-benefits in low-income countries. Carbon finance activities are being integrated with country programs as well as with countries' NDCs. Given low-income countries' emission and market profiles, concessional financing and adaptation have traditionally been stronger instruments for such countries than results-based and market-based instruments such as carbon finance. The World Bank is paying closer attention to helping create and connect carbon markets, leveraging more private finance and increasing financing for adaptation, especially in International Development Association (IDA) countries. Where relevant, the World Bank also aims to identify opportunities to capture both mitigation and adaptation simultaneously, as in low-carbon energy access, where mitigation and adaptation can be delivered together in low-income countries.

Recommendation 4. The World Bank Group should identify complementary and country-specific interventions that enhance the greenhouse gas emission reduction impact of carbon pricing solutions, consistent with countries' NDCs. Carbon pricing policies and measures, along with other

approaches consistent with each country's NDC and with the Sustainable Development Goals, will be important in delivering on the climate challenge both globally and nationally, while supporting countries' immediate development needs and objectives. Carbon pricing has been recognized as an effective approach to incentivizing low-carbon-intensive activities, generating significant revenue flow as well as broader development co-benefits. The World Bank will continue to explore how carbon pricing policies and measures can be integrated in operational support to countries—subject to country demand, and balancing this activity with other country priorities—while continuing its outreach and convening activities to leverage the broader engagement of stakeholders.

Recommendation 5. The World Bank Group should continue to pilot new market-based and scalable approaches for reducing greenhouse gas emissions, including those that focus on underutilized sectors and underserved countries. The World Bank has identified gaps in carbon markets and is addressing underserved sectors, such as forests and landscapes, through the Forest Carbon Partnership Facility (FCPF) and the BioCarbon Fund Initiative for Sustainable Forest Landscapes, which are beginning to generate good results. Historically, the World Bank's engagement was limited by the fact that the agriculture/forest sectors were not approved as eligible under the Kyoto Protocol's emission reduction compliance market. With respect to the transport sector, its specific economic dynamics and the complexity of measuring the point source of emissions from transport have traditionally made it less suitable than other sectors to engage in carbon finance. Looking forward, the World Bank will continue to work in underutilized sectors and underserved countries in the context of client demand, NDCs, and developing approaches under the Paris Agreement.

IFC Management Response

IFC Management thanks IEG for its informative evaluation of the World Bank Group's support for carbon finance. We believe that the report provides a reasonable and balanced account of World Bank Group activities to support the carbon markets, reinforcing their importance and providing insights and guidance for ongoing and future efforts. IFC Management will take the findings and assessment of the report into consideration as it begins implementing the IFC 3.0 Strategy and Maximizing Finance for Development (MFD), and as it continues to work on the broader concept of climate finance, leveraging its carbon markets experience.

IFC Management broadly concurs with the main findings of the report and IEG's recommendations. Management notes that IFC has exited the carbon finance markets, and its related activities are now in the broader context of climate finance. IFC Management will take the findings and assessments of the report into consideration as it leverages its carbon markets experience in climate finance. However, IFC's action plan in response to this report, which is specific to carbon finance, will be limited in scope until IFC re-enters the carbon finance business.

As part of IFC's climate finance strategy, when opportunities for complementarity arise, IFC continues to actively coordinate: for example, with the next generation of Forests Bonds IFC is working with the World Bank's FCPF and with linkages to other World Bank carbon facilities that support IFC

investments. There is currently no demand for private sector-generated credits, as compliance-based carbon finance markets remain nascent and uncertain globally. If IFC re-engages in the carbon finance markets, it will build on its prior experience and ongoing climate finance activities to engage with the private sector, conditional on client demands. IFC will also consider developing or reintroducing related de-risking instruments if there is sufficient market interest.

Regarding Recommendation 4 on identifying constraints and complementary approaches to carbon pricing, IFC has been supporting the efforts of the Carbon Pricing Leadership Coalition to engage the private sector on issues related to carbon pricing. IFC will continue to facilitate dialogue between the private sector and governments as opportunities arise in Carbon Pricing Leadership Coalition events and working groups.

MIGA Management Response

MIGA welcomes the IEG Evaluation Report on the World Bank Group's support for climate finance and finds it useful and important. The report recognizes MIGA guarantees as important carbon market innovations that provide an insurance mechanism, although they do not create demand for carbon credits. Even so, MIGA notes that the carbon finance guarantee projects discussed in the evaluation are not the only such projects that MIGA has supported; the MIGA guarantee projects discussed in the Evaluation Report should be viewed as a sampled portfolio and therefore, the findings, conclusions, and recommendations of the Evaluation Report should be viewed in context.

MIGA support for carbon finance projects. As the Evaluation Report notes, MIGA provided the first political risk guarantees for carbon finance investments. Further, MIGA's political risk guarantees for CDM projects demonstrated their relevance and importance for carbon finance projects. The Evaluation Report rightly notes that the demand for MIGA guarantees has been low, partly because of the limited flow of foreign direct investment into CDM projects and low carbon prices after 2012.

MIGA strategy and carbon finance. The Evaluation Report states that MIGA's Strategy and Business Outlook (FY18–20) commits to supporting climate change without mentioning carbon, and it also notes MIGA's view that although the Strategic Business Outlook paper does not specifically mention carbon finance, it does not preclude MIGA's supporting carbon finance guarantee projects. MIGA notes that since 2016, it has been supporting a more comprehensive approach to climate finance, including carbon finance. MIGA has also started using the World Bank Group's internal carbon pricing model as part of its economic analysis of guarantee projects. In addition, Carbon Markets/Finance is also part of the World Bank Group's Climate Action Plan 2016–20, which applies to MIGA in relevant areas.

Recommendations. MIGA welcomes the recommendations of the Evaluation Report as useful for guiding the important World Bank Group climate change mitigation agenda. However, MIGA notes that dealing with demand-side issues—which constrained MIGA support for carbon finance projects following the Kyoto Protocol—remains the key challenge for MIGA.

management action record

Coordination, Complementarity

IEG FINDINGS AND CONCLUSIONS The World Bank Group was successful in raising resources and was generally responsive to changes in markets and regulatory systems and to the needs and priorities of its client countries, including low-income countries (LICs). Though country-level engagement has declined after 2012 because of limited carbon market activities and some of the Kyoto funds have recently closed or are expected to close in 2018, growth and responsiveness of the Bank Group came at the expense of fragmentation and proliferation of carbon funds and facilities during the early period (19 of the 25 CF funds, facilities, and instruments were created before 2012) resulting in difficulties in coordination; and uneven governance and monitoring and evaluation (with some exceptions like the Partnership for Market Readiness [PMR] and Forest Carbon Protection Facility [FCPF]).

IEG RECOMMENDATIONS **Recommendation 1:** The World Bank Group should further strengthen coordination among its different CF initiatives and instruments to enhance complementarity, avoid fragmentation, and harmonize their results frameworks. The World Bank Group should strive for complementarity between the relevant instruments and emphasize development of fewer, more harmonized, and consolidated carbon vehicles with shared vision, common governance systems, simpler rules, and well-functioning and consistent results frameworks for enhanced accountability and learning. For IFC, it should deepen its coordination and complementarity where and when it engages in carbon finance (for example, coordinate Forests Bonds with FCPF, BioCarbon Fund Initiative for Sustainable Forest Landscapes [BioCF ISFL]), just as MIGA can strengthen complementarity of any relevant guarantees. Learning from the Kyoto experience, this may require donors and other stakeholders to support such harmonization and consolidation to avoid proliferation of carbon funds and facilities under the new framework of the Paris Agreement.

ACCEPTANCE BY MANAGEMENT Agree.

MANAGEMENT RESPONSE The World Bank strives continuously to enhance complementarity and is working closely with development partners on consolidation and harmonization. Especially since 2013, the World Bank has focused on a few larger and targeted instruments and trust funds that aim to scale up climate mitigation action. In addition, it has established a Climate Change Group with a dedicated Senior Director to further strengthen strategic focus and coordinate across the World Bank sectors and Regions. Within the Climate Change Group a dedicated Climate Change Fund Management Unit has been established to oversee and help harmonize the results frameworks of instruments and trust funds. In terms of results frameworks, carbon finance is a results-based payment mechanism and therefore by definition strongly correlates performance (measured in tCO₂e) and payment.

Additionality

IEG FINDINGS AND CONCLUSIONS Although the World Bank Group complied with the standard UN protocols and procedures including third-party validation requirements for Kyoto projects for ex ante additionality determination and ex post verification of emission reductions, an IEG global review finds that the real additionality of emission reductions from certain technology types (for example, some hydro power, wind, industrial energy efficiency) supported through CF is found to be questionable. Nevertheless, subject to the new rules, modalities, and procedures under development, additionality remains relevant under the new framework of the Paris Agreement (Article 6.4) for specific activities which generate transferable carbon credits for use as offsets by other parties. It is therefore important for World Bank Group CF activities that generate emission reductions for use as offsets to learn from the Kyoto experience regarding the additionality of different CF projects and technologies, and focus on transformative interventions that generate emission reductions which are additional to any that would occur in the absence of the certified project activity. This suggests the need to identify new ways to use CF as catalytic funding for unlocking transformational approaches and low carbon technologies. The selective experiences in integrating CF with climate finance (for example, the Carbon Partnership Facility with the Clean Technology Fund, and FCPF and BioCF ISFL with the Forest Investment Program) can provide useful insights.

IEG RECOMMENDATIONS **Recommendation 2:** The World Bank Group should increase its use of CF instruments to attract and mobilize finance that supports transformational activities and leverages private investments. The World Bank Group should identify new ways to use CF as catalytic funding for enabling transformational approaches (low-carbon technologies and policies) which may not otherwise be feasible or commercially viable under “business as usual” conditions (for example, innovative low-carbon investments in technologies currently limited by bankability and other barriers). Through its selective and catalytic use of CF for climate mitigation to support such transformational interventions that meet the relevant additionality criteria (under the Kyoto or Paris mechanisms), the World Bank Group should also continue to use CF to crowd-in or leverage private sector finance (for example, by packaging CF with climate finance to provide some up-front financing or mitigate risks), where possible, in line with Maximizing Finance for Development objectives and the Cascade Approach, seeking private sector solutions and minimizing the use of scarce public finance resources. If and when IFC re-engages in carbon markets, it should build on its recent (for example, Forests Bonds) and prior experience to leverage private finance and investments. MIGA should identify opportunities to enhance demand for its guarantees to support transformational projects.

ACCEPTANCE BY MANAGEMENT Agree.

MANAGEMENT RESPONSE The World Bank continues to recognize the critical importance of mobilizing private sector investments in climate action to get the scale, scope, and speed needed to reach the Paris Agreement commitments and the Sustainable Development Goals. The World Bank has started to apply the Maximizing Finance for Development approach in climate. Developing carbon markets, carbon pricing, and results-based carbon finance are all among the tools for mobilizing transformational climate finance.

Development Co-Benefits

IEG FINDINGS AND CONCLUSIONS Although World Bank Group CF projects were designed to meet the dual objectives of the CDM to generate GHG emission reductions—following UNFCCC rules—and sustainable development benefits, as determined by Host Country Governments, local development co-benefits from World Bank Group CF have been uneven or weak in some cases. The local development co-benefits are important for achieving the World Bank Group's broader development goals, including poverty reduction; but the Bank Group faced challenges in promoting and documenting such co-benefits from CF activities (with some exceptions such as CDCF and BioCF). Many interventions were small prototypes, not integrated or packaged with development investments or other Bank Group financing operations in client countries. However, the Bank Group could build on examples of innovative projects that actively promote and contribute to both mitigation and economic development at the local level (for example, projects supported by the Carbon Initiative for Development [Ci-Dev] the Community Development Carbon Fund [CDCF], and BioCF).

IEG RECOMMENDATIONS **Recommendation 3:** The World Bank Group should strengthen the client country focus of its CF activities, integrating them with country programs, in accordance with client demand and international agreements, enhancing their economic development benefits in client countries, and especially promoting poverty reduction co-benefits in LICs. This is consistent with both the continuing commitment of the Paris Agreement to development co-benefits and the World Bank Group's own developmental goals. CF must be host country client-driven and increasingly streamlined into country programs and financing operations, with a vision toward bundling or packaging of all CF activities in host countries with other relevant World Bank Group operations. The design for integrating CF into country development programs and operations should be flexible, consider unique features of CF operations and associated legal commitments and risks, engage the private sector for scaling up successful pilots, and ensure delivery of development results, especially in low-income countries. Sustainable social and economic development co-benefits should be systematically targeted and promoted. Conditional on client demand, this would also apply to future IFC activities, if and when it re-engages in CF activities with the private sector in client countries, and MIGA guarantees, to strengthen support for climate mitigation and development efforts in client countries.

ACCEPTANCE BY MANAGEMENT Agree.

MANAGEMENT RESPONSE Carbon finance activities are being integrated with country programs as well as with countries' Nationally Determined Contributions (NDCs). Given low-income countries' emission and market profiles, concessional financing and adaptation have traditionally been stronger instruments for such countries than results-based and market-based instruments such as carbon finance. The World Bank is paying closer attention to helping create and connect carbon markets, leveraging more private finance and increasing financing for adaptation, especially in International Development Association (IDA) countries. Where relevant, the World Bank also aims to identify opportunities to capture both mitigation and adaptation simultaneously, as in low-carbon energy access, where mitigation and adaptation can be delivered together in low-income countries.

The Importance of Pricing

IEG FINDINGS AND CONCLUSIONS The World Bank Group has been a key thought leader and convener in carbon markets and pricing, and this role has been more dynamic and flexible than its other roles in CF. It was successful in pioneering new forms of partnerships and initiatives. This has also allowed developing countries to experiment with carbon pricing instruments and identify relevant mitigation options. However, carbon pricing by itself is unlikely to provide the solution to large-scale mitigation unless it is supported by other complementary non-market efforts and domestic policy instruments. The international market prices for carbon credits are currently too low and do not reflect the full social cost of carbon emissions. Unless client countries are able to implement carbon prices that will be high enough to provide strong price signals to bring significant changes in emissions, other complementary instruments will be crucial to increase the overall effectiveness of carbon pricing efforts (for example, carbon taxes and emission trading schemes) in client countries.

IEG RECOMMENDATIONS **Recommendation 4:** The World Bank Group should identify complementary and country-specific interventions that enhance the greenhouse gas (GHG) emission reduction impact of carbon pricing solutions, consistent with countries' Nationally Determined Contributions. At the country level, low carbon prices mandate identification and structuring of complementary and synergistic programs, policy and institutional reforms, and instruments (such as removal of fossil fuel subsidies, energy efficiency standards, etc.) closely aligned or synchronized with carbon pricing approaches (for example, carbon taxes, emission trading schemes). Initiatives to remove any binding constraints at the country, market, or sector level offer the potential to improve the efficiency and effectiveness of the carbon pricing approaches and create an enabling environment for private sector solutions. Where relevant and when they are active, IFC, through its engagement with the private sector under the World Bank Group's Carbon Pricing Leadership Coalition (CPLC), and MIGA should coordinate in the identification of constraints and complementary approaches to carbon pricing in client countries.

ACCEPTANCE BY MANAGEMENT Agree.

MANAGEMENT RESPONSE Carbon pricing policies and measures, along with other approaches consistent with each country's NDC and with the Sustainable Development Goals, will be important in delivering on the climate challenge both globally and nationally, while supporting countries' immediate development needs and objectives. Carbon pricing has been recognized as an effective approach to incentivizing low-carbon-intensive activities, generating significant revenue flow as well as broader development co-benefits. The World Bank will continue to explore how carbon pricing policies and measures can be integrated in operational support to countries—subject to country demand and balancing this activity with other country priorities—while continuing its outreach and convening activities to leverage the broader engagement of stakeholders.

IFC has been supporting the CPLC's efforts in engaging the private sector on issues related to carbon pricing. IFC will continue to facilitate dialogue between the private sector and governments as opportunities arise in CPLC events and working groups.

Innovation to Fill Gaps

IEG FINDINGS AND CONCLUSIONS The Bank Group has been largely effective in innovating CF and in building capacity for its client countries, developing methodologies and financial instruments. IFC developed new financing instruments but was not able to scale them up. MIGA provided the first political risk guarantees, but uptake was limited. Yet CF has largely remained a trust-funded and project-focused activity poorly integrated into World Bank Group financing operations. Consistent with the Paris ambitions, there is a need to scale up past successful pilots and to develop new scalable approaches to significantly increase emission reductions and facilitate the transition to the new framework of the Paris Agreement. While recognizing the World Bank Group's past and ongoing efforts in developing a diversified carbon finance portfolio, further innovation and capacity development for the future are needed to fill the gaps in underutilized sectors, especially agriculture, transport and urban development, and underserved countries.

IEG RECOMMENDATIONS **Recommendation 5:** The World Bank Group should continue to pilot new market-based and scalable approaches for reducing GHG emissions, including those that focus on underutilized sectors and underserved countries. To do so the World Bank Group should further sharpen the focus of its capacity building, technical assistance, and innovation on scalable approaches that contribute to raising the mitigation ambition. This includes piloting of new and scalable financial products (such as PAF) as well as programmatic, sectoral, and policy crediting approaches (such as TCAF) that are useful to support the transition to the new market mechanisms under the Paris framework. IFC and MIGA could also pilot scalable business models and de-risking instruments to support upscaled crediting approaches. The World Bank Group should identify and increase innovative crediting approaches for carbon assets from forests, agriculture, and land use (for example, FCPF and BioCF ISFL) and for transport and urban building infrastructure.

ACCEPTANCE BY MANAGEMENT Agree.

MANAGEMENT RESPONSE The World Bank has identified gaps in carbon markets and is addressing underserved sectors, such as forests and landscapes, through the FCPF and the BioCF ISFL, which are beginning to generate good results. Historically, the World Bank's engagement was limited by the fact that the agriculture/forest sectors were not approved as eligible under the Kyoto Protocol's emission reduction compliance market. With respect to the transport sector, its specific economic dynamics and the complexity of measuring the point source of emissions from transport have traditionally made it less suitable than other sectors to engage in carbon finance. Looking forward, the World Bank will continue to work in underutilized sectors and underserved countries in the context of client demand, NDCs, and developing approaches under the Paris Agreement.

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The Role of Carbon Markets in Greenhouse Gas Mitigation

highlights



The World Bank Group's involvement in carbon finance (CF) in the late 1990s followed from the precursor programs implemented during the 1990s.



In the early 2000s, CF emerged as a cornerstone of the global approach to curbing greenhouse gases.



The Kyoto Protocol, signed in 1997 and in force since 2005, provided a legal framework for creating carbon markets.



The World Bank Group conceptualized carbon funds to experiment, pioneer, and demonstrate a proof of concept to catalyze carbon markets for low-cost climate mitigation.



Beyond serving as trustee, the World Bank Group played four key roles: catalyzing and developing carbon markets; innovating in CF; building capacity; and thought leadership and convening of global and national partnerships.



The signing of the Paris Agreement in 2015 as the framework for the post-2020 period reignited interest in market mechanisms.

Reducing Greenhouse Gas Emissions: Carbon Markets and Pricing Instruments

With the recognition that human activity drives global warming, the World Bank Group has pursued a long-term commitment to curb global greenhouse gas (GHG) emissions for more than 20 years. A key component of this commitment for most of this time has been to support the development of markets for carbon finance (CF)—one of the World Bank Group's first and longest engagements to mitigate climate change. CF is a generic term used for the revenue streams that can be generated by low-carbon projects and activities from sale of their GHG emission reductions by sources or emission removals by sinks through carbon sequestration and storage, or from trading in carbon credits (World Bank 2010b).¹ The World Bank Group launched CF with the intent to support development of a global carbon market that will reduce the cost of achieving GHG emission reductions and facilitate sustainable development (World Bank 2010b).

From at least the 1990s, the World Bank Group recognized climate change as a clear threat to global development and to its core mission of reducing poverty and promoting shared prosperity. The emission of GHGs increased substantially after the industrial revolution and contributes to global warming and climate change (IPCC 2014).² Globally, the main emissions of GHGs—carbon dioxide (CO₂), methane, nitrous oxide, and industrial gases—result from energy (35 percent), agriculture and forestry (24 percent), industry (21 percent), transport (14 percent), and construction (6 percent) (World Bank 2010a). CF is one of the multiple instruments used by the World Bank Group to reduce GHG emissions and support low-carbon development and poverty reduction.

Using policy instruments to reduce GHG emissions is key to mitigate climate change, protect livelihoods in vulnerable areas, and support low-carbon development.³ The effects of emissions and climate change on poverty and sustainable development have attracted global attention. Climate shocks could wipe out hard-won gains in poverty reduction and force more than 100 million people into poverty by 2030, especially in Africa and South Asia (Hallegatte et al. 2016).

The Kyoto Protocol introduced the concept of flexible market-based mechanisms based on trading of GHG emissions credits or offsets. Its arrangements were intended to achieve emissions reductions at least cost, stimulate green investment in developing countries, encourage leap-frogging to cleaner technologies, and engage the private sector. Through these mechanisms, the Kyoto Protocol gave rise to a demand for CF.

The Kyoto Protocol adopted in 1997 provided an international legal framework for carbon markets. The Protocol established agreed binding emission reduction targets for industrialized countries including transition economies (Annex B countries).⁴ These countries can meet their commitments through domestic actions as well as through three market mechanisms: the Clean Development Mechanism (CDM), Joint Implementation (JI) and International Emission Trading (IET). The CDM generates Certified Emission Reductions (CERs) through mitigation projects in developing countries while JI generates Emission Reduction Units (ERUs) through projects in Annex B countries. Both CERs and ERUs can be transferred through carbon markets to meet compliance needs. Under IET, Annex B countries can trade Assigned Amount Units (AAUs) to meet their targets.⁵

When the Kyoto Protocol entered into force in 2005, it boosted nascent and emerging carbon markets. Because of an unexpectedly large inflow of projects, CDM initially suffered from weak governance and processing delays (Michaelowa and Buen 2012, World Bank 2010a; 2010b). Although the additionality⁶ of many CDM projects has been questioned (Schneider 2009) there is evidence that the CDM has contributed to stimulating learning, raising awareness, building capacity, and improved additionality determination (Michaelowa 2009). It has also attracted investment for mitigation actions in developing countries to supply emission credits for compliance markets (Ellis et al. 2007; World Bank 2010a).⁷ However, the failure to agree on the post-2012 regulatory framework, CER credit import restrictions in Annex B countries following the financial crisis, and the end of the first commitment period of the Kyoto Protocol, led to a credit price collapse between 2011 and 2013.⁸

The signing of the Paris Agreement in 2015 has re-ignited interest in market mechanisms. The Paris Agreement established that every country will contribute to global mitigation efforts through Nationally Determined Contributions (NDCs).⁹ The detailed rules, modalities and procedures of the market mechanisms (Article 6) of the Paris framework are still being developed (Hoch and Michaelowa 2016; DEHSt 2016). The Marrakech conference of 2016 has set a deadline of 2018 for finalizing these negotiations. This offers an opening for the World Bank Group to pilot and operationalize a new generation of CF instruments under the Paris framework.

The World Bank Group's Role in Carbon Finance

The World Bank Group's involvement in CF started in the late 1990s immediately after the Kyoto Protocol had been negotiated in 1997.¹⁰ Building on the precursor programs on Activities Implemented Jointly,¹¹ the first CF activities were launched in 2000. Progressively, the World Bank Group conceptualized various carbon funds to experiment, pioneer, and demonstrate a “proof of concept” for a carbon market as an instrument for climate change mitigation and global public good in support of the Bank Group's larger development goals. In addition to serving as the “trustee” for various carbon funds and facilities, it progressively assumed four key roles in implementing its CF activities (see theory of change in figure 1.1):¹²

- **Catalyzing and developing carbon markets:** The Bank Group aimed to create, build, and expand international carbon markets; enhance access to and stability of carbon markets; and leverage private and public investments in projects that reduce carbon emissions.
- **Innovating CF:** The Bank Group aimed to develop new tools, methodologies, and financial instruments to increase stability or reduce market or delivery risks.
- **Capacity building:** The Bank Group aimed to provide technical and advisory services to enable clients to benefit from carbon markets and carbon pricing instruments.
- **Thought leadership and convening power:** The Bank Group aimed to strengthen global and national partnerships for carbon markets, and carbon pricing more generally, and has served as a trustee and convener. Thought leadership builds on two subsidiary roles: (i) **Knowledge services**, including the Bank Group's leadership in knowledge creation and dissemination; conceptualizing

the carbon market; development of methodologies; market intelligence; and analytical work to support carbon pricing approaches; and (ii) **Advisory services**, including the support to strengthen client capacity in project design; establishing monitoring, reporting, and verification (MRV) systems; market readiness; carbon pricing approaches; and identifying market-based mitigation in new areas (for example, forestry and land use).

These two components of thought leadership in turn contribute to the convening power of the World Bank. This includes the ability to: (i) bring key players together for dialogue and consensus building, and (ii) identify solutions for global challenges by leveraging internal knowledge and expertise and harnessing external knowledge and resources through networks and partnerships.¹³

The Bank Group launched several funds, facilities, and initiatives at various times primarily supported through multidonor trust funds (see appendixes B and L). The Bank Group's CF interventions implemented through these multiple vehicles can be broadly classified into two major components:

- **Carbon market activities:** Development of the essential architecture for the functioning of carbon markets and the identification and design of projects for buying credits through Emission Reduction Purchase Agreements (ERPAs);¹⁴ and
- **Advisory services and analytics (ASA) activities:** These include capacity building for market readiness and carbon pricing as well as strengthening of global and national partnerships, and non-project support to innovation and convening activities.

Objectives and Key Evaluation Issues

This evaluation aims to assess the role and contributions of the World Bank Group in CF related to the needs and priorities of its clients and its potential comparative advantage and draw lessons to inform the World Bank Group's strategic direction in CF. Until now, the Independent Evaluation Group (IEG) has not conducted a comprehensive evaluation of CF operations. Understanding comparative advantages in CF requires careful analysis of the four dimensions: (i) the needs and priorities of its clients (client countries and private sector); (ii) the Bank Group's strategy and responses; (iii) its effectiveness in delivering results around the four key roles, and (iv) its distinguishing features and internal synergies. The evaluation is expected to inform the Bank Group's plan to develop a new carbon markets strategy and its broader strategic direction in CF and development of new priorities and interventions in the future.

On the Bank Group portfolio, the evaluation focuses only on the CF portfolio (ERPAs and ASA) and does not include the broad scope of climate finance. The overarching question that IEG needs to answer in this evaluation is, *what has been the strategic objective, nature of engagement, and contribution of the World Bank Group in supporting CF? And what lessons can be drawn from this to inform the Bank Group's strategic direction in supporting the next generation of market-based carbon mitigation activities given its potential comparative advantage?*

Underpinning this are four subordinate questions: (i) What has been the nature and extent of engagement of World Bank Group support to CF since its inception in about 2000? (ii) What have

been the evolving needs and priorities in CF for stakeholders at global and national levels from Kyoto to Paris and how did the World Bank Group respond to these? (iii) To what extent and in what ways has the World Bank Group contributed to developing and innovating carbon markets and building capacities through its multiple roles and support to CF? and (iv) To what extent and how did Bank Group support to CF distinguish itself from support provided by other institutional actors and contribute to its own operations?

Evaluation Approach and Methods

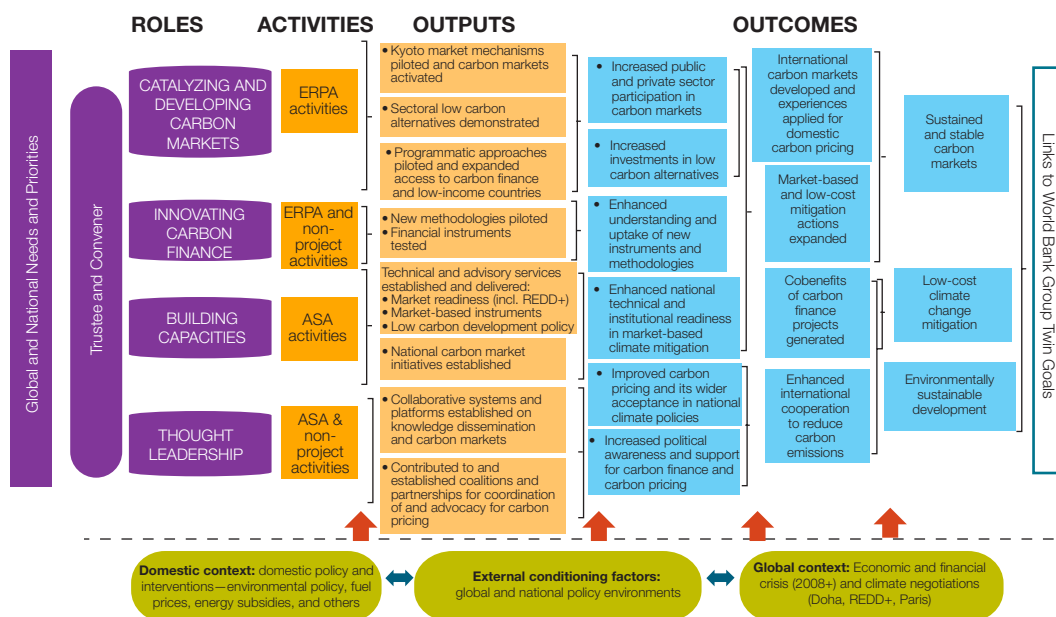
This is a multilevel, multisite evaluation, and it employs mixed and innovative methods to generate robust evidence. The multilevel dimension of the evaluation refers to the different data collection and analysis activities conducted at global (portfolio), country, and intervention category levels. The multisite aspect concerns the purposive selection of countries for in-depth data collection. The main findings and conclusions are thus based on triangulation from multiple sources of evidence using mixed methods (see appendix A for a detailed description of the methods and limitations).¹⁵

The evaluation approach is guided by the synthetic results framework which outlines the underlying theory of change for the evaluation. The changes in global and national needs and priorities underpin and shape the main roles (first column) and activities (second column) defined in terms of ERPA and ASA projects' activities and some nonproject activities (see figure 1.1 and appendix A). It links these CF interventions with expected outputs and the intended sequence of outcomes which ultimately culminate (conditional on domestic policies and external factors) in three results that contribute to the World Bank Group's twin goals: (i) Sustained and stable carbon markets, (ii) Low-cost climate change mitigation, and (iii) Environmentally sustainable social and economic development. Beyond this broad framework lies a detailed (and nested) theory of change laying out causal pathways and underlying assumptions for selected ERPA interventions to guide data collection, analysis, and case studies (see details in appendix A).

The main methodological approaches applied included the following:

- **Structured country case studies and in-depth causal analysis.** For country case studies, the team applied a template aligned with the evaluation questions. For intervention-level cases, a deep analysis focused on the direct contribution of ERPA interventions to reducing emissions, generating co-benefits, and demonstration effects. This involved developing a nested causal theory of change, data collection and analysis, and application of two case-based methods providing robust evidence for causal analysis (appendix C).
- **Portfolio review and analysis.** The team identified a population of 243 World Bank Group financed ERPA projects and 170 ASA projects relating to CF activities (table 1.1), contextual factors influencing implementation and processes of change. The construction of this portfolio allowed an analysis of key features of the portfolio, including technologies employed, country context, and other intervention-level characteristics (appendix B).

FIGURE 1.1 | Synthetic Theory of Change for World Bank Group Carbon Finance Activities



Note: ASA = Advisory Services and Analytics; CF = carbon finance; ERPA = Emission Reductions Purchase Agreement; REDD = reducing emissions from deforestation and forest degradation; WBG = World Bank Group.

- **Structured literature reviews** were conducted based on protocols that specified the search, identification, information extraction and synthesis processes of the literature reviews. The three structured literature reviews conducted looked at (i) additionality of activities underlying ERPAs; (ii) co-benefits of activities with ERPAs; and (iii) changes in markets and regulatory systems and how the Bank Group responded to these changes.
- **Desk reviews** were conducted on a variety of additional issues: (i) the architecture of Bank Group CF initiatives, and strategic objectives and activities; (ii) the changes in needs and priorities and Bank Group strategies in selected countries; (iii) the Bank Group's role in catalyzing and developing markets, innovating CF, capacity building, and convening and thought leadership in CF; and (iv) the global institutional landscape in CF.

TABLE 1.1 | Identified Carbon Finance Portfolio, by Institution

Portfolio Type	World Bank	IFC	MIGA	Total
ERPA	211	17	15	243
ASA	167	3	0	170

Note: ASA = Advisory Services and Analytics; ERPA = Emissions Reduction Purchase Agreement IFC = International Finance Corporation; MIGA = Multilateral Investment Guarantee Agency.

- **Statistical analysis**—The evaluation took advantage of the global United Nations Environment Program (UNEP) DTU CDM pipeline database to undertake some comparative descriptive analysis and econometric analysis to assess the extent to which World Bank Group–supported projects were different from other similar projects in reducing emissions (CER issuances) (see appendix D).
- **Protocol-based interviews** were conducted of the following groups:
 - **Relevant Bank Group staff and Management** on CF experience; Bank Group activities and roles; alignment of strategies with activities and country priorities; effectiveness; adaptation to evolving trends; and how CF was leveraged to reinforce its operations.
 - **Stakeholders** in selected countries on country priorities; the Bank Group’s responsiveness to evolving trends; effectiveness of Bank Group interventions; the institutional landscape, and the extent to which CF reinforced the Bank Group’s operational activities.
 - **Leading CF experts and stakeholders** on global CF needs and priorities; client needs and priorities; the effectiveness of the Bank Group’s convening and thought leadership roles; and the Bank Group’s position in the global institutional landscape.

The team has drawn on these multiple sources and innovative methods (detailed in appendix A) to derive robust findings and lessons regarding the World Bank Group experience in CF. Chapter 2 examines global needs and priorities relevant to CF. Chapter 3 presents the World Bank Group’s support to CF and its responsiveness to the evolving needs, priorities, and challenges defined in chapter 2. Chapter 4 draws from a range of sources and methods to analyze the effectiveness of the World Bank Group’s multiple roles. Chapter 5 presents the positioning of the Bank Group in CF in the landscape of major actors, how it has leveraged CF in its core business, and the key issues for the future of CF. Finally, chapter 6 presents conclusions and recommendations for the Bank Group looking to its future role in carbon markets in the context of its broader role in promoting sustainable social and economic development for all.

¹ For this evaluation, carbon finance includes the World Bank Group’s activities and support for implementing carbon market mechanisms (including the creation and operationalization of the carbon market architecture, carbon pricing and associated capacity building, and technical assistance and advisory services for greenhouse gas mitigation, and payments for carbon emission reductions). In the use of the term carbon finance, we do not differentiate whether the carbon payments and the resulting emission reductions are used for offsetting to meet part of a country’s emission reduction obligations or not.

² The Intergovernmental Panel on Climate Change (IPCC) in its fifth assessment report clarifies that “human influence on the climate system is clear” and “warming of the climate system is unequivocal” (IPCC 2014).

³ We use the term *carbon emissions* to denote all greenhouse gas emissions.

⁴ The emission targets were expressed in terms of allowed emissions or “assigned amounts” for the first commitment period (2008–12), collectively amounting to a reduction of 5.2 percent against 1990 levels.

⁵ Under IET, Annex B countries can acquire emission units (called Assigned Amount Units; AAUs) from other Annex B countries and use them toward meeting their targets or sell unused AAUs to Annex B countries that are exceeding their targets.

- ⁶ Additionality refers to a requirement under the Kyoto Protocol that emission reductions resulting from Clean Development Mechanism (CDM) projects must be “real, measurable and long-term,” and they should be “additional to any that would occur in the absence of the certified project activity” (UNFCCC 1998). The CDM and Joint Implementation (JI) projects, therefore, seek to demonstrate additionality through procedures that have evolved over time. Though it is an attractive concept in theory, the demonstration of additionality has turned out to be very challenging to implement and evaluate objectively in practice. Many different approaches to additionality determination have been developed during the past three decades but additionality testing continues to be a subject of debate between project entities and CDM regulators as well as among stakeholders.
- ⁷ Carbon markets can be domestic, regional, or international in scope. These markets have generally emerged under two different systems: compliance schemes or voluntary programs. Compliance markets are created and regulated through mandatory national, regional, or international emission reduction regimes (for example, cap-and-trade schemes). Voluntary carbon markets function outside of the compliance market and enable corporations, governments, and nonstate actors to voluntarily offset their emissions by purchasing carbon credits created either through the CDM (for example, CERs) or in the voluntary market (for example, using Verified or Voluntary Emissions Reductions, VERs).
- ⁸ The second commitment period of the Kyoto Protocol for 2013–20 (Doha Amendment) has not yet entered into force. http://unfccc.int/kyoto_protocol/doha_amendment/items/7362.php.
- ⁹ The new mechanisms are open to all countries. Art. 6 of the Paris Agreement introduces two new market mechanisms: Cooperative Approaches under Art. 6.2 and a “mechanism to contribute to mitigation and sustainable development” (often called sustainable development mechanism), under Art. 6.4. Cooperative Approaches create Internationally Transferred Mitigation Outcomes toward fulfilment of the Nationally Determined Contributions.
- ¹⁰ At the Earth Summit in 1992 several important global frameworks were created: (a) Agenda 21, (b) UN Convention on Biodiversity (CBD), (c) UN Convention to Combat Desertification (UNCDD), and (d) United Nations Framework Convention on Climate Change (UNFCCC).
- ¹¹ The pilot phase for Activities Implemented Jointly (AIJ) was formally initiated by the first Conference of the Parties (COP1) to the United Nations Framework Convention on Climate Change (UNFCCC) in Berlin (1995). Without generation of emission credits, it piloted the greenhouse gas emission reduction and sequestration projects carried out through partnerships between an investor from a developed country and a host from a developing country or a country with an economy in transition. The purpose was to enhance the transfer of technology and know-how on climate mitigation from developed to developing countries and to gather experience on the opportunities and obstacles for the joint implementation of policies and measures to avert climate change. AIJ mobilized 156 projects in 42 host countries and this experience helped to elaborate the design of the Kyoto mechanisms. The World Bank Group’s engagement in AIJ started in 1993 soon after UNFCCC signed through a collaborative \$4.8 million cofinancing agreement between the World Bank and the Government of Norway to implement two demonstration joint implementation projects, as it was referred to then. The objectives of the agreement were to analyze the methodological and practical issues related to the concept of Joint Implementation (JI), through experience gained from two projects which included the Poland Coal-to-Gas Boiler Conversion Project and the Mexico ILUMEX High Efficiency Lighting Project. This was later expanded to four projects. In addition to the Poland and Mexico projects, the World Bank implemented a sustainable energy project in Burkina Faso, the only AIJ project in the Africa region, and an agricultural demand-side management project in India. This also included a pilot verification and certification exercise, whereby the ILUMEX project was subjected to a verification and certification of its emission reductions by an independent third-party environmental auditor. The AIJ provided the practical understanding of how such project-based mechanisms can function for emission reduction (Heister et al. 1999).
- ¹² The “trustee” role includes the hosting, fiduciary, governance, and program implementation roles. However, this evaluation will mainly look at the “convening” role with emphasis on the thought leadership and effectiveness of the global and national partnerships to support carbon markets and carbon pricing instruments. A “convener” is an entity for bringing different stakeholders and players together to address an issue, problem, or opportunity. A convener uses its knowledge and authority (thought leadership), resources, and unique position (for example, as trusted neutral broker) to influence desired change by bringing different stakeholders and players together (for example, common

platforms, networks, conferences, funding partnerships) to deliberate on specific issues and collaborate in finding solutions. Depending on circumstances, the World Bank Group may have played distinct roles: main convener, joint convener, or collaborator.

¹³ Examples of the convening service include leadership or co-leadership in bringing together key actors for dialogue and promoting consensus around key aspects of carbon markets and climate policy, strengthening global and national partnerships (such as the Carbon Pricing Leadership Coalition) and conducting annual fairs and conferences (for example, Carbon Expo) and events at the United Nations Framework Convention on Climate Change Conference of Parties (COPs).

¹⁴ The full cycle for developing and implementing Clean Development Mechanism and Joint Implementation projects involves multiple steps for due diligence that go from the Project Idea Note (PIN), Project Concept Note (PCN), Project Design Document (PDD), baseline and monitoring methodologies, risk assessment, validation by external auditors, registration by the United Nations Framework Convention on Climate Change, project design and contracting, periodic supervision, verification by external auditors, payments and transfer of credits, and completion of the project.

¹⁵ Appendix A presents details of the evaluation approach, methods used, and triangulation of the evidence from the different sources to answer the evaluation questions.

2

Changing Needs, Priorities, and Regulatory Challenges in Carbon Markets

highlights



The main global need and priority initially were to pilot the market mechanisms and catalyze carbon markets. Defining the ground rules and essential methodologies for greenhouse gas accounting were critical.



Ensuring environmental integrity and additionality remained major regulatory challenges, and they increased transaction costs and regulatory risks to projects.



As the markets developed, filling financing gaps and leveling the field in underserved sectors and geographies (for example, Africa) was required to make progress on mitigation and development targets.



Many developing countries see climate mitigation as a co-benefit from projects that contribute to sustainable development, but the Clean Development Mechanism lacked standardized systems to track development impacts.



Carbon markets collapsed in 2012 just as many low-income countries were beginning to engage in them. The market crisis also

affected investor incentives and private sector confidence.



Capacity building remained important, first to support market participation and later to mitigate the effects of the crisis and support market readiness and domestic carbon pricing. Many Clean Development Mechanism projects (especially in low-income countries) require support in transitioning from the Kyoto Protocol to the Paris Agreement.

GIVEN THE GROWING RECOGNITION of the importance of climate change and the acceptance of carbon markets as a key means of addressing it under the Kyoto Protocol, a distinctive set of needs, priorities, and challenges emerged, as outlined in this section.

The global needs and priorities and regulatory challenges varied during the different phases of carbon market development. They are assessed distinguishing three phases of CF markets prior to the ratification of the Paris Agreement: (i) Catalyzing carbon markets (2000–05); (ii) Building and expanding markets (2006–11); and (iii) Mitigating the impact of the market crisis (2012–16).¹ The post-Paris phase is discussed in chapter 5.

Catalyzing Carbon Markets (2000–05)

Needs and Priorities at the Global Level

Following the signing of the Kyoto Protocol, the main global need and priority was to pilot the market mechanisms. Building on the Activities Implemented Jointly experience (Schwarze 2000), the initial interest in catalyzing markets was on middle-income countries (with CDM) and the transition economies of Eastern Europe (with JI). The piloting of the flexible mechanisms and prototyping of the carbon market were necessary to accumulate experience with the design, implementation, and evaluation of emission reduction projects including the modalities for pricing carbon as a tradable asset and transferring of carbon credits.

Capacity building and technical assistance were required at all levels, especially in developing countries. During these initial years, many of the developing countries had inadequate awareness, knowledge, and expertise in the use of market instruments in both public and private sectors (Michaelowa 2003). The emerging carbon markets under the Kyoto Protocol required rigorous use of MRV systems which involved public institutions, for example, Designated National Authorities (DNAs) to approve CDM projects; and private companies, for example, project developers in consultation with third-party auditors, to validate proposals and verify emission reductions.

Creating the initial demand for carbon assets and financing early projects was crucial to catalyzing the market. The IEG's rigorous review and interviews show that raising awareness and promoting private sector participation were priorities. Many projects, however, faced financial and bankability challenges because of lack of initial demand and associated project risks. Up-front financing and frontloading of carbon revenues were therefore important to support projects facing profitability or bankability issues.

Evolution of Market and Global Regulatory Challenges

The nascent market needed to be equipped with ground rules and essential methodologies, including documentation. With the setting up of the Kyoto Protocol as the legal framework for creating markets, the key issues were to reach agreement on the operational rules and procedures for CDM/JI and to develop methodologies for validation of mitigation projects, critical for ensuring

environmental integrity. In the absence of precedent, establishing document templates and legal approaches to generating and transferring credits was also indispensable (Brown 2003).²

Baseline setting and additionality determination were controversial and faced operational challenges.³ To ensure the environmental integrity of mitigation actions, additionality determination is required. Initially lenient rules and the resulting inflow of nonadditional projects as well as manipulation of data were criticized by observers (Zhang et al. 2005; Chomitz 2002; Geres and Michaelowa 2002).⁴ Standardization of additionality assessment and baseline determination helped to improve transparency and legitimacy of the validation system.

Transaction costs were high and regulatory risks increased the project risks. The complex project cycle generated high transaction costs, reducing the economic viability of small projects (Jotzo and Michaelowa 2002).⁵ Likewise, initially unpredictable regulatory decision making led to reluctance to engage in the CDM (Shishlov and Bellassen 2012).

The market and regulatory regime needed to compromise on the definition and relevance of eligible activities in the forestry sector in the context of sustainable development. Some observers saw forestry projects as crucial for generating large emission reductions and delivering sustainable development benefits for local communities.⁶ Others feared it would deliver only limited impacts, discriminate against developing regions, or worsen methodological challenges (Groen, Nabuurs, and Schelhaas 2006; Dulal, Brodnig, and Shah 2011; Zomer et al. 2008). Already in 2001, the decision had been made to recognize emission reductions from afforestation and reforestation (A/R) while emission reductions in some agricultural activities⁷ (for example, removals through land use change and soil carbon sequestration) and reduced deforestation were either disadvantaged or not covered by the CDM.

Building and Expanding Markets (2006–11)

Needs and Priorities at the Global Level

With the growth in demand, building the capacity of public and private participants was required to facilitate market growth as well as ensure additionality. The IEG reviews pointed out the challenges in achieving quick growth in the capacity of regulators, project developers, consultants, and auditors to process a large inflow of projects and prepare high-quality proposals that meet additionality requirements. Streamlining and standardization of CDM procedures were also required to improve the quality of project submissions and reduce the proportion of rejections (Platonova-Oquab et al. 2012).

The sustainable development contributions of the CDM are questioned. The interest to foster social, economic and environmental co-benefits, was strongly stated by host countries, but DNAs were not able to check and enforce co-benefits. Research suggested the need for engagement after project completion to enhance uptake of technologies that provide co-benefits (Barstow et al. 2016). Although the CDM rules have evolved to include “suppressed demand”⁸ in baselines, challenges remained to balance simplification and environmental integrity (Spalding-Fecher 2015). Technology

transfer as a co-benefit showed significant but heterogeneous results (UNFCCC 2010; Das 2011; Karakosta, Doukas, and Psarras 2012).⁹

Filling financing gaps and leveling the field in underserved sectors and geographies were imperative to make progress on mitigation and development targets. One of the main criticisms of early CDM and JI was the uneven geographical distribution of projects largely bypassing Africa.¹⁰ Since 2007, programmatic approaches allowed Africa to significantly increase its share in CDM activities. The concentration of CDM supply (Wara 2007) was also observed in few sectors (for example, industrial gases, renewable energy, and energy efficiency) while agriculture and transportation lagged, despite their large share in global emissions.¹¹

Evolution of Market and Global Regulatory Challenges

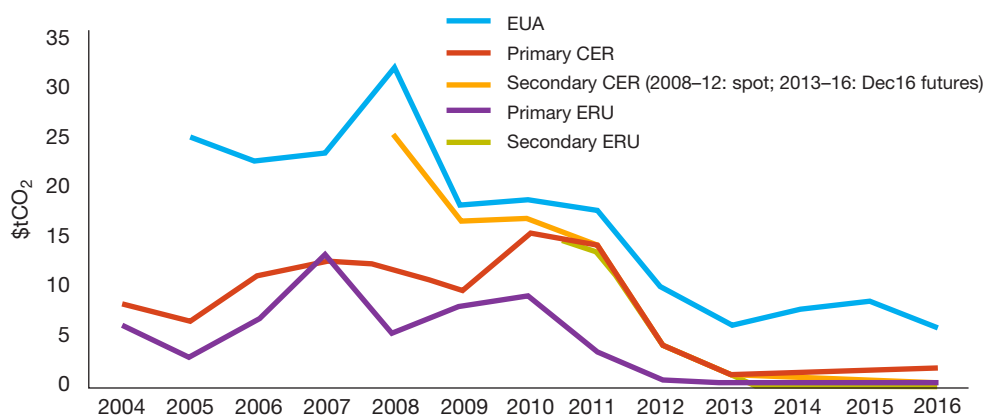
Governance of carbon markets needed to be improved both at the international and national levels. This included issues raised by project developers regarding lack of transparency on the CDM executive board's decisions, lack of grievance redress mechanism, and limited interaction along the process. In addition, low quality of third-party auditing of project documents and possible conflict of interest for the Designated Operational Entities accredited by the CDM executive board but hired by project owners became an important governance issue (Dyck 2011).

Ensuring environmental integrity and additionality become major regulatory challenges while sustainable development remains in the domain of the host countries. Given the asymmetric information issues, research acknowledged that it was difficult to ensure additionality in practice (Shishlov and Bellassen 2012). However, more stringent additionality, standardized baselines, and performance benchmarks can help ensure net emission reductions to compensate for any nonadditional projects (Carmichael, Lea, and Balatbat 2016). On the other hand, there were no standardized criteria and MRV methods for measuring any development impacts and co-benefits (Cole 2012). There was also a tendency to exploit the cheap abatement opportunities in certain sectors (for example, industrial gas, large hydro), while energy efficiency, agriculture, and transport lagged (Imai, Akita, and Niizawa 2012; Newell and Bumpus 2012).

Delivery risk in terms of a discrepancy between estimated and issued carbon credits was identified as one of the key challenges to CDM project development. The non-issuance of CERs was attributed 29 percent to failure of projects (for example, negative validation or project withdrawal), 12 percent to delays in approval process, 27 percent to delays in commissioning, and only 1 percent to operational underperformance. Hence, by 2011 only about 30 percent of the expected CERs had been issued (Cormier and Bellassen 2013).

Along with the CDM, parallel voluntary markets were rising across the globe. Methane and fuel switch were predominant in voluntary markets; Africa benefited least (Corbera, Estrada, and Brown 2009). Credit prices were more differentiated under the voluntary markets (for example, prices were higher for projects located in developing countries or low-income countries [LICs; except forestry projects]) (Conte and Kotchen 2010). This difference suggests an implicit valuation of the social and environmental co-benefits in developing countries linked to buyers' perception that the co-benefits of mitigation projects are higher in these locations.

FIGURE 2.1 | Average Annual Carbon Price Trends



Source: Point Carbon (EUA), Bluenext/EEEX (secondary CER/ERU) and World Bank reports (primary CER/ERU).

Note: CER = Certified Emission Reduction; ERU = Emission Reduction Unit; EUA = European Union Emissions Allowances.

Mitigating the Impact of the Market Crisis (2012–16)

Needs and Priorities at the Global Level

Stabilizing the market and upholding demand in this critical period were vital in the face of crisis. Given the unwillingness of many Annex B governments to buy CDM credits after the 2009 Copenhagen conference, the aggregate CER/ERU credit supply in 2012 exceeded the restricted credit imports allowed in the European Union (EU) emissions trading system (ETS) and all relevant buyer countries, leading to the carbon credit price collapse.¹² This created the global need to contain the market crisis and to retain the CDM infrastructure. There was also urgent priority to fill in the growing demand gap in carbon markets and in sectors where risk of project discontinuation was high. The price plunge that followed was particularly painful for LICs where Programs of Activities (PoAs) had finally started to take off and where past capacity building had started to bear some fruit (Kreibich et al. 2017).¹³

Preservation of accumulated technical capacity and a pool of expertise was crucial. The price crash led to a significant down-scaling of activities at all stages of project development, severely diminishing private sector incentives. A large number of businesses (including intermediaries) were moving out of the CDM. This out-migration of expertise and capacity placed additional pressure on the fragmenting markets (Michaelowa 2012).

Evolution of Market and Global Regulatory Challenges

Following the market crisis, mitigating impacts by restoring credit demand and market confidence was one of the most urgent market priorities. Globally, the average primary CER prices that peaked at \$15 in 2010 plunged to between \$1–2 since 2013 (figure 2.1).¹⁴ The drastic fall in credit prices, combined with the regulatory uncertainty, resulted in a drastic decline in new CDM project registrations. The IEG case studies indicate that many see the post-2012 situation as the “decay of

the CDM” and this has severely affected investor confidence in carbon markets. The market crisis was compounded by inflow of “hot air” credits through JI in late 2012, when several hundred million JI credits were issued in a few weeks by Ukraine and the Russian Federation (Kollmuss, Schneider, and Zhezherin 2015).¹⁵

CDM reform was accelerated in the light of its potential recycling into post-2012 new market mechanisms. A special High-Level Panel established by the CDM executive board in 2011 published in the following year its final report consisting of 51 recommendations (UNFCCC 2012).¹⁶ However, not all recommendations were implemented.¹⁷

Needs and Priorities at the National Level

The needs and priorities of the client countries with respect to CF vary significantly and have changed over time.¹⁸ The national needs and priorities in CF are conditioned by national economic, institutional, and political economy factors, and by the capacity of public and private sectors to access international carbon markets. Under the Kyoto Protocol, developing countries had no mitigation targets; under the Paris Agreement they voluntarily contribute to mitigation. But though the national development strategies in many countries recognize climate change as a threat to sustainable development, mitigation ambitions are subordinate to broader social and economic development goals. Taking into account country differences in intervention strategies regarding constraints in delivering their NDCs is thus important.

Based on the IEG case studies in six countries, the diversity of client country needs and priorities in CF and their level of engagement in global carbon markets and carbon pricing can be classified broadly into three categories.

(i) Pioneers in catalyzing and developing carbon markets, now moving toward different pricing instruments; for example, Chile and Colombia. These are early movers into the CDM with substantial government support. The private sector quickly understood the CDM concept and engaged in different GHG mitigation opportunities. Companies were able to reap substantial benefits from the CDM. After the decline of the CDM market, governments engaged in domestic carbon pricing coupled to offset systems.

(ii) Initially reluctant players, moving to become world leaders in CDM; for example, China and India.¹⁹ Unsure about the benefits and strategic relevance of the CDM, these countries adopted a cautious approach in the early years. They realized that reducing emissions was consistent with their long-term strategic needs, especially in generating revenue, enhancing energy efficiency, renewable energy, and reducing pollution. Over time, both countries moved swiftly to become global leaders in generating CERs, led by the private sector in the Indian case, and a government-led strategy in the Chinese case. China used the experience to build domestic markets and launched a national carbon trading scheme in 2017, accepting project-based credits to some extent. India, on the other hand, has only recently started to consider domestic carbon pricing instruments. These countries now have different needs and may require different types of support.

(iii) **Latecomers requiring extensive capacity development;** for example, Ethiopia and Uganda. Many LICs, especially in Africa, required significant capacity development and learning by doing to understand the carbon markets. Despite significant international support, capacity developed slowly and private sector participation remained limited. Starting from forestry, CDM moved into energy access and renewable energy, especially through PoAs that successfully reduced transaction costs. However, the CDM market declined before these countries could fully make use of their newly built capacity.

Most developing countries, particularly LICs, see mitigation as a co-benefit to projects and interventions that aim at poverty reduction and economic development. The country-level case studies indicate that many developing countries prefer interventions that primarily meet their development aspirations while also reducing emissions or contributing to adaptation. Mitigation thus needs to be consistent with development priorities, which will be a challenge to increasing developing countries' overall mitigation ambition.

¹ The Paris Agreement entered into force on 4 November 2016, 30 days after at least 55 Parties to the Convention, accounting for at least 55 percent of the total global GHG emissions, have deposited their instruments of ratification, acceptance, approval, or accession with the Depositary. We therefore consider the post-Paris phase to start from 2017. This also suggests that moving beyond mitigating the negative impacts of the price collapse, the World Bank's efforts during the latter part of the third phase (2012–16) also supported the Paris process in anticipation of putting in place a new global climate framework for developing the next generation of carbon markets.

² As the Clean Development Mechanism and Joint Implementation projects started to develop, the priority was soon recognized to formulate a new domain of formal regulation to facilitate international carbon transactions and provide a platform to administer legal disputes between different entities across public and private sectors.

³ In the context of project-based mechanism, the baseline is the reference hypothetical scenario that is identified as the most likely in the absence of the proposed project, and against which emission reduction can be claimed. Additionality indicates that the project would not have occurred in the absence of revenue from sale of the emission credits.

⁴ Additionality of the investment had not been checked by the regulators, which was broadly criticized by the literature (Anagnostopoulos, Flamos, and Psarras 2003; Carmichael, Lea, and Balatbat 2016; Gillenwater 2011; Greiner and Michaelowa 2003; Lund 2009; Purohit and Michaelowa 2007; World Bank 2016b). See details on additionality of Clean Development Mechanism and Joint Implementation projects in Appendix F.

⁵ To reduce these costs and contribute to a more geographical distribution, the Programs of Activities (PoA) were initiated in 2005 to allow the registration of multiple activities of the same type without any limit over a period of 28 years.

⁶ Four key elements were identified as relevant for the delivery of real local sustainable development: ownership, price, transaction costs, and use rights.

⁷ Agriculture is not formally excluded from the Clean Development Mechanism (CDM) and some methodologies covering livestock waste, biomass energy, fertilizer use, and agroforestry (since 2008) have been developed. However, the sector overall remains underrepresented in the CDM portfolio. According to the Intergovernmental Panel on Climate Change, agriculture accounted for an estimated 5.1 to 6.1 gigatons of carbon dioxide equivalent (GtCO₂e) in 2005, or roughly 12 percent of the global greenhouse gas emissions. However, agriculture's net contribution to emissions could be reduced through removal or sequestration of up to 1.6 GtCO₂e annually at relatively low carbon prices. Most

opportunities identified to date involve biomass energy and methane capture in livestock waste, or afforestation and reforestation for forestry and land use change (Smith et al. 2007). Most significant opportunities are in efforts to restore carbon pools in soils, which closely links mitigation in agriculture with development. Such projects that are designed to sequester carbon in soils, however, face special hurdles under current rules (Larson, Dinar, and Frisbie 2011). Land use change is also difficult to address in a project context while reversing soil degradation faces coordination hurdles; effective management requires collective action by many land users. In addition, the parameters used to establish net emission outcomes depend on local soil conditions, making it difficult to standardize and replicate successful projects. All of this adds to complex monitoring, reporting, and verification systems and steeper monitoring, measurement, and implementation costs, making agricultural land-use projects (and especially soil carbon sequestration projects) less attractive to investors (Larson, Dinar, and Frisbie 2011).

⁸ “Suppressed demand” refers to the current consumption for basic services which may not reflect the real need of low-income households (Spalding-Fecher 2015).

⁹ A comprehensive study was conducted by the United Nations Framework Convention on Climate Change to systematically analyze the technology transfer claims made by project participants in the project design documents of 4,984 projects that were in the Clean Development Mechanism pipeline as of 30 June 2010. The study found that about 30 percent of all projects in the pipeline, accounting for 48 percent of estimated emission reductions, involve technology transfer (UNFCCC 2010).

¹⁰ Host country attractiveness under the Clean Development Mechanism (CDM) at the height of the market expansion found India, China, Mexico, Brazil, the Republic of Korea, and Chile at the top, while under Joint Implementation New Zealand, Denmark, and Sweden were seen as leaders (Oleschak and Springer 2007), leaving low-income countries—African countries, in particular—behind. When bilateral CDM projects were assessed, it was found that the familiarity factors (colonial history, bilateral trade, and bilateral aid) strongly influence CDM location decisions (Dolšák and Crandall 2013).

¹¹ In addition to the efforts to reduce emissions in traditional sectors, new mitigation options such as cities and urban development (including construction and transport) as well as coastal ecosystem management (“blue” carbon) are potential niche sectors for low-carbon development (Rescalvo et al. 2013; Wylie, Sutton-Grier, and Moore 2016). The objective of balancing greenhouse gas emissions and carbon sinks under the Paris Agreement puts an implicit emphasis on Carbon Capture and Storage technologies.

¹² The main sources of end-use demand for international carbon credits Certified Emission Reductions [CERs] and Emission Reduction Units [ERUs] were private companies subject to the EU Emissions Trading Scheme and governments of Annex B countries to the Kyoto Protocol that had a deficit of carbon units for compliance in the first Commitment Period (2008–12). The EU legislation set in 2004 a maximum limit on the use of international credits for compliance in Phase 2 (2008–12) at around 1.4 billion tons of carbon dioxide equivalent (tCO₂e) and increased it in 2009 by around 0.25 billion tCO₂e for Phase 3 (2013–20). The total demand for international carbon credits from the EU-ETS was thus around 1.65 billion tCO₂e in 2008–20 (Stephan, Bellassen, and Alberola 2014), while the total demand for international credits from governments—mainly Japan—was estimated at 0.3 billion tCO₂e in 2008–15 (Bellassen, Nicolas, and Benoit 2012). The combined CER and ERU supply hit the 2 billion tCO₂e mark sometime in 2012 thus exceeding the aggregate demand and leading to the carbon credit price collapse. As of January 1, 2016, the 7,684 registered Clean Development Mechanism and 604 Joint Implementation projects had issued 1.642 billion CERs and 864 million ERUs (Shishlov, Morel, and Bellassen 2016). In addition, though governments took the Kyoto Protocol seriously and budgeted significant public money for acquisition of credits, they did not do this with the Copenhagen Pledges under the informal and non-binding Copenhagen Accord of 2009. Under the Kyoto Protocol before Copenhagen, there were significant government acquisition programs for Certified Emission Reductions (for example, in Italy, Japan, the Netherlands, Scandinavia, and Spain), inside and outside the World Bank Group. After Copenhagen, most of them (except the Scandinavian countries) stopped.

¹³ Africa represents 34 percent of Programs of Activities (PoAs) compared to only 3 percent of regular Clean Development Mechanism (CDM) projects, while low-income countries account for 19 percent of PoAs compared to only 1.6 percent of regular CDM projects (UNEP DTU 2017a).

¹⁴ The EU initiated reforms of its Emission Trading Scheme (ETS) in early 2017; these have gradually led to an upward trend in European Union Emission Allowance (EUA) prices, which reached \$18 per ton as of June 1, 2018 (not shown in figure 2.1). However, while more recent primary certified emissions reductions (CER) data are not publicly available and there are no new emission reduction unit (ERU) transactions, these upward changes in European Union Emissions Allowance (EUA) prices are not expected to have a direct effect on credit prices. This is mainly because no more CERs and ERUs can be used after reaching the maximum use threshold in the EU-ETS; hence, the recent EUA price hike cannot directly influence CER/ERU prices. The primary CERs of certain “fashionable” project types currently command a premium compared to a secondary market oversupplied with CERs from industrial gases and large-scale renewable projects.

¹⁵ The broader definition of “hot air” is that the country’s emission reduction target is less stringent than business as usual. This means that the country can sell emission units (under emission trading) or emission credits (under baseline and credit systems) without having to do any mitigation. This situation led to large surplus of emission allowance in some of the transition economies following the reduction of greenhouse gas emissions after the collapse of the socialist economies. The first track of Joint Implementation, which was devoid of international oversight, allowed a massive issuance of JI credits in a very short period (Kollmuss et al. 2015).

¹⁶ The Panel was established at the 63rd meeting of the Clean Development Mechanism (CDM) Executive Board to conduct a policy dialogue involving civil society, policy makers, and market participants. It comprised 11 leaders of companies, nongovernmental organizations, and governmental bodies not directly involved in the CDM. The policy dialogue consisted of 58 public input submissions, 18 consultations with stakeholders, and 17 informal meetings. Key issues addressed were: (i) streamlining the project cycle; (ii) changing the methods for determining additionality; (iii) modifying the role of the secretariat; (iv) improving the validation and verification model; (v) professionalization of the Executive Board; (vi) implementation of an appeals mechanism; and (vii) strengthening the current stakeholder consultation system (Classen et al. 2012).

¹⁷ Among many factors this is related to differing opinions of countries’ governments; the regulators continued to streamline and standardize the regulations.

¹⁸ In addition to the IEG field-based case studies in the six countries and interviews of global carbon finance experts and Bank Group staff and management, this chapter draws from the following sources of evidence undertaken by IEG: (i) Structured Literature Review on evolution of markets and regulatory systems from Kyoto to Paris; (ii) Literature review on evolution of carbon markets from Kyoto to Paris; and (iii) Desk review of the changing needs and priorities in carbon finance at the global level.

¹⁹ Given their growing greenhouse gas emissions and pollution issues associated with rapid economic growth, these countries often found themselves in a paradoxical situation.

3

highlights

World Bank Group Support to Carbon Finance and Responsiveness to Needs and Priorities



The World Bank Group's strategy varied over time while its engagement shifted progressively from catalyzing carbon markets to capacity development.



The post-2012 strategy also indicated a shift from supporting carbon markets for Kyoto compliance to domestic carbon pricing and integrating CF into development assistance.



CF evolved separately in IFC and the World Bank; IFC did not operate in LICs and exited the carbon market soon after 2012.



CF has been concentrated in a few sectors (energy efficiency, renewable energy, industrial gases, and waste management). Transport and agriculture were underrepresented.



The World Bank Group has developed a diverse CF portfolio and attempted to increase its support to LICs. However, this also led to fragmentation and proliferation of funds and facilities.



CF has largely remained a trust-funded activity poorly integrated into development operations. The monitoring and evaluation systems and governance are uneven.



There was no clear exit strategy and the World Bank Group continued to engage in downstream market transactions.

THE GLOBAL AND NATIONAL NEEDS laid out in chapter 2 stimulated an active World Bank Group response elaborated below, which IEG has reconstructed based on its expert interviews (internal and external), desk reviews, and portfolio analysis.

Evolution of the Vision and Strategic Objectives

CF in World Bank Group Strategies

The launch of CF activities in the World Bank Group preceded any formal statement of strategy, but the World Bank Group Executive Board was consulted. Building on a precursor program of the UNFCCC and capacity building activities in the 1990s,¹ the World Bank launched the first carbon fund, the Prototype Carbon Fund (PCF), which aimed to “operationalize the Kyoto market mechanisms” by nurturing carbon markets and preparing the way for increased participation by public and private buyers (World Bank 2010b). The World Bank’s Board of Directors (Resolution 99-1) and management had approved the PCF to promote buying carbon emission reductions in developing and transition countries in 1999. As the PCF moved forward, the World Bank invited governments and private sector entities to subscribe shares to pioneer several concepts in carbon markets.

The World Bank Group’s first “Strategic Directions” for CF was issued in 2003.² It outlined three objectives: (i) assist in building, sustaining, and expanding international carbon market development and increasing the viability of project-based mechanisms; (ii) extend the benefits of CF to the smallest, poorest countries and poor communities; and (iii) demonstrate CF for carbon sinks (sequestration). IFC followed in 2005 with its Strategic Directions document, which described possible opportunities for the private sector in the carbon market and provided a rationale for IFC’s continued engagement.

CF guidance was updated through authorization from the World Bank Group Board in 2005, further detailed in 2006, and reiterated in 2007.³ As they had done for the PCF, the Executive Directors requested Management to report on progress semiannually. The 2007 Global Public Goods framework paper presented to the World Bank/International Monetary Fund Development Committee on the role of the World Bank Group in providing global public goods through CF and proposed encouraging innovation through pilot projects (World Bank 2007a).⁴ The World Bank was instructed to ensure that emissions reduction would not impair growth. Its role in CF was also defined as demonstrating the scope for public-private partnerships, new technologies, and mobilization of additional carbon funds.

In 2008, the World Bank Group mainstreamed climate change issues, including CF. The 2008 Strategic Framework on Development and Climate Change (SFDCC) formalized the World Bank Group strategy to integrate mitigation and adaptation into its development assistance and financing mechanisms (World Bank 2008). The SFDCC identified six priority action areas to support adaptation and mitigation actions with co-benefits: (i) support climate actions in country-led development processes; (ii) mobilize additional concessional and innovative finance; (iii) facilitate the development

of market-based financing mechanisms; (iv) leverage private sector resources; (v) support accelerated development and deployment of new technologies; and (vi) step up policy research, knowledge, and capacity building. Of these areas, the third, fourth, and sixth priority actions were directly relevant to CF.⁵ In addition, IFC's separate strategy documents from FY08 and FY09 echo the World Bank Group's SFDCC.⁶

Despite the market crisis, the strategic approach to CF was updated in 2012 with a five-year business outlook. This aimed at supporting countries in market participation and introducing a more programmatic, integrated approach to scaling up emissions reductions. Despite the uncertainty, the new Environment Strategy in 2012 continued to embrace CF activities. It emphasized the World Bank's bridging function in connecting climate policy process and operational requirements of concrete mitigation activities (World Bank 2012a).⁷ Lastly, the IFC FY13–15 Road Map summarized activities in climate change, noting IFC's leadership among international finance institutions in offering structured CF products.

The World Bank Group's 2013 overall corporate strategy recognized climate change as a development challenge and committed itself to incorporating climate concerns into development processes. The IFC's FY15–17 Road Map committed IFC to capture new climate opportunities and integrate a climate-smart approach, but CF is not mentioned. In its FY15–17 Strategic Directions paper, MIGA committed to supporting energy efficiency and climate change through involvement in complex energy and infrastructure projects.

Following the Paris Agreement, the World Bank Group issued its new Climate Change Action Plan in 2016. To maximize impact, the Plan focused on helping countries to shape national policies and leverage private sector investment. The plan also emphasized getting carbon prices right, including extending work to “widen, deepen, and connect markets, with a focus on implementation at the country level” (World Bank 2016a).⁸ IFC's Climate Implementation Plan, launched as part of the World Bank Group 2016 Climate Change Action Plan, complemented the World Bank's activities, focusing on risk mitigation. Though the plan mentioned carbon pricing, it did not specify any activity regarding carbon markets or finance.⁹

IFC and MIGA's recent strategies support the broader category of climate finance, rather than carbon finance. As part of IFC's goal of financially sustainable climate markets, the FY18–FY20 IFC Strategy and Business Outlook (IFC 3.0), dated March 2017, proposed to rethink private sector climate finance. IFC's approach includes strategies that mitigate climate risks (such as the plan to implement internal carbon pricing to high-emitting sectors) and the support to private companies to engage in carbon pricing through the Carbon Pricing Leadership Coalition (CPLC).¹⁰ MIGA's Strategy and Business Outlook, FY18–20, commits to supporting climate change without mentioning carbon.¹¹

Strategic Objectives of CF

The strategic objectives and CF activities varied under different phases. Following the chronological phases introduced in chapter 2, World Bank Group support for CF can be classified into four phases: (i) phase 1—catalyzing carbon markets (2000–05): This saw the approval of 11 funds and facilities with funding totaling \$1.15 billion; (ii) phase 2—building and expanding markets (2006–11): In the

second phase, eight facilities and programs were initiated with total funding of \$2.86 billion; (iii) phase 3—mitigating the impact of the market crisis (2012–16): In this phase, six new funds and facilities were developed totaling another \$0.79 billion; and (iv) phase 4—relaunching markets after Paris (2017+).

During its early stage of engagement (phase 1), the World Bank Group's objective was to catalyze the nascent international market for GHG emission reductions and overcome barriers to the use of CF. The World Bank Group prepared its first CF strategy in 2003, outlining three objectives: (i) expand support for carbon market development and increasing the viability of project-based mechanisms; (ii) extend the benefits of CF to the smallest, poorest countries and poor communities; and (iii) demonstrate CF for carbon sinks (sequestration) (World Bank 2003). The World Bank's engagement was built on the recognition of the substantial difference between the costs of emission reductions in developed and developing countries and the opportunities for reducing the cost of compliance with the Kyoto Protocol for developed countries. Such trade could potentially lead in the long term to new and additional sources of finance for developing countries for low-carbon development (World Bank 2006a).

The second phase of the World Bank Group's CF aimed at building and expanding carbon markets while preparing for post-2012. The CF strategy was revised in 2006 with a focus on the following areas: (i) ensure that carbon finance contributes substantially to sustainable development; (ii) assist in building, sustaining, and expanding the international carbon market; and (iii) further strengthen the capacity of developing countries to benefit from the emerging markets (World Bank 2006a).

During the third phase, the World Bank Group focused on mitigating the market crisis following the failure of the international process to agree on the Kyoto Protocol's second commitment period. The CF strategy was further updated in 2012, targeting the following objectives: (i) support countries in their domestic carbon pricing policies to mitigate the impact of the global market crisis; and (ii) move from a project-by-project to an integrated programmatic approach to manage risks and support scaling-up of emission reductions (World Bank 2012b).

During the post-Paris phase, the World Bank Group is looking into a future relaunching of carbon markets and piloting the Paris Agreement mechanisms. Although it is not part of this evaluation to assess its effectiveness, this phase aims to pilot scaled-up crediting approaches linked to the introduction of mitigation policy instruments and investment programs (see chapter 5 for discussion of this phase).

Nature of the Engagement and Architecture of CF

During the different phases, the Bank Group has developed numerous funds, facilities, and initiatives designed to support its different roles. During the evaluation period, the Bank Group created a total of 25 CF vehicles in line with the key roles in implementing its CF activities. During calendar years 2000–17, the PRA indicates that the Bank Group's CF initiatives generated 228 ERPA's and 170 ASA activities (\$4.73 billion) and provided political risk guarantees for 15 ERPA's (table 3.1).¹² The World Bank (International Bank for Reconstruction and Development [IBRD] and International Development

Association (IDA)) are responsible for almost 90 percent of the total direct financial support for 211 ERPAs and 167 ASAs (appendix B). IFC provided 10 percent of the financial support with 17 ERPAs and 3 ASAs. In addition, MIGA provided guarantees for 15 CDM projects with a gross exposure of \$2.253 billion. Over time, project activities have shifted from a predominance of ERPAs to include a substantial number of ASAs. This pattern matches the evolution of the Bank Group's carbon finance initiatives, which reflects the focus on carbon market functionality in the early days to capacity building and thought leadership in more recent years.

With the exceptions of IFC's Carbon Delivery Guarantee (CDG) and the Post-2012 Carbon Fund and the Forests Bond, CF operations have been primarily trust-funded activities mainly contributed by governments and companies in Organisation for Economic Co-operation and Development (OECD) countries. Across this portfolio, governance arrangements, record-keeping, monitoring and evaluation (M&E), accountability, and learning varied widely with some improvement over time. Many of the older Kyoto funds lacked clear governance arrangements while the newer initiatives (for example, the Carbon Partnership Facility [CPF], Forest Carbon Partnership Facility [FCPF], and the Partnership for Market Readiness [PMR]) developed more inclusive, balanced, and transparent arrangements and allowed client countries and funders to engage actively in decision-making processes. The new initiatives also have more transparent results frameworks and M&E arrangements to generate necessary data and evidence to support accountability and learning (see appendix J).

Over the evaluation period, the World Bank Group has been proactively developing diverse CF initiatives and created 25 vehicles to support its multiple roles. Whereas the Pilot Auction Facility (PAF) was developed specifically to innovate, the Umbrella Carbon Facility (UCF) and country funds (for example, the Italian Carbon Fund [ICF], the Carbon Fund for Europe [CFE], IFC-Netherlands Carbon Facility [INCaF], and Danish Carbon Fund [DCF]) were conceived to catalyze and develop carbon markets. Capacity building was mainly integrated with thought leadership and convening

TABLE 3.1 | World Bank Group Engagement in Carbon Finance: Kyoto to Paris

World Bank Group	Amount (\$, millions)	2000–05		2006–11		2012–17		Total	
		ERPA	ASA	ERPA	ASA	ERPA	ASA	ERPA	ASA
World Bank	4,288.7	32	2	147	78	32	87	211	167
IFC	443.12	3	0	13	2	1	1	17	3
MIGA	2,253.5	0	0	1	0	14	0	15	0
Total	6,985.32	35	2	161	80	47	88	243	170

Source: Independent Evaluation Group portfolio review and Carbon Finance Unit data.

Note: Advisory Services and Analytics (ASA) includes capacity building and work such as technical assistance, training, and analytical studies. The amount shown for MIGA is the value of the gross exposure for the guarantees. Years are calendar years. ERPA = Emission Reduction Purchase Agreement.

power in Carbon Finance Assist (CF-Assist), PMR, FCPF, and the BioCarbon Fund for Sustainable Forest Landscapes (BioCF ISFL). The Prototype Carbon Fund (PCF), CDCF, BioCF, CPF, Carbon Initiative for Development (Ci-Dev), and the Transformative Carbon Asset Facility (TCAF) contribute to all the roles (table 3.2).

Responsiveness to Evolving Needs, Priorities, and Challenges

The World Bank Group has been responding to the changes in needs and priorities and perceived challenges through its diverse architecture of CF vehicles. The current architecture of CF evolved as part of the World Bank Group's responses to various regional and global needs and priorities and market and regulatory changes during the four phases. The World Bank Group therefore created

TABLE 3.2 | Carbon Finance Initiatives Grouped by Main Role of the World Bank Group

Roles					Funds/Facilities	Amount (\$, millions)	ERPA Projects	Non- ERPA Projects
1	2	3	4	5				
Yes	Yes	Yes	Yes	Yes	PCF, CDCF, BioCF, CPF, Ci-Dev, TCAF	846.5	119	45
Yes					ICF, CFE, INCaF, IFC NECaF, World Bank NECaF, DCF, UCF	1,518.00	54	0
Yes	Yes				IFC CDG, IFC-P12CF, IFC Forests Bond	316.6	5	0
Yes		Yes		Yes	World Bank-NCDMF, SCF	383.7	50	3
	Yes	Yes	Yes	Yes	FCPF, BioCF ISFL	1,453.7	0	40
	Yes				PAF, MIGA Guarantees	2,306.5	15	0
		Yes	Yes	Yes	CF-Assist, PMR	149.09	0	77
			Yes	Yes	CPLC, NCM, IFC AS	11.23	0	5
Total						6,895.32	243	170

Note: Codes: 1 = Catalyzing and developing carbon markets; 2 = Innovating CF; 3 = Capacity building; 4 = Thought leadership; 5 = Convening power. Although many of the CF vehicles may contribute to multiple roles, this classification is based on the main contributions as reflected in the objectives and activities of the initiative. BioCF=BioCarbon Fund; BioCF ISFL=BioCF Initiative for Sustainable Forest Landscapes; CDCF=Community Development Carbon Fund; CF-Assist=Carbon Fund Assist; CFE=Carbon Fund for Europe; Ci-Dev=Carbon Initiative for Development; CPF=Carbon Partnership Facility; CPLC=Carbon Pricing Leadership Coalition; DCF=Danish Carbon Fund; FCPF=Forest Carbon Partnership Facility; ICF=Italian Carbon Fund; IFC AS=International Finance Corporation Advisory Services; IFC CDG=IFC Carbon Delivery Guarantee; IFC NECaF=IFC-Netherlands Carbon Facility; IFC p12CF=IFC Post-2012 Carbon Facility; NCM=Networked Carbon Markets; PAF=Pilot Auction Facility; PCF=Prototype Carbon Fund; PMR=Partnership for Market Readiness; SCF=Spanish Carbon Fund; TCAF=Transformative Carbon Asset Facility; UCF=Umbrella Carbon Facility; World Bank NCDMF=World Bank Netherlands Clean Development Mechanism Facility.

multiple trust funds and some private equity and investment funds (see appendix L). Its responses during each phase are briefly summarized below.

Catalyzing Carbon Markets (2000–05)

In response to the global need to catalyze and develop carbon markets, the World Bank Group moved in at the right time and provided global leadership. Despite the political uncertainty on the market mechanisms of the Kyoto Protocol and the reputational risks, the World Bank Group launched the first carbon fund (the PCF) and took the lead in designing and implementing carbon market pilots well before the entry into force of the Kyoto Protocol.

The initial experience with the PCF, and the interest in expanding the pilots to more countries and sectors in meeting the growing demand, gave rise to the establishment of other dedicated carbon funds. A total of 11 funds valued at \$1.146 billion were launched during this period (including PCF). Of this IFC managed two facilities valued at \$135 million. Some of the funds were targeted to respond to specific needs; for example, CDCF was designed to extend the benefits of carbon markets to LICs and poor communities; and BioCF was developed to demonstrate mitigation opportunities in forestry and agriculture through carbon sequestration. Both CDCF and BioCF were relevant in catalyzing carbon markets through small-scale projects in LICs with the intent to produce sustainable development co-benefits.¹³ CF-Assist was launched in response to the need for building capacity in host countries in designing and developing CF projects, especially considering the methodological issues and other complexities involved in the CDM/JI project cycles. Several of the national funds were developed to support projects aimed to generate emission credits for Kyoto Protocol compliance targets but were also relevant in catalyzing the markets and extending the lessons to the sponsoring countries.¹⁴ As part of catalyzing carbon markets, a total of 35 ERPAs and 2 ASAs were developed and supported during this phase, mostly by the World Bank (92 percent) and by IFC (8 percent).

Building and Expanding Markets (2006–11)

During this period, the World Bank Group increased its effort to expand the market in response to the growing demand for carbon credits. UCF–Tranche 1 was launched to inject large volumes of emission reductions into the market to meet the large demand for carbon credits in Europe. UCF Tranche 1 was built through a new call for interest which brought together the country-specific funds established earlier and other players. It was, however, criticized for focusing on industrial gas credits from China (Michaelowa and Michaelowa, 2011). The CPF was then launched with the ambition to scale up emission reductions through the PoA approach. New funding of \$2.936 billion was made available and a total of 161 ERPAs and 80 ASAs were developed during this period.

The World Bank Group further strengthened its support for capacity building for carbon pricing in middle-income countries (MICs) and development of co-benefits in LICs. The PMR was established to provide technical assistance for the design and implementation of domestic carbon pricing initiatives in selected middle-income countries.¹⁵ The FCPF was created to develop the MRV systems and support capacity building for market readiness in the forestry sector. Ci-Dev was established to support LICs focusing on transformational projects—such as rural electrification,

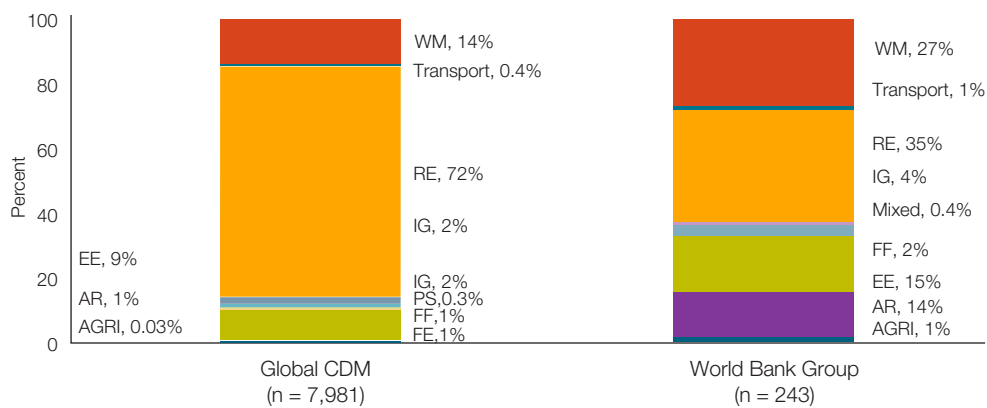
access to clean energy, and improved energy efficiency—that contribute to mitigation and economic development.¹⁶

Anticipating the regulatory uncertainty and market risks, especially in view of post-2012, the World Bank Group also established new initiatives. IFC established the CDG product to cushion against the delivery risk of carbon projects. IFC also created the Post-2012 Carbon Facility (P12CF) for forward purchasing CERs to be produced 2013–20 and to offer a guaranteed floor price to mitigate the price risks. The UCF Tranche 2 was created as a response to the regulatory uncertainty with the intention to boost and maintain demand for CERs post-2012 and sign renewable ERPA contracts before the end of the first commitment period.¹⁷ In addition, the CDCF recognized the importance of project development lead time in the consideration of CDM,¹⁸ helped participants to maximize the volume of CERs generated by 2012,¹⁹ and provided a cushion for market uncertainty by offering a conversion of outstanding CERs generated after 2012 to verified or voluntary emission reductions (CDCF 2006).

Mitigating the Impact of the Market Crisis (2012–16)

The World Bank Group’s responses were focused on mitigating the impact of the market crisis. Substantial effort was channeled to fill in the demand gap and support continuation of existing projects. While most public and private investors including IFC exited the carbon market to undertake new initiatives, the World Bank maintained its commitment, honored the agreements in the ERPAs, and paid fixed carbon prices well above the primary CER markets. The World Bank launched the PAF to provide price insurance for methane- and nitrous oxide–related projects.²⁰ Notably, Ci-Dev concluded ERPAs with CDM projects and programs in Africa, thus providing a lifeline to activities that otherwise would have been stalled, given market conditions. A total of \$0.648 billion in new funding was made available

FIGURE 3.1 | Distribution of Projects and PoAs by Sector or Technology



Source: Independent Evaluation Group based on interviews, literature and portfolio reviews.

Note: Includes only registered PoAs. Global CDM excludes World Bank Group projects. AGRI = Agriculture, A/R = afforestation or reforestation; CDM = Clean Development Mechanism; EE = energy efficiency; ERPA = Emission Reductions Purchase Agreement; FF= fossil fuel switch; IG= industrial gases; PoAs = Programs of Activities; RE= renewable energy; WM = waste management.

during this phase. Consistent with the re-orientation of the CF toward capacity development and domestic carbon pricing, a total of 88 ASAs were developed during this phase. However, a total of 47 new ERPAs were also signed, mainly through UCF Tranche 2, BioCF, Ci-Dev, and CPF targeting certain projects or regions. IFC also initiated the Forests Bond as a new product that makes use of capital markets and “green” coupons to pay for REDD+ (reducing deforestation and forest degradation) credits with a private company underwriting the implicit put option.

Comparative Analysis of World Bank Group Responses

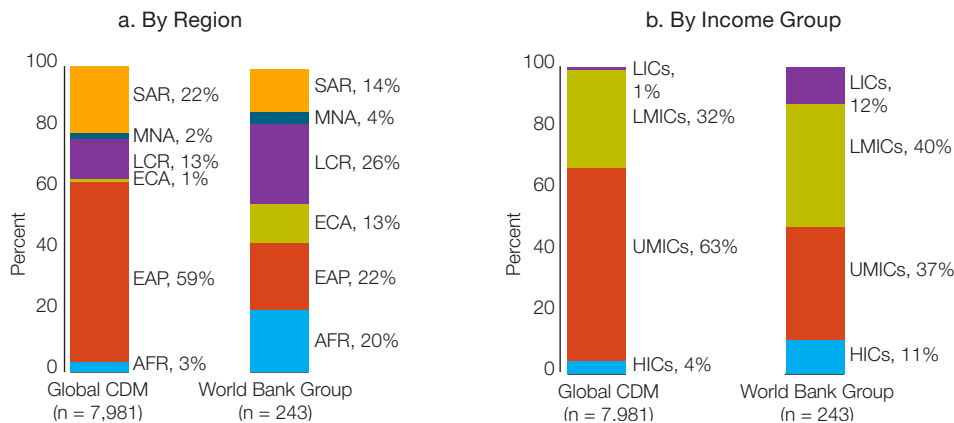
World Bank Group CF activities mainly target the energy and environment sectors and some sectors remained underserved. More than a third of the projects (35 percent) are in renewable energy, 27 percent in waste management/methane, 15 percent in energy efficiency, and 14 percent in A/R. This compares with the rest of the global CDM portfolio where renewable energy accounts for 72 percent, waste management 14 percent, energy efficiency 9 percent, and A/R 1 percent. The main differences from the global CDM are in the higher proportion of projects in waste management and A/R in the World Bank Group portfolio. Whereas agriculture has been underrepresented overall, the stronger focus on A/R is consistent with the importance of agriculture and forestry, which account for about a quarter of global GHG emissions. The transport sector, accounting for nearly 14 percent of global emissions, has less than 1 percent of the global CDM and JI portfolio; the World Bank Group has not covered this sector (see figure 3.1).

The regional distribution of the World Bank Group’s CF portfolio is more balanced than the distribution of the CDM portfolio. The number of ERPA and ASA projects is more evenly spread across regions, and more than one quarter of non-ERPA projects were in Africa. This compares with the greater concentration of the global CDM in the Asia-Pacific Region (82 percent), Latin America (13 percent), and Africa (3 percent) (figure 3.2).

The World Bank Group has achieved a better balance in the distribution of its project portfolio toward different regions and LICs. Compared with the global CDM, the World Bank Group has a larger share of CF projects supporting carbon markets in low-income regions (figure 3.2). While only 1 percent of the rest of the CDM portfolio focused on LICs, about 12 percent of the World Bank portfolio did so. Similarly, while only 3 percent of the CDM portfolio was in Sub-Saharan Africa, it accounted for 20 percent of the World Bank Group’s portfolio. This suggests markets alone are likely to bypass some regions. For PoAs alone, Africa’s share was 49 percent in the World Bank Group and 33 percent in the rest of the CDM.²¹ IFC was not able to operate in LICs because of their limited opportunities for large-scale projects for emission reduction.

The World Bank Group’s support to CF is not, however, reflected in the country strategy documents. The review of World Bank Group Country Partnership Framework and country assistance strategy Country Assistance Strategy for selected countries reveals uneven patterns of attention given to CF activities during different periods (figure 3.3). The strategy review shows that the World Bank Group has recognized CF in certain carbon market pioneering countries (for example, Brazil, China,

FIGURE 3.2 | Importance of CF and Carbon Markets in World Bank Group Country Strategies

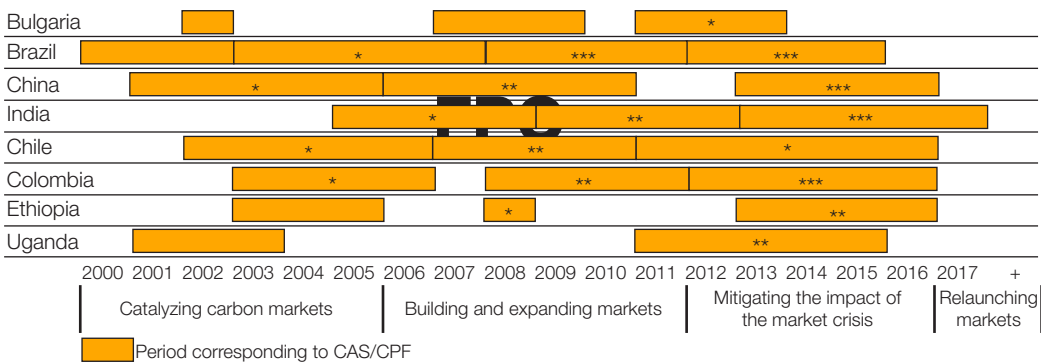


Source: Independent Evaluation Group analyses based on United Nations Environment Program -Technical University of Denmark (2017a) Clean Development Mechanism and World Bank Group Carbon Finance Unit.

Note: AFR = Africa; CDM = Clean Development Mechanism; ECA = Europe and Central Asia; LAC = Latin America and the Caribbean; EAP = East Asia and Pacific; MENA = Middle East and North Africa; SAR = South Asia.

Chile, and Colombia) since the early 2000s and increasingly integrated it into its country strategies (for example, India). However, in LICs (for example, Ethiopia and Uganda) CF was recognized in the strategy toward the end of the first commitment period although some CF activities were ongoing in these countries.

FIGURE 3.3 | Distribution of Projects and Programs



Source: Independent Evaluation Group analyses based on review of Bank Group Country Partnership Framework (CPF) and Country Assistance Strategies (CAS).

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- ¹ “The establishment of the Prototype Carbon Fund followed earlier preparatory and capacity building work undertaken in the late 1990s, when the World Bank engaged in a program of National Strategy Studies (NSS) and Activities Implemented Jointly (AIJ).” (World Bank 2010b, 12). The studies assessed greenhouse gas emission reduction potential and costs and Clean Development Mechanism/Joint Implementation options for each country and developed a project pipeline. The program brought together host country stakeholders with international experts in biennial program workshops. It also actively shared lessons with UNFCCC negotiators designing the Kyoto Mechanisms (for example, World Bank 2000).
- ² CF was mentioned in the World Bank Group’s 2001 environment strategy, but it played a small role. The Prototype Carbon Fund was highlighted as an example of global partnerships contributing to global public goods. It mentioned the Fund’s objectives, including to help client countries prepare for participation in the UNFCCC and the Kyoto Protocol. It also mentioned IFC’s support for carbon finance through private sector and nongovernmental organization partnerships.
- ³ See, for example, “The Role of the World Bank in Carbon Finance and the Proposed Umbrella Carbon Facility,” (November 9, 2005; R2005-0230). In 2006, the World Bank’s approach was revised through a paper focusing on: (a) ensuring that carbon finance contributes substantially to sustainable development; (b) assisting in building, sustaining, and expanding the international carbon market; and (c) strengthening the capacity of developing countries to benefit from the emerging markets (World Bank 2006a).
- ⁴ It stated that the World Bank “should try to expand carbon markets, to avoid a loss of momentum and learning, and to send a positive signal to the market at large.”
- ⁵ Of nine proposed implementation initiatives in the SFDCC, four were directly relevant to carbon finance: (i) Operationalize, execute, and share lessons from Climate Investment Funds (CIF), the Carbon Partnership Facility (CPF), and the Forest Carbon Partnership Facility and work with partners to improve monitoring of climate-related finance and its additionality; (ii) Support carbon market development through investments in longer-term assets and currently bypassed reduction potentials, financial and quality enhancements of carbon assets, methodology development, and sharing lessons of experience; (iii) Promote packaging of its development finance instruments with instruments provided by carbon finance, the Global Environment Facility, and the CIF; and (iv) Enhance the knowledge and capacity of clients and staff to analyze and manage development-climate linkages at the global, regional, country, sector, and project levels.
- ⁶ IFC’s contemporaneous strategy documents provide consistent role and objectives for carbon finance. Its Strategic Directions, FY08–10, described IFC’s carbon finance facilities and emphasized the role of the private sector in the development of carbon markets. The IFC FY09–11 Road Map added climate change to the IFC’s priorities and set out the extension of carbon finance activities as a key feature of IFC’s approach.
- ⁷ “In addition, the World Bank Group will build on its experience in carbon finance to test the market’s willingness to encourage the protection of critical habitat areas while also providing carbon storage benefits; continue innovative work on forests and land use linked to the Reducing Emissions from Deforestation and Degradation (REDD) program; and develop methodologies to capture and monetize carbon co-benefits—for example, through wildlife conservation programs.” (World Bank 2012a).
- ⁸ The Climate Action Plan stressed implementation at the country level working through the Carbon Pricing Leadership Coalition and continuing support “for country programs through the Partnership for Market Readiness (PMR) and extending the work on Networked Carbon Markets (NCM).” It also envisioned World Bank task team leaders with a “one-stop shop to help them blend climate finance...and use carbon finance instruments.”
- ⁹ In addition to the Climate Change Action Plan, the 2016 Forest Action Plan included an emphasis on forests’ interplay with climate change, including the use of carbon funds. It highlighted the importance of climate change trust funds for innovative Bank Group work.
- ¹⁰ IFC provides leadership of the private sector engagement in the Carbon Pricing Leadership Coalition, targeting the banking and construction industries through sector-specific task teams.

- ¹¹ MIGA, however, indicates that although the Strategic Business Outlook does not specifically mention carbon finance, it does not preclude it from supporting carbon finance schemes. MIGA also notes that since 2016, it has been supporting a more comprehensive approach to climate finance, including carbon finance. MIGA also started using the World Bank Group's internal carbon pricing model as part of its economic analysis of guarantee projects.
- ¹² See Appendix A for a breakdown of the World Bank Group's carbon finance vehicles grouped into the four phases and based on their main objectives. Appendix L also shows the CF initiatives and their main objectives and their special features.
- ¹³ However, some of the Bank Group activities in the forestry sector were associated with the potential for increasing pressure on forests and worsening of local communities' livelihoods. Especially in Indonesia and Brazil, MIGA and IFC did not adopt the Forest Safeguard Policy and the transparency of the External Advisory Group was questioned (Anonymous 2005).
- ¹⁴ This includes several carbon funds established with the support of European countries, for example, the IFC-Netherlands Carbon Facility (INCaF), Netherlands CDM Fund (NCDMF), Italian Carbon Fund (ICF), IFC & IBRD Netherlands European Carbon Facility, Spanish Carbon Fund (SCF), Danish Carbon Fund (DCF), and Carbon Fund for Europe (CFE).
- ¹⁵ The low-income countries are currently excluded from the program.
- ¹⁶ The World Bank Group was also the first mover in developing markets in carbon sequestration and SD-generating sectors as new asset classes in developing countries (such as BioCF on afforestation/reforestation, REDD+, and sustainable land management, and the Forest Carbon Partnership Facility to build capacity for REDD+).
- ¹⁷ The funding of UFC-T2 was contributed by Deutsche Bank, GDF Suez, and the Swedish Energy Agency.
- ¹⁸ The Community Development Carbon Fund experience shows that not less than 5 years, and usually 10 years of revenues from emission reductions at current market prices, are required to influence project financing and enable Clean Development Mechanism-eligible projects to proceed to implementation.
- ¹⁹ The Community Development Carbon Fund aims to deliver emission reductions starting in 2005, with at least 75 percent of the total emission reductions expected to be generated before 2012.
- ²⁰ The Pilot Auction Facility initially targeted the non-World Bank-supported Clean Development Mechanism methane projects, which were at risk of discontinuation.
- ²¹ For the Programs of Activities (PoAs) alone, the share of low-income countries (LICs) was 37 percent in the World Bank Group's Emission Reduction Purchase Agreement portfolio and 15 percent for the rest of the Clean Development Mechanism, indicating that the LICs, and Africa in particular, are taking the lead in developing PoAs.

4

Effectiveness of World Bank Group Roles

highlights



The World Bank Group catalyzed carbon markets and produced pioneering models for low-cost greenhouse gas emission reduction and helped operationalize the Clean Development Mechanism and Joint Implementation at the time of policy uncertainty.



The success in demonstrating carbon finance in renewable energy, energy efficiency, waste management, industrial gases, and forestry (afforestation/reforestation) did not extend to transport, agriculture, and forestry.



The World Bank Group's success in catalyzing and developing markets was not sustained beyond 2012 owing to external factors. The World Bank continued its support to stabilize the carbon market, but this was not enough to stem the decline in credit prices or “save” the market.



The World Bank Group contributed to the success of projects in reducing emissions, but the additionality of some of the climate mitigation benefits is questionable.



The flow of sustainable development co-benefits has been uneven or weak in some cases and the World Bank Group faced challenges in documenting development results.



The World Bank Group has been largely effective in innovating CF, but some of its World Bank methodologies and IFC financial products were not adopted or scaled up. MIGA also faced limited demand for its guarantees.



The capacity building activities in CF mainly targeted lower-middle-income countries and upper-middle-income countries; the share of the low-income countries in the Advisory Services and Analytics portfolio is about 15 percent.



The early flagship initiatives for capacity building helped client countries access markets but did not achieve the desired critical mass in many cases.



The renewed capacity building support for domestic carbon pricing and market readiness has developed a robust and demand-driven agenda and made slow but steady progress overall.



The World Bank has been generally effective in thought leadership and convening for carbon pricing and was successful in pioneering new forms of partnership and initiatives.

THIS CHAPTER ASSESSES THE EFFECTIVENESS of World Bank Group’s main roles and the contributions in catalyzing and developing carbon markets; innovating in CF; building capacity; and thought leadership and convening.

World Bank Group Performance in Catalyzing and Developing Carbon Markets

Creating and Developing Markets

Phase 1: Catalyzing Carbon Markets (2000–05)

In the early 2000s, the World Bank Group developed pioneering models and tested the “proof of concept” to demonstrate the potential of markets as an instrument for implementing the Kyoto Protocol. The evidence from the structured literature reviews, portfolio review and analysis, case studies, and expert interviews shows that the World Bank Group was one of the first movers into CF and its early engagement was relevant: it provided leadership and demonstrated and operationalized the CDM and JI as the market mechanisms of the Kyoto Protocol. It assumed global leadership and took significant risks at the time of policy uncertainty to drive the process of creating and catalyzing the global carbon market. The World Bank Group achieved this important global function by proactively piloting and operationalizing the market mechanisms before the Kyoto Protocol came into force in 2005.

The World Bank Group catalyzed the initial carbon markets, connecting the demand and supply of carbon credits and successfully making carbon a tradable asset. Building on other precursor programs, the World Bank launched the first carbon fund, the Prototype Carbon Fund (PCF), in 2000 which was instrumental in prototyping and creating the first tradable carbon asset and in catalyzing carbon markets. Through the PCF, the World Bank Group led in developing the concept of an ERPA, the project cycle, and a suite of required documentation, and supported the development of methodologies, kick-starting the carbon market in 2000 through selected ERPAs that set the price for carbon and defined the MRV approach to ensure environmental integrity. The PCF and the other funds that followed (for example, CDCF and BioCF) were also instrumental in catalyzing the markets and piloting and operationalizing the CDM and JI.¹

The World Bank Group’s activities in CF during 2000–05 increased confidence in the Kyoto Protocol’s market mechanisms and in the idea of trading carbon assets. IEG interviews of CF experts found that the World Bank Group’s work in pioneering the Kyoto Protocol’s market mechanisms (CDM/JI) created more confidence and consensus among international community stakeholders in ratifying the Kyoto Protocol and supporting its coming into force in early 2005.

The World Bank was one of the two key buyers of emission reduction credits during this period, particularly in the early stages. (The other important buyer was the Netherlands).² Its presence as a large buyer during the period stimulated demand. The World Bank’s share of the CDM/JI market decreased from 31 percent in 2002 to 15 percent in 2004 as other players moved into the market

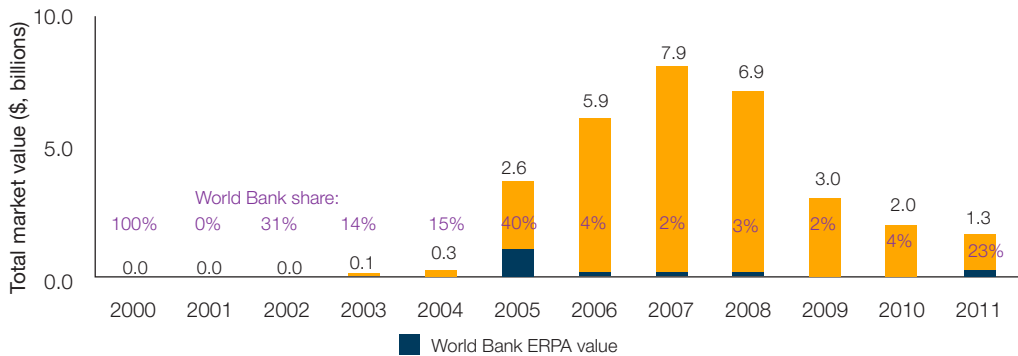
(figure 4.1). IEG interviews of CF experts confirm that the World Bank Group's role was crucial in kick-starting carbon markets in the early 2000s. The World Bank was also the first entity attempting to pioneer crediting of biological sequestration and to bring CF to the world's poorest countries.

However, though the World Bank Group strongly achieved its objective of catalyzing carbon markets and demonstrating CF, its activities also generated some concerns. These include: (i) Concerns over pricing: The overlapping roles played by the World Bank Group as fund manager and carbon credit buyer generated potential conflicts. The World Bank Group served fund participants who want to pay the lowest price for project-based emission reductions. While playing the role of the price setter in the initial stages, the World Bank Group also engaged with sellers and host countries who were traditional World Bank clients and wanted the highest price for their emission reductions.³ (ii) Over-active fundraising: Some stakeholders and experts interviewed judged the World Bank to have been overly aggressive in establishing follow-on funds after the PCF, which were seen as competing for business against private firms.⁴ This effect is assessed further in the next section.

Phase 2: Building and Expanding Carbon Markets (2006–11)

Following the demonstration of the “proof of concept,” the World Bank Group was effective in further expanding the carbon market. From 2005, credit demand increased significantly, and the World Bank Group’s initial challenge was to find ways to meet the explosion in demand from countries with compliance obligations. The World Bank’s share of the CDM/JI market increased from 15 percent in 2003–04 to 40 percent in 2005 as the World Bank entered into a contract for large emission credits from industrial gases in China (figure 4.1). World Bank activities in the carbon market increased the participation of LICs (particularly those in Africa). CDM activities were undertaken in 155 countries around the world (World Bank 2014).

FIGURE 4.1 | World Bank Market Share in CDM and JI Transactions



Source: World Bank data.

Note: Small values showing as zero are \$2.47 million (2000) and \$12.6 million (2002). CDM = Clean Development Mechanism; ERPA = Emission Reductions Purchase Agreement; JI = Joint Implementation.

World Bank Group activities began in a situation of sustained growth, but the global economic downturn in 2007–08 imposed significant adverse impacts on carbon markets. Although the significant takeoff in carbon markets during the initial years suggested the markets were entering a period of sustained growth, the financial crisis in 2008 affected industrial production in the EU, leading to decreased demand for emissions allowances under the EU Emissions Trading Scheme (ETS). This depressed prices for carbon credits. On the supply side, the market exhibited impressive increases in contracted volumes and market value despite the drop in EUA carbon prices⁵ (see chapter 3). Nevertheless, despite these market shocks, the World Bank Group contributed to developing and expanding the market, continuing activities under its existing funds and facilities and adding new ones.⁶

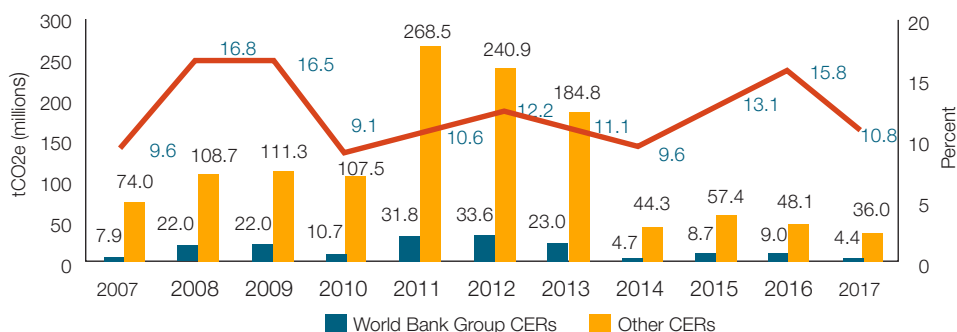
The World Bank Group continued its direct involvement in low-risk and mainstream carbon market transactions, potentially crowding out the private sector. IEG's interviews with experts and stakeholders revealed a view that the World Bank disadvantaged and crowded out the private sector, especially during the 2006–07 period. In addition, there was criticism raised with regards to potential “perverse incentives” from the hydrofluorocarbon-23 (HFC-23) ERPA to increase production that were created by using early baseline and monitoring methodologies.⁷ The stakeholders also argue that the World Bank leveraged its long-standing relationships in countries that hosted CDM projects, disadvantaging private firms. Moreover, the World Bank continued to engage in routine low-risk carbon transactions post-2005 (especially in lower-middle-income countries and upper-middle-income countries [UMICS]) which could have narrowed the space for the private sector. Countering this view, while the substantial increase in the World Bank's primary market share in 2005 to 40 percent following the large deal for HFC-23 is suggestive of its strong market position at the time, its share declined to 4 percent in 2006 and did not exceed this level until 2010, suggesting that any negative effect is likely to have been short-lived.⁸ In addition, the World Bank Group has engaged the private sector both as investors in the carbon instruments (credit buyers) and as project developers in host countries (credit sellers).⁹ The overall share of the private sector in the World Bank Group portfolio was 51 percent while 5 percent were public-private partnerships, and the private sector generated 73 percent of the emission reductions.¹⁰

Phase 3: Mitigating the Impacts of the Market Crisis (2012–16)

Carbon markets declined significantly after the expiration of the first commitment period of the Kyoto Protocol in 2012, continuing the trend of prior years. This decline was evident in traded volumes and issued CERs (figure 4.2) as well as registered projects and PoAs at the global level. The total CER issuance for CDM declined from 300 million in 2011 to about 40 million tCO₂e in 2017. With limited exceptions, the private sector exited the carbon market during this period, as dictated by market conditions. Following this drastic decline, much of the World Bank Group's attention shifted to domestic carbon markets and carbon pricing.

Hence, despite the World Bank Group's sustained support, the strong initial success in catalyzing and developing carbon markets was not sustained because of external factors. Carbon prices collapsed in 2012 as the demand for carbon credits from the EU ETS started to be saturated because of quantitative limits on the use of offsets (Bellassen et al. 2012; Stephan et al. 2014). This was further amplified by fading demand from governments after the global community failed to

FIGURE 4.2 | Bank Group Share in Clean Development Mechanism CER Issuance, 2007–17



Source: Independent Evaluation Group analysis based on Bank Group portfolio and United Nations Framework Convention on Climate Change (UNFCCC) data.

Note: CER = certified emission reduction; WBG = World Bank Group.

secure commitment to the second phase of the Kyoto Protocol. The World Bank Group's support to stabilize markets and create certain pockets of demand was not enough to stem the decline in credit prices and "save" the market. However, the World Bank Group did "keep the torch alive." The post-2012 situation is now seen by some stakeholders as "decay of the CDM" and has severely diminished private sector interest and confidence in carbon markets. The World Bank Group's CF activities during 2012–16 therefore aimed at propping up the existing market, exploring new approaches, creating new instruments to mitigate the risks, and supporting the Paris process (see section on the effectiveness of the capacity building).

Nevertheless, the global carbon market expanded significantly until 2012 although the overall impact was reduced by the market collapse. As of December 2017, a total of 7,784 CDM projects, 604 JI projects, 310 CDM PoAs, and 38 JI PoAs were registered and have generated over 1.9 billion CERs and 0.9 million ERUs. Although the World Bank Group's contributions are indirect, at its height, the annual global primary CDM/JI market reached \$7.9 billion in 2007 (figure 4.1). This also stimulated additional values in secondary markets.

Motivating Adoption and Demonstration of CF

The country case studies and causal analysis evidence show that the World Bank Group made a significant contribution to inform project developers about CDM markets and motivating the adoption of CF to catalyze carbon markets. In most cases, the World Bank Group projects were either CDM pioneers in the country or in a specific sector. Most of the project entities had little to no awareness of CDM markets and CF, but even when they did, the World Bank Group's role was critical in terms of actual uptake. In some cases, a third party or the government was also instrumental in motivating the decision to pursue CF and in linking the World Bank Group with the project entity. The World Bank Group's contributions include: (i) introducing the project entity to carbon markets and the concept of CF under the CDM; (ii) reassuring the project entity about the new carbon market as a guaranteed

buyer of potential CERs through ERPA agreements; and (iii) sharing up-front risks and financing the CDM project development process when needed (for example, prepaying for expected CERs or guaranteeing to buy CERs to help project developers secure other financing).

The World Bank made valuable contributions to the project preparation and validation process in almost all cases across countries. The case studies show that the World Bank leveraged its expertise and knowledge of the CDM process and provided critical contributions in many of the cases where local knowledge and domestic expertise on the CDM process and carbon markets was limited. The World Bank Group provided advice and technical support, especially for more technically challenging aspects of project design such as the additionality and the barrier analysis. The World Bank was also instrumental in the preparation of the validation protocol and in ensuring that the Designated Operational Entities delivered their reports in a timely manner with sufficient quality.

The causal analysis also shows significant evidence across all countries that World Bank Group projects generated a demonstration effect that catalyzed the development of other CF projects. The World Bank Group's contribution comes through its pioneering role in demonstrating CF. Many of the cases exhibiting such a demonstration effect were early CDM projects, the first to be registered in their country, or the first of a specific technology to be registered. As such, they played a significant role in providing proof of concept and demonstrating to others that CF is real and viable and that carbon offset revenue was practical. The qualitative comparative analysis results provide further clarity on the combined contributory factors that ought to be in place for such an effect to materialize. The winning configuration that emerges consists of cases where the project was a pioneer CDM project, either in the country or for a specific technology in the country, and where both the World Bank Group and the project entity made a substantive effort to disseminate and advertise the experience (see appendix C).

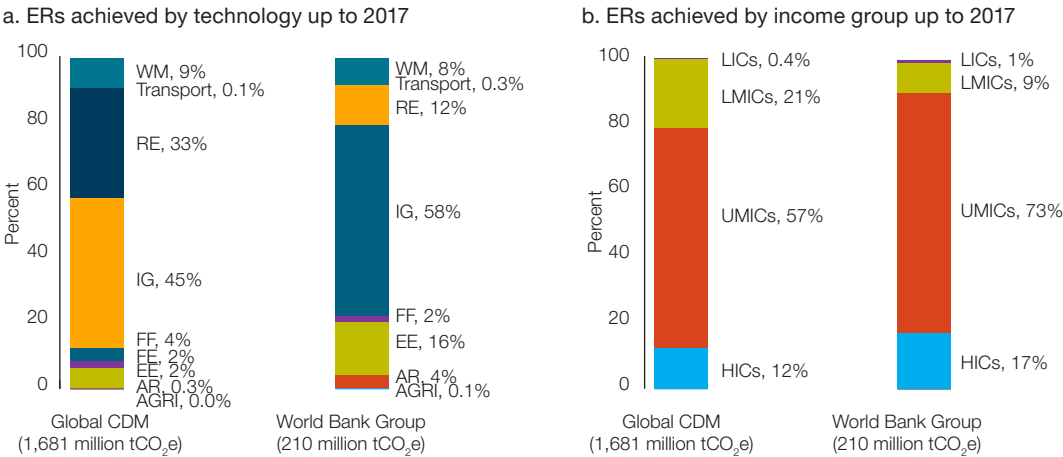
Reducing GHG Emissions

Despite the uncertain global regulatory framework, the World Bank Group has made positive contributions to the success of projects in reducing emissions. A complex architecture was created to implement the market mechanisms under Kyoto, but the World Bank found a way to operate and generate global public goods. Based on emission reduction issuances to August 2017, a total of 210 million tCO₂e verified units were produced by World Bank (97 percent) and IFC (3 percent), exclusive of those from MIGA guarantees. This constitutes 80 percent of the planned emission reductions from the last amended ERPAs for the World Bank and 32 percent for IFC, and 76 percent jointly for the World Bank Group. However, a few sectors dominate in supply of emission reductions: industrial gases (58 percent), energy efficiency (16 percent), and renewable energy (12 percent). The agriculture, forestry, and transport sectors jointly account for less than 5 percent of the emission reduction issuances. Because the emission reductions from industrial gases originated from China, upper-middle-income countries (UMICs) dominate the issuance of emission reductions, accounting for 73 percent of the total. This is higher than the share of these countries in the rest of the CDM portfolio (67 percent) (figure 4.3). The top 10 countries in the World Bank Group portfolio account for about 93 percent of the issuances, of which China alone accounted for 61 percent, followed by Poland (13 percent).¹¹ Despite the higher representation of LICs in the World Bank Group portfolio, their share in the emission reduction issuances remains very low (about 1 percent) and not much different from the global CDM (0.4 percent).

Analysis of the global CDM data shows that the registered World Bank Group projects were more likely to issue and produced more CERs compared with the rest of the global CDM projects. The econometric analysis shows that controlling for observable factors such as project type, technology, investment, crediting period, country economic factors, and region, the World Bank Group projects had a higher likelihood of positive issuances and produced more CERs per year than the rest of the CDM (see appendix D). Although causality cannot be attributed, the technical assistance and other contributions of the World Bank Group seems to contribute to this positive outcome. This is supported by the causal case study analysis which shows that the World Bank made significant contributions in motivating the start of CDM projects and in the design and due diligence process up to validation and registration across all countries and technologies. The World Bank's critical contributions included introducing various project entities across countries to the concept of CF, representing a guaranteed buyer for potential CERs, spreading the investment risk through ERPAs, and in some cases, assuming additional up-front risks and financing the CDM process by prepaying for expected CERs. In addition, the World Bank provided technical and financial assistance with the more challenging aspects of project design such as devising the methodology and the additionality barrier analysis.

The theory-based causal analysis further shows that multiple factors constrained the performance of projects in delivering emission reductions. There were two sets of circumstances that explained why 13 out of the 16 cases that fell short of meeting their ERPA targets. First, projects with operational inefficiencies or technical challenges were likely to underdeliver. Second, projects that did not

FIGURE 4.3 | **Achieved ERs (tCO₂e) by Technology and Host Country Income Group**



Source: Independent Evaluation Group analysis based on World Bank Group portfolio (August 2017) and United Nations Environment Program—Technical University of Denmark CDM database (December 2017).

Note: AGRI = agriculture; AR = afforestation or reforestation; CDM = Clean Development Mechanism; EE= energy efficiency; FE= fugitive emissions; FF = fossil fuel switch; HICs = high-income countries; IG = industrial gases; LICs = low-income countris; LMICs = lower-middle-income countries; RE = renewable energy; UMICs = upper-middle-income countries; WM = waste management.

experience operational challenges but had faulty monitoring, independent of the robustness of the methodology, were also more likely to fail to meet their target commitments (see appendix C).

Projects under the Kyoto Protocol mechanisms must provide evidence of additionality—the requirement to demonstrate that the emission reductions would not have occurred in the absence of the CF project activities. The World Bank Group complied with the standard UNFCCC rules and procedures and third-party validation and verification systems as part of its project design and emission reduction issuance, but the additionality issue remained controversial. IEG’s rigorous structured literature review of the published global evidence on additionality indicated that the emission reductions from certain technology types (for example, large hydropower, wind power, bagasse, and industrial energy efficiency) were unlikely to be additional because they were economically viable without the presence of CF and used common practice technologies. By contrast, off-grid renewable energy, rural electricity access, industrial gases, and A/R (with long harvesting and rotation cycles) are likely to be additional (see appendix F). An IEG Project Performance Assessment Report in Brazil (landfill gas) and Bulgaria (energy efficiency) strongly supports this evidence (see appendix I). The structured literature review also finds that significant steps were made in the regulation and operation of the CDM over time to reduce the risk of low additionality while also raising concerns about the ability of any project-based CF method to ascertain additionality, given asymmetric information between project developers and regulators, flaws in assessment processes, and the high fixed costs of additionality assessments.

Generating Local Co-benefits for Sustainable Development

The published literature finds mixed evidence on the degree to which CDM projects led to local development co-benefits. IEG carried out a structured literature review on the extent to which CDM projects led to significant development co-benefits for local communities (see appendix G). The review found that the CDM does not consistently deliver significant co-benefits to local communities. Although ex post evidence was limited, the flow of local and community-level co-benefits depends on the nature of the technology, the design features, the degree to which governments chose to emphasize development outcomes, and local participation. The most consistent finding was that local co-benefits were more likely when local stakeholders and communities were engaged in project development. The World Bank Group projects supported by funds targeting local development (for example, CDCF, BioCF) appear to have delivered direct local co-benefits. Agriculture and forestry projects and small and medium hydro projects (but not large hydro) appear to have a high possibility of delivering local co-benefits, such as improved productivity, access to energy, and improved local air quality, as do other renewable energy projects. The review also suggests that there can be trade-offs between achieving emission reductions at least cost and maximizing development benefits (for example, HFC-23 projects provided emission reductions at low cost but provided few local development benefits). The higher share of HFC-23 credits in the World Bank Group portfolio raises concerns about missed opportunities to maximize development benefits in LICs by leveraging CF through projects with high co-benefits.

The patterns emerging from the theory-based causal analysis of case studies echo several of these findings. The analysis of patterns by technology found that the A/R projects across all countries were designed to generate co-benefits directly to local communities. This was in part because all the A/R projects were prepared under the BioCF, one of three carbon funds that explicitly targets

local development. The A/R cases reviewed also had inherent characteristics that required providing incentive to local communities. Projects where there was a strong “intent” to achieve co-benefits at the project design and for which there was a demonstrated commitment of the project entity, were also more likely to achieve local co-benefits. In some cases, the World Bank was instrumental in ensuring that there was an explicit and deliberate intent to generate co-benefits at project design, including through its Safeguards policies, specifically regarding indigenous peoples (see appendix C). Conversely, when there was limited intent and when the World Bank had a limited say in the project beyond ensuring compliance with safeguards, co-benefits were unlikely to be generated.

The CDM was launched with the dual objective of reducing the cost of compliance with Kyoto targets and contributing to sustainable development in host countries. However, the sustainable development outcomes and the social and environmental co-benefits in many CF projects were not monitored. Whereas the environmental integrity of emission reductions and additionality were checked through the CDM’s elaborate validation and verification process, there was no such process for development co-benefits. The host countries themselves through the DNAs were expected to play this role, but many were underfunded and lacked institutional and technical capacity. However, the expert interviews noted, many corporates in voluntary markets want carbon credits with co-benefits (for example, REDD+ in developing countries with multiple environmental co-benefits). A lack of clear criteria for assessing development co-benefits has led to inconsistent and often weak application of the goal of achieving sustainable development in the CDM project assessment.

Technology Transfer and Diffusion

Technology transfer and demonstration in CF is common but varies by sector and has a mixed history. A UN analysis in 2010 of about 5,000 projects in the CDM pipeline found that 30 percent of them, accounting for 48 percent of estimated emission reductions, involved technology transfer. Sectors vary, with only 13 percent of hydro projects showing transfer but 100 percent of N₂O projects. About one-third of biomass and wind projects, about three-quarters of methane avoidance projects, 40 percent of energy efficiency projects, and 80 percent of landfill gas projects. Technology transfer was found to occur more frequently in larger projects and more frequently in the early years of CDM (UNFCCC 2010).

Technology transfer has been significant, but the World Bank Group’s contribution to it is less prominent. The IEG causal analysis shows that the projects that contributed to technology transfer involved new technologies that were piloted by the CDM project or the first time that an established technology was applied at such a large scale (for example, China landfill gas and biogas projects). The qualitative comparative analysis further reveals that projects that did not catalyze the transfer of technology were those that used technologies that were already well-established in the country (for example, hydro projects in Chile), or those in which a policy barrier is preventing further replication (for example, wind project in Colombia). When there was novelty in technology and the project entity contributed to either replicate or disseminate the technological innovation, positive demonstration effects on future adoption within the country were more likely to occur. Several projects also contributed to local diffusion of the climate mitigation technologies.

World Bank Group Performance in Innovating in CF

Development of Baseline and Monitoring Methodologies

The World Bank took major steps to develop methodologies that helped catalyze markets and operationalize the Kyoto mechanisms. Creating a tradable carbon asset requires an approved baseline and monitoring methodology.¹² IEG interviews of experts and staff showed that the World Bank CF team was able to anticipate the newly emerging CDM/JI rules and started to develop methodologies even before the formal adoption of the rules in Marrakech in 2001. Because the methodologies can be used without any restrictions once they are approved by the regulatory authorities, they can be seen as global public goods to enhance the depth and quality of carbon markets. There are no patents or fees or copyrights that go to compensate methodology developers.

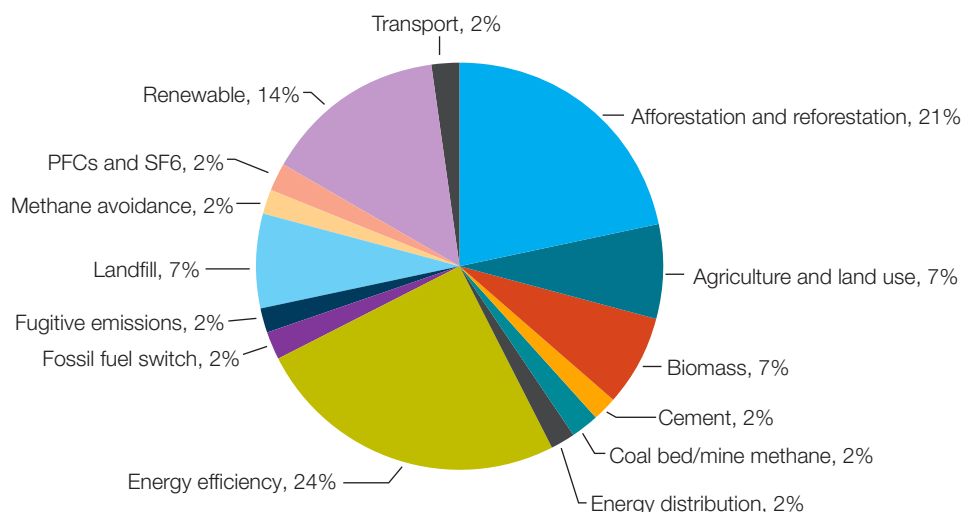
The causal analysis found that the World Bank played a key role in either developing new methodologies or adapting and consolidating existing methodologies, across all countries and technologies. The World Bank played a lead role in providing critical technical and sometimes financial support to develop new methodologies. Even in cases where the project entity had high capacity staff, the World Bank was recognized for providing critical input through technical peer reviews. In several cases, the World Bank contributed identifying applicable methodologies for the project and provided technical and financial support to adapt them to project-specific conditions that sometimes resulted in registration of new versions of existing methodologies (appendix C).

The World Bank through the Carbon Finance Unit¹³ has over the years contributed 42 CDM methodologies. These represent more than 16 percent of the 253 approved CDM methodologies (until August 1, 2017) (see appendix H). The IEG review indicated that this ratio was much higher during the first years of the CDM, when most of the approved methodologies were developed by the World Bank. These methodologies include the only three forestry sector methodologies approved and the first methodologies in the mining sector (coal mine methane and cement) which provided the basis for subsequent approved consolidated methodologies. Many project developers and CDM experts in developing countries benefited directly or indirectly from these methodologies. However, experts interviewed note that approval of methodologies proposed by the World Bank Group was often a lengthy process, requiring many revisions and improvements, while some were rejected.

The World Bank filled gaps and moved beyond the narrow focus on projects and methodologies in few sectors. The prioritized sectors with underrepresented methodologies were energy efficiency, carbon sequestration through agriculture, and forestry (figure 4.4). The major gap in methodology development and approval under the CDM has been in the transport sector, though it has high mitigation potential in future. The World Bank helped to develop one of the two approved methodologies for bus rapid transit projects in urban transport. Moreover, small-scale project methodologies were targeted to enhance the participation of LICs. Specialized funds such as the BioCF contributed to the establishment of pioneering methodologies in forests, livestock, and land management. Similarly, the CDCF contributed by developing simplified small-scale methodologies.

Building on the experiences of the CDCF, Ci-Dev has developed tools and methodologies to help LICs access CF, mainly in the area of energy access. Ci-Dev supported methodological and

FIGURE 4.4 | Sectors Targeted by World Bank Methodology Submissions



Source: Independent Evaluation Group analysis based on United Nations Environment Program—Technical University of Denmark CDM and Program of Activities database.

knowledge work with a focus on energy access for poor and marginalized communities and working together with World Bank investment projects in poor countries. The Ci-Dev has also been testing and developing creative approaches for blending CF with regular development financing and has piloted a standardized crediting framework for energy access.¹⁴

Uptake of Tools and Methodologies by the Market

A large share of the CDM projects and PoAs use methodologies developed by the World Bank, but many methodologies remain underused. The IEG review shows that as of December 2017, more than 6,067 (77 percent) out of 7,889 CDM project activities and 136 (44 percent) out of 310 PoAs use the World Bank methodologies (appendix H). However, many existing methodologies are still not widely used.¹⁵ From a total of 120 approved large-scale CDM methodologies globally, about 30 percent have not yet been used even once. The majority of those not used were approved only after the price crash (UNEP DTU 2017b). In total, 9 out of the 42 methodologies submitted by the World Bank were not used. This reflects a higher rate of uptake for the World Bank methodologies than for the CDM in total (see appendix H). There are, however, several reasons as to why some CDM methodologies may not be used.

New Financing Instruments

IFC: Financial Instruments

To address price and delivery risks, IFC developed a new financing product—the Carbon Delivery Guarantee (CDG). IFC early on realized a potential niche market to address the challenges faced by many buyers in guaranteeing delivery of CERs and wanted to leverage IFC's ability to take project

and credit risk in emerging markets to guarantee the delivery of CERs to buyers. Accordingly, IFC decided to move away from donor-funded carbon transactions and took on-balance-sheet exposure to carbon markets and created the CDG. The CDG was conceived to minimize the reputational risks for large private sector buyers with best-of-class environmental, social, and governance performance standards in the delivery of CERs (IFC 2008).

Under the CDG instrument, IFC guaranteed the delivery of CERs to buyers in developed countries by taking the country, credit, and project risks on its AAA-rated balance sheet. This aimed to make the delivery of emission reductions from the CDG instrument AAA-rated and create a high level of assurance to the buyer. In exchange, the buyers requiring AAA-rated CERs would pay a premium above the primary and closer to the secondary market price for CERs, which in principle also allows IFC to offer better prices to suppliers in developing countries (IFC 2011a). The innovative design of the CDG instrument allowed IFC to act as a counterparty for the buyers, who require certainty of CER delivery, and for the sellers, who want a better price for their high-quality CERs.

IFC tested the CDG instrument but was not able to bring the instrument to scale. Its implementation was limited to three signed agreements in India and South Africa (IFC 2008, 37; IFC 2009, 78) involving new and existing IFC clients. IFC did not bring the innovative instrument to scale for various reasons, including the relative complexity of the CDG instrument for small-scale clients, and—eventually—the 2012 carbon market collapse, leading to loss of demand from the buyers of the AAA-rated CERs.¹⁶

IFC launched the Post-2012 Carbon Facility (P12CF) to foster investments by mitigating the anticipated risks in carbon markets emanating from the uncertainties of a post-2012 global climate regime. The P12CF was designed following the concept of a private equity fund; IFC as Facility Manager would invest 10 percent (€15 million) of its own capital to leverage the remaining amount from different Facility participants in Europe, including one commercial bank, commodity traders, and several electrical utilities.¹⁷ The P12CF provided minimum price guarantees on CERs to sellers.

After more than a decade of experience in CF, IFC took a significant risk in creating the P12CF by investing its own capital. IFC's own investment in the P12CF attracted other investors; the facility was quickly subscribed and IFC had to turn down some investors.¹⁸ Under the P12CF, IFC made its first investment, in July 2011, in a biomass energy project (using rice husks) in India. However, the P12CF, an early entrant for post-2012, was affected by the market collapse in 2012. The P12CF was terminated on June 9, 2014, after agreement was reached with the investors.¹⁹ This marked the closure of IFC's CF business which fully ended after all ERPAs from the INCaF and NECaF facilities were closed by 2014.²⁰ However, in 2016, IFC launched its first pilot Forests Bond, which mobilizes capital from investors through debt capital markets and offers REDD+ credits as payment in lieu of cash.

MIGA—Guarantees for Political Risks

For projects that meet certain environmental and social performance standards, MIGA guarantees provide foreign investors and lenders coverage against certain political risks. These include breach of contract, non-honoring of financial obligations, currency inconvertibility and transfer restriction,

expropriation, war, terrorism, and civil disturbance. In 2006, MIGA provided its first-ever support for a CDM project—a solid waste landfill project in El Salvador—by providing \$2 million in guarantee coverage. A MIGA guarantee for a registered CDM project often covers the risk of expropriation of the investment, revocation of the letter of approval, failure to allow the carbon credits to be transferred outside the host country, and war and civil disturbance that affect the underlying project. However, MIGA does not cover the regulatory risks related to ratification of the second commitment period of Kyoto. Nor does the coverage include delivery of carbon credits; but it does cover the potential loss of carbon revenue. MIGA provided similar political risk guarantees for 14 CDM projects mainly in renewable energy. The demand for the instrument was, however, limited partly because of the limited flow of foreign direct investment into CDM projects and low carbon prices after 2012.

World Bank—PAF

In an effort to enhance the cost-efficiency of emission reductions and create price guarantees for private sector investors, the World Bank launched the PAF in 2013. The key objective of the PAF was to demonstrate a new, cost-effective climate finance mechanism that incentivizes private sector investment and action in climate change in developing countries by providing a guaranteed floor price for carbon emission reduction credits. The guaranteed floor price would be delivered through the auctioning of put options supported by donor funding (PAF 2013). The auctions establish a floor on the value of the emission reduction credit. The option gives the owner the right (but not the obligation) to sell the emission reduction credits established by the underlying project at the strike price.

The PAF had successfully completed three auctions between July 2015 and January 2017 and demonstrated a potentially scalable approach. The first online auction targeted some 1,200 methane reducing projects at risk of decommissioning following the post-2012 price collapse. At the first auction, 12 bidders won price guarantees of \$2.40 per tCO₂e for 8.7 million tons of emission reductions (PAF 2018). The second auction on May 12, 2016 also targeted methane mitigation projects and established a clearing price of \$3.50 with a put option premium of \$1.41 per tCO₂e of verified emission reductions. Nine bidders won price guarantees for 5.7 million tCO₂e verified emission reductions (PAF 2018). The third auction was held on January 10, 2017 targeting nitrous oxide (N₂O) emissions from nitric acid production. It allocated \$13.0 million to reduce 6.2 million tCO₂e of verified emission reductions. Five bidders from five countries won the auction and established a price of \$2.10 per tCO₂e with a premium of \$0.30 per tCO₂e (PAF 2018).

Contributions to Enhancing Access to and Quality of Carbon Markets

The CDG and P12CF were designed to test and develop products that mitigate relevant country, project, or market and price risks that affect carbon market performance but were not successful. The CDG was particularly conceived to de-risk the delivery of CERs to buyers, but IFC was not able to scale up the product despite making multiple revisions and improvements. IFC was only able to implement two projects with large corporates; its effect on enhancing the quality of carbon markets was limited. However, the CDG remains an off-the-shelf product that can be used in future should IFC return to carbon markets. In addition, the P12CF was terminated soon after the collapse of carbon markets and failed to achieve its potential. The market crisis pushed IFC to shift scope away from CF to a broader focus on climate business. Consequently, most staff have been absorbed by

other IFC departments or work in the original unit now focusing on climate finance. MIGA guarantees tried de-risking certain political risks for investors and lenders in CDM projects. This cover did not, however, include the delivery of CERs or the global regularity risks from the Kyoto Protocol. The market did not take up these guarantees beyond a few CDM activities.

The PAF has been piloting a new approach, was oversubscribed and provided important initial lessons relevant for scaling up future climate finance flows. With target capitalization of \$100 million, the PAF was designed as a pilot (\$53 million) and has a large potential for scaling up and replication, including through the Green Climate Fund (GCF). If the full auctioning model is successful, the PAF could be scaled up, and its model can be replicated in other sectors, where payments could be triggered by results measured in a variety of metrics, and not just emission reductions. The PAF plans to share its experience and lessons learned widely, including the GCF (PAF 2013), and it has produced a report on the lessons learned from its first auction (PAF 2015). Nevertheless, the PAF has so far benefited only large companies which can participate in auctions and pay the premiums. The World Bank’s other CF initiatives have also contributed to experimenting and piloting carbon markets in certain underserved regions and sectors.

World Bank Group Performance in Building Capacity

The capacity building activities in CF mainly target lower-middle-income countries (32 percent) and UMICs (31 percent). The share of the LICs in the ASA portfolio is about 15 percent (table 4.1). In terms of the regional distribution, The Sub-Saharan Africa and Latin America and the Caribbean Regions account for 26 percent and 24 percent of ASA activities. About 18 percent of the activities were global or regional. The target areas of capacity building could be grouped into three areas (table 4.2): (i) developing tools and methodologies and strengthening capacity for CDM project design and implementation (for example, CF-Assist, PCF, NCDM, BioCF, CDCF); (ii) contributing to the design or implementation of carbon market readiness or carbon pricing (for example, PMR); and (iii) building

TABLE 4.1 | ASA Activities by Country Income Group

Income Group	Active or Pipeline	Closed	Dropped	Total	
				Number	Percent
High income	4	3	0	7	4.1
Upper middle income	36	12	4	52	30.6
Lower middle income	35	14	6	55	32.4
Low income	21	2	2	25	14.7
World/Regional	11	18	2	31	18.2
Total	107	49	14	170	100.0

Source: Independent Evaluation Group Portfolio Review based on World Bank Group data. For details, see appendix B.

capacity for carbon sequestration and REDD+ (for example, BioCF, ISFL, FCPF). This section will present evidence from these three target areas, which cover more than 90 percent of the portfolio.

The National Strategy Studies Program provided valuable country-level capacity for participation in carbon markets in the early 2000s. Until 2004, detailed studies were developed for over 20 countries, most of which later participated in the Kyoto Mechanisms (Michaelowa 2005). The studies assessed GHG emission reduction potential and costs and CDM/JI options for each country and developed a project pipeline. The program convened national partners with international experts in biennial program workshops. It also shared lessons with UNFCCC negotiators designing the Kyoto Mechanisms (World Bank 2000).

Developing Tools and Methodologies and Strengthening Capacity for CDM

CF-Assist served as the first flagship capacity building program for carbon finance after the entry into force of the Kyoto Protocol. Launched in 2005, it aimed to promote and support the participation of developing countries and economies in transition in the global carbon market. CF-Assist support covered three areas: (i) developing and managing emission reduction projects; (ii) maximizing the sustainable development benefits from CDM/JI projects; and (iii) reducing the transaction costs. Its original scope was revised, however, following the 2009 mid-term evaluation to cover the broader climate policy and finance issues, reflecting the emerging trends in climate change action and the evolving scaled-up instruments.

CF-Assist has provided a total of 45 ASA activities covering over 60 countries across all regions and support at the global level. Through technical assistance, advisory services, training, and some analytical work, it aims to build capacity, bridge knowledge gaps, and facilitate market development and policy formulation. The recent projects strengthen the capacity to understand, integrate, and develop NDCs and climate action strategies (CF-Assist 2017).

TABLE 4.2 | Capacity Building or Technical Assistance Activities

Target Areas	World Bank	IFC	Total
Developing tools and methodologies and strengthening capacity	54	1	55
Building capacity for carbon sequestration through forests and landscapes	70	0	70
Contributing to the design or implementation of carbon market readiness or carbon pricing approaches	32	1	33
Enhancing development benefits and regional distribution by focusing on the poorest countries	9	1	10
Stimulating or informing debates at the country, regional, or global level	2	0	2
Total	167	3	170

Source: Independent Evaluation Group Portfolio Review based on World Bank Group data.

The mid-term evaluation finds a broad consensus among the stakeholders that CF-Assist's knowledge sharing activities have been successful. These include major events such as global and regional carbon forums and various trainings and workshops held in host countries (ICF 2009). The IEG case studies support this finding. The initial support to the DNAs has also been relevant and effective but did not increase national institutional capacity (ICF 2009). Since its inception in 2005, the CF-Assist Trust Fund has trained more than 55,000 participants in client countries to enhance their knowledge, skills, and institutional capacity (CF-Assist 2015).

CF-Assist also invested in knowledge platforms and e-learning programs providing content on climate finance and policy. These contributed to the expansion of relevant portfolios to reach new beneficiary clients and scaling-up of existing activities (CF-Assist 2015). CF-Assist supported the World Bank Group's flagship report "State and Trends of the Carbon Market." It also supported domestic financing mechanisms including the China CDM Fund, the Argentine Carbon Fund, and the Mexican Carbon Facility, designed to facilitate domestic carbon asset development. IEG's China case study found that the CDMF was instrumental in catalyzing China's leading role in the CDM and in financing domestic emission reduction projects in priority sectors.

Despite its wide-ranging support to CF and climate policy, CF-Assist was not able to build a critical mass of national institutional capacity in many countries (ICF 2009). The broad coverage of countries did not allow the emergence of "critical mass" to facilitate sustainable national capacity in CF at the country level. It was also not able to establish a systematic country-driven approach to set priorities and lacked an enhanced M&E framework (ICF 2009).

Capacity Building for Carbon Market Readiness and Carbon Pricing

Following the post-2012 shift in strategy toward domestic carbon pricing approaches, the PMR is the main vehicle supporting capacity building for market readiness in selected countries. The PMR's objectives have evolved over time from an initial emphasis on "market readiness" to a more flexible approach focusing on capacity building for carbon pricing. The objectives were revised recently to make them more results-oriented with a focus on four components: Build, Create, Assist, and Inform.

Since its inception in 2010, the PMR has supported a total of 32 ASA activities (all started post-2012) to build national and institutional capacity for market readiness in 18 countries. The PMR brought together more than 30 countries—including some of the world's largest carbon emitters (PMR 2017). The PMR's support for "market readiness" is delivered mainly through its Country Programs which provide grant funding to pilot carbon pricing and build capacity for market-based approaches. This is supported by the Technical Work Program and the Policy Analysis Program.

The 2015 external evaluation concludes that the PMR has developed into a relevant and demand-driven program. The activities and outputs of the PMR were also found to be relevant to the overall goal and objectives of the program. This was largely confirmed through IEG case studies in four countries where the PMR activities supporting national capacity building efforts were largely considered to be timely and relevant. However, the 18 target countries are at different stages in their "market readiness" process and the design and use of market-based instruments.

Progress in relation to piloting, testing, and sequencing of new concepts for domestic markets and carbon pricing has been slow but has started to accelerate in recent years. The initial implementation was limited to three Market Readiness Proposals (MRPs) (Chile, China, and Turkey) that have signed grant agreements, while the rest were awaiting grant finalization (PMR 2015). Implementation ramped up significantly after 2015 as MRP piloting and testing started in multiple countries. However, progress has been slow in several countries (for example, Sri Lanka, Tunisia, and Kazakhstan); their final MRPs were not yet endorsed by October 2017. In addition, the PMR has been criticized for bypassing the LICs and focusing on big emitters.

The most important contribution of the PMR in this domain was demonstrated in China, which launched its national ETS in December 2017. Although China had decided to develop a domestic carbon market before the PMR and other players than the World Bank Group, such as the EU, are actively supporting the development of the Chinese ETS, its piloting and launching benefited substantially from the PMR and the World Bank Group's long-term engagement through the CF portfolio in China (including the PCF, CF-Assist, UCF Tranche 1, BioCF, CDCF).

Since 2015, the PMR also provided scenario modeling work to inform policy choices for mid- and long-term mitigation in selected countries. The work consisted of GHG emissions scenario analysis for 2020, 2030, and 2050, and was instrumental in providing inputs for developing intended NDCs in several countries (for example, China, Brazil, Chile, Colombia, Morocco, Vietnam) (PMR 2017). In Colombia, the MRP suffered from delays in implementation and is being reformulated to align with recent climate change policy advances at the national level.²¹ In India, the process was delayed for various reasons and the MRP was only approved and published in 2017 although the expression of interest had been signed in 2011 (PMR 2017).

Building Capacity for Carbon Sequestration Through Forests and Landscapes

The BioCF was a global pioneer in providing technical assistance for designing and implementing land-based biological carbon sequestration projects. The BioCF provided support to A/R and other land-based projects excluded from the CDM (for example, agricultural sustainable land management). It delivered capacity building through BioCF*plus* to support project design; development of the first methodologies and tools for carbon accounting of A/R projects; helping countries to engage in climate negotiations and other meetings; and disseminating lessons from its pioneering experience in carbon sequestration (BioCF 2011). The BioCF*plus* has supported 37 ERPAs and 30 capacity building (ASA) activities (about 20 percent initiated post-2012) in more than 20 countries. Much of the capacity building activity was linked to developing a project pipeline and related ERPAs.

The case studies in Uganda, Ethiopia, Chile, Colombia, and China provided evidence that the BioCF has made significant contributions in designing and developing A/R and related land management projects. In some countries, BioCF has also enhanced the capacity of local institutions, such as cooperatives, to participate in carbon projects, and to increase their social capital, negotiating power, communication, and collaboration (BioCF 2011). This was the case in the Nile Basin (Uganda) and in the Humbo (Ethiopia) projects which supported community-based forest management. In

Humbo, the communities were also trained in forest inventory techniques. However, the Humbo and Nile Basin cases show that the commercialization of emission reductions and sustainability of the established forests after the end of the ERPA remain a significant challenge.

Despite some exceptions, the overall impact of the BioCF projects in empowering women and minorities as well as facilitating inclusive approaches has been limited. The Uganda case study found only limited support to active participation by women and youth in forest management. Implementing entities sign agreements and transfer payments to communities that will manage the internal benefit sharing. In the Humbo case, World Vision Ethiopia has promoted some activities targeted to women. The other exceptions are the Himachal Pradesh (India) and Aberdare Range (Kenya) projects (BioCF 2011).

In recent years, the BioCF initiated technical assistance and investment programs to support large-scale mitigation under the BioCF ISFL. It promotes reducing GHG emissions from the land sector, from deforestation and forest degradation in developing countries (REDD+), and from sustainable agriculture, as well as smarter land-use planning, policies, and practices.²² The BioCF ISFL aims to strengthen the capacity of jurisdiction-scale landscape programs. It is pioneering work that enables countries and private sector actors to adopt changes in sustainable landscapes, climate-smart land use, and green supply chains through jurisdictional programs and has initiated a pipeline in selected countries (for example, Ethiopia, Colombia, Zambia). However, IEG case studies in Ethiopia show that the lack of prior experience in implementing large-scale and multisectoral REDD+ programs at the jurisdictional level would require significant technical assistance to foster understanding and ownership by clients including the private sector. Stronger coordination with the FCPF process is taking place in some countries (such as Ethiopia) but it would also be pertinent to coordinate and exploit such synergies in other countries (such as Colombia).²³

FCPF was designed to support client countries in their efforts to reduce emissions from deforestation and forest degradation (REDD). The FCPF became operational in June 2008 and implemented activities through two separate but complementary funding mechanisms—the Readiness Fund and the Carbon Fund. The Readiness Fund provided technical assistance to support national readiness, targeting 47 countries; it became operational in 2008 and closes in 2020. Once the capacity building preparation of REDD+ strategies under the Readiness Fund was completed, the Carbon Fund was to purchase these emission reductions through an ERPA for selected countries. The Readiness Fund resources have already been allocated, but the Carbon Fund has not yet signed any ERPAs (it has started for Democratic Republic of Congo). The World Bank serves as trustee and secretariat for FCPF as well as one of the three Delivery Partners for the Readiness Fund (others are the United Nations Development Programme and Inter-American Development Bank)²⁴ and the sole Delivery Partner for the Carbon Fund.²⁵

The FCPF has supported 35 capacity building (ASA) activities in 34 countries (about half initiated during post-2012) targeted through the Readiness Fund. The FCPF Evaluation Oversight Committee has commissioned two external evaluations to assess the performance and effectiveness of the facility. The first evaluation (covering June 2008 to June 2010) was completed in June 2011 and the

second evaluation (covering July 2011 to December 2014 and taking into account new developments in 2015 and 2016) was completed in November 2016.²⁶

FCPF provided a strong institutional structure and common readiness framework to client countries even before the Warsaw Framework for REDD+ was approved in 2013. Similarly, FCPF has contributed to the development of global REDD+ modalities and roadmaps for countries to achieve readiness, which has helped to institutionalize REDD+ at the national level. However, there were key weaknesses in the extent to which the country engagement strategies of the Delivery Partners were aligned with the REDD+ agenda in target countries.

FCPF has also been effective in kick-starting national readiness processes and in building the first multilateral results-based framework for REDD+. The FCPF has provided tailored technical assistance for developing REDD+ national plans and strategies, stakeholder consultations, reference levels, capacities and systems for MRV, and safeguards information systems required for increasing emission reductions from forests.²⁷

The FCPF has faced challenges in reaching advanced stages of readiness at the portfolio level and securing investments for the future emission reduction programs (FCPF 2016). As of August 2017, nine countries (Chile, Costa Rica, Democratic Republic of Congo, Ghana, Mexico, Mozambique, Nepal, the Republic of Congo, and Vietnam) out of 47 reached the REDD+ readiness stage to start implementing large-scale emission reduction programs.²⁸ However, about half of the countries had reached the mid-term milestone in REDD+ readiness while the other target countries are at different stages of the process. Progress has either been slow or inadequate in some countries (for example, Kenya and Paraguay).²⁹ In Uganda, only two of the four readiness plan components (REDD+ Strategy and Forest Reference Emissions Levels) were well advanced in November 2017, while other components were likely to require more time to complete. In Colombia, the REDD+ strategy has been drafted but has not yet been adopted while the World Bank is already moving to develop a parallel technical assistance support for the planned jurisdictional program (under BioCF ISFL) in Orinoquia Region.

Although it is robust, the Carbon Fund's Methodological Framework is viewed as technically challenging and likely to require significant support to meet its objectives (FCPF 2016). This is particularly relevant for the scaled-up jurisdictional REDD+ approach which requires GHG accounting and safeguards compliance within the entire jurisdiction as well as baseline and reference levels at the national or jurisdictional scale.³⁰ The FCPF has also not achieved systematic gender mainstreaming in the readiness process and has not managed to attract the private sector to engage effectively across the portfolio.³¹ Although grant disbursements from the Readiness Fund have continued to accelerate recently, the disbursement rates were significantly lower than what was planned (FCPF 2016).³²

World Bank Group Performance as Convener and Thought Leader in CF

The thought leadership role of the World Bank has included both knowledge services and advisory services. This role emerged as part of the World Bank's activities in catalyzing and developing markets and carbon pricing, which required continuous innovation and knowledge creation. In addition to knowledge services, the World Bank provided timely technical advice and support to strengthen client capacity, requiring thought leadership in designing carbon projects, use of methodologies and MRV systems, and carbon pricing approaches. The World Bank's thought leadership in turn contributed to its convening power.

The World Bank Group became a key thought leader in the carbon market, influencing the development of the rules governing the post-Kyoto mechanisms. These efforts included development of baseline and monitoring methodologies, leadership in expanding CF into new areas (for example, carbon sequestration and REDD through FCPF), knowledge creation and support for domestic carbon pricing (for example, PMR),³³ overview reports on the status of carbon markets worldwide, and studies on sectoral and upscaled crediting approaches. The World Bank's work on capacity building and technical assistance bolstered its thought leadership capabilities. Together, these activities generated substantial and valuable global knowledge on international carbon markets and the flexible mechanisms, emission reduction activities outside CDM (for example, agriculture and REDD+), and domestic carbon pricing.

The convening role of the World Bank Group in CF has arisen from its other roles in CF. As defined in chapter 1, convening services are the ability to bring key players together for dialogue and to help build consensus and identify solutions to global challenges by leveraging internal knowledge and expertise and harnessing external resources, networks, and partnerships. The World Bank has led in catalyzing new partnerships and bringing together key actors for dialogue and promoting consensus around key aspects of climate policy and carbon pricing, including annual meetings and platforms, global and regional forums, side events at the COPs, and high-level commissions for certain issues.

Carbon pricing by itself may not, however, be sufficient to induce change that is consistent with the high ambition of the Paris Agreement. The IEG expert interviews and desk review consistently show that although carbon pricing remains central, many developing countries cannot set reasonably high prices that provide strong signals to drive mitigation to keep global temperature increases below 2°C. The global High-Level Commission on Carbon Prices recently concluded that the carbon price level consistent with the Paris targets is significantly higher than the current low prices: \$40–80/tCO₂e by 2020 and \$50–100/tCO₂e by 2030 (CPLC 2017). To enhance the effectiveness of current carbon pricing policies,³⁴ the Commission and others emphasize the need to introduce complementary and synergistic policies and institutional reforms to remedy various market and government failures and help reduce emissions (for example, removal of fossil fuel subsidies, energy efficiency standards, and so on.) (Fay et al. 2015; Bhattacharya, Oppenheim, and Stern 2015; CPLC 2017).³⁵

Enhancing Efficiency in Implementation of the Kyoto Mechanisms

The World Bank strongly contributed to improving the efficiency of the CDM/JI mechanisms in their early years. Both the analytic work undertaken and the practical experience from the pioneering work of the World Bank were important in informing and shaping the regulatory rules and arrangements. The World Bank has provided regular feedback to enhance regulatory systems.³⁶ It systematically responded to requests for input from the CDM Executive Board and the JI Supervisory Committee, presented an overview of the status of the regulatory system, and disseminated experiences to regulatory bodies and other market participants (World Bank 2006b). The World Bank also provided analysis and studies on the potential gains and benefits from various regulatory changes to deepen understanding (Platonova-Oquab 2012).

Over the years, the World Bank has contributed proposals, inputs, and recommendations to improve the CDM, which contributed to further enhancing its reach and efficiency³⁷ (World Bank 2010b).³⁸ These include (i) contributions to the approval of methodologies and regulatory guidelines in areas left out of the regulatory process, for example, switching from nonrenewable to renewable biomass³⁹ or A/R projects under different land use regimes (World Bank 2007b); (ii) proposal for a programmatic approach (which led to the regulatory approval of the concept of PoA in July 2007);⁴⁰ and (iii) proposal for a standardized crediting approach (Ci-Dev 2016), contributing to enhanced clarity and efficiency.

Engaging the Private Sector in CF

The private sector has played a key role in financing mitigation through carbon markets and related instruments. Despite relatively low participation of the private sector in the Kyoto negotiation process, the World Bank actively engaged and ensured private sector participation in the design of the first carbon instrument (the PCF). The PCF was a public-private partnership involving 6 governments and 17 companies. This early dialogue and engagement were important to advance understanding of how the new markets would work and to rally the private sector. Market growth and expansion stimulated the emergence and development of a complex industry of service providers from the private sector. However, there is little evidence on the extent to which the World Bank Group was able to leverage private investments through CF.⁴¹ Nonetheless, about 51 percent of the World Bank Group ERPA's come from the private sector, and 5 percent from public-private partnerships, indicating a significant level of private investment leveraged through carbon funds.

Yet the positive effect of the early phases in rallying the private sector was not sustained. The uncertainties and risks involved in the regulatory process, and the post-2012 market crisis, undermined private sector confidence in carbon market mechanisms. The drastic fall in demand and market collapse also led many private companies to reduce or close their carbon-related business and led most financial institutions to decrease activities.

Influencing Through Knowledge Sharing and Networking

The World Bank Group has created and shared knowledge through its multiple CF vehicles. These initiatives supported the production and dissemination of important information and market intelligence. A cornerstone in knowledge sharing has been *State and Trends*, a flagship annual series published since 2003, *State and Trends* featuring important issues such as CF supply and demand,

contracted volumes, buyers and sellers, asset classes, and pricing and transaction structures. The IEG desk reviews, expert interviews, and case studies confirm that this series has been the most comprehensive source of freely accessible knowledge on carbon market activity, attracted a global readership, and helped to inform market participants at all levels on ongoing trends. The World Bank Group also disseminated information to market participants through other outlets, including web platforms, global and regional forums, and workshops. As intellectual leaders, CF staff also supported key institutions shaping and supervising CF mechanisms including the secretariat of the UNFCCC, the CDM executive board, and the methodologies panel (Kelly and Jordan 2004).

The World Bank Group played various facilitating roles, bringing together diverse stakeholders to overcome hurdles. The World Bank Group continued to provide several bridge building and convening activities that involve knowledge sharing and networking: (i) facilitating international technical roundtable discussions on various topics convening stakeholders and experts; (ii) providing a forum for host countries—through its Host Country Committee—to advise the World Bank on its CF activities and share experience; and facilitating participation of developing country sellers and regulators in forums such as Carbon Expo.

Global events sponsored by CF-Assist have been an important component of knowledge sharing and networking. The Carbon Expo fair, started in 2005, was one of the most important events in the nascent stage of the carbon market. The expert interviews indicate that it brought together up to 3,000 policy makers over three years (2008–10), from developed and developing countries, project developers, buyers, and other stakeholders interested in the carbon market. Numerous panels of high-level experts addressed critical issues. The World Bank's convening and sponsorship facilitated the dissemination of knowledge, communicated solutions to leading challenges, created partnerships, increased awareness, and provided opportunities for networking and deal-making. World Bank Group funds and facilities have been active participants at these events.

Following the Paris Agreement, new global events have been organized to support its advancement. CF-Assist launched the Innovate4Climate Finance and Markets Week (I4C) event series in Barcelona in 2017 as a successor to the Carbon Expo. In partnership with the International Emission Trading Association, this created a new global dialogue among governments, multilateral banks, businesses, and financial leaders to shape the next generation of policies to stimulate climate investments. This event facilitates networking and building of partnerships and coalitions to advocate for carbon pricing policies at all levels.

Regional forums and workshops have been another important avenue for knowledge sharing and networking. CF-Assist has convened annual events in regions including (i) Latin America and the Caribbean, bringing together market stakeholders; (ii) Africa, for CDM training and market opportunities including PoAs; (iii) India, bringing together market participants to discuss market opportunities and finance options; and (iv) Central Asia. Over the years, these events have been attended by approximately 50,000 participants and held in partnership with leading global UN, multilateral, and business organizations (CF-Assist 2015).

Influencing Through Global and National Partnerships

The World Bank Group has brought together multiple stakeholders to create various carbon partnerships to facilitate dialogue, collaboration, and climate actions. Recently, this was supported through the FCPF, which has fostered partnerships involving more than 50 countries to build capacity and tackle the complex issue of REDD. The PMR has created platforms to enable policy makers, practitioners, and public and private entities to share information on domestic carbon pricing and market readiness. The CPF promotes emission reductions through larger-scale, longer-term investments through PoAs and scaled-up approaches. The Carbon Pricing Leadership Coalition has become the key convening instrument to advance knowledge on effective carbon pricing systems. The new initiatives under TCAF also aim to forge partnerships to support transformative mitigation programs in client countries.

¹ The PRA shows that the first Emission Reduction Purchase Agreement (ERPA), which later became the model for the private sector and other carbon market players, was signed in 2000 for a methane reduction project in Latvia. This was followed by four ERPAs signed in 2002 in Chile (small hydro), Brazil (biomass energy), Colombia (wind energy), and Costa Rica (small hydro). A total of 20 ERPAs were signed before the end of 2004—Prototype Carbon Fund (14), Community Development Carbon Fund (2), the Netherlands Clean Development Fund (4). The IFC ERPAs started from 2005 (three signed under INCaF).

² The Netherlands initiated two carbon market programs in 2000 called ERUPT for acquiring emission reduction units (ERUs) under the Joint Implementation (JI) and CERUPT for acquiring Certified Emission Reductions (CERs) under the Clean Development Mechanism (CDM) of the Kyoto Protocol. The CERUPT program which was originally estimated to deliver 17 million CERs, was stopped after the first round and replaced by programs run by various financial institutions including the World Bank. The ERUPT program for JI, however, had five consecutive tenders and contributed to demonstrating the practicality of the mechanism (Personal Communication April 2018 with Mr. Adriaan Korthuis, former ERUPT & CERUPT program manager, and Mr. Maurits Blanson Henkemans, former official of the Dutch Ministry of Economy).

³ During this period, prices for project-based greenhouse gas emission reductions were just emerging and remained relatively low. Once the number of players increased and the World Bank Group's market share declined, such conflict became less of an issue. In the cases where IFC provided financing either as equity or loans, efforts were made to manage such conflicts of interest by separating CF governance from investment decisions.

⁴ The new follow-on funds include (i) Netherlands CDM Facility; (ii) Italian Carbon Fund; (iii) Spanish Carbon Fund; (iv) Netherlands European Carbon Facility; and (v) Danish Carbon Fund. They were capitalized with nearly \$756 million and the Bank Group was involved in sourcing carbon credits for the specific funds. Some believed that the World Bank should instead have provided funding to carbon specialist companies to manage countries' purchases of carbon assets.

⁵ The European Union Emission Allowance prices dropped from \$20–30/tCO₂ during 2005–08 to \$15–20/tCO₂e in 2009–11.

⁶ During the 2009–12 period, the World Bank Group also supported a shift toward programmatic approaches to scale up emission reductions. This shift was based on the realization that the project-based approach was inefficient and resource-intensive to achieve impact at scale. The Bank Group hence actively supported the move toward the Programs of Activities (PoAs) that were introduced by the UNFCCC in 2007 and developed and piloted nine PoAs during this period; these allow entire policies and program components to be registered under one PoA and saves costs. Since 2007, when the initial PoA-related procedures and project design documents (PDDs) were introduced at the 32nd and 33rd meeting of the Clean Development Mechanism Executive Board, the Program of Activities

(PoA) requirements have been significantly improved and are still being calibrated to meet the specific needs of PoA participants.

⁷ There is a long controversy on HFC-23, which is a by-product of the manufacture of HCFC-22, an ozone-destroying refrigerant. HFC-23, often considered as a “super GHG,” is 14,800 times more powerful in trapping heat than CO₂. HCFC-22 is banned in developed countries but developing countries can keep making it until 2030. Given the low marginal abatement costs and the incentives established under the Clean Development Mechanism (CDM) for generating international carbon credits to reduce compliance costs in Annex I countries with Kyoto obligation, HFC-23 was low-hanging fruit for developing CDM projects. However, under the CDM rules, eligibility was limited to companies which were already producing the gases in 2000–04, and companies are capped in the amount they can receive. In 2005, the World Bank signed emission reduction purchase agreements for two such CDM projects in China for destruction of HFC-23 (Project 0306 and Project 0011 registered by UNFCCC during June and August 2006 following the standard validation process and review by the CDM Executive Board). However, controversy emerged regarding the use of HFC-23 credits in the CDM mainly around two issues: (i) unexpected “perverse incentives” from the destruction of HFC-23 for CDM credits (for example, moral hazard issues and incentives for companies producing HFC-23 to increase production in anticipation of lucrative carbon payments under situations where past long-term behavior has not been adequately monitored); (ii) risk of over-crediting of HFC-23 credits when the baseline for destruction of HFC-23 is manipulated. Following these controversies, the CDM Executive Board further tightened the eligibility rules. The European Commission formally adopted a ban on the use of industrial gas credits in the EU Emission Trading Scheme as of May 2013; other governments also followed and banned HFC-23 credits. The tightening by the CDM Executive Board on the associated methodology to cap the generation of HFC-23 is likely to have mitigated the perverse incentives. However, *The Economist* reports that “CDMwatch, a group that monitors the offset market, has shown the CDM Executive Board that some plants have reduced their HFC-23 production during periods in which they were ineligible for Certified Emission Reductions (CERs) and upped it when they became eligible again, gaming the system” (*The Economist* 2010). The World Bank says that “having established best practice, the World Bank did not intend to develop any additional HFC-23 projects in its pipeline in China or elsewhere, to not crowd out the private sector.” The World Bank was, however, aware of the serious reputational risks and the potential impacts of large HFC-23 payments (with lucrative profit margins) to the two HFC-23 entities in China which could affect the prospects for developing CDM projects in other sectors, and agreed a deal with the Chinese government in 2006 to establish the China CDM Fund, financed by a tax of 65 percent of revenues from the HFC-23 CERs sales. The IEG case study indicated that the China CDM Fund subsequently supported the growth and expansion of carbon markets across key sectors in China, especially the growth of domestic CDM. Subsequently, China introduced in 2015 a temporary incentive scheme to pay Y4 (\$0.65) per tCO₂e from HFC-23 destruction projects achieved in 2014, and to reduce the amount each year and phase out the subsidy after 2020 (<http://carbon-pulse.com/4706/>). In 2016, the Kigali Amendment to the Montreal Protocol also agreed an HFC phase-down of trade with Parties that have not ratified the Amendment (“non-Parties”) will be banned from January 1, 2033. As per the Amendment, HCFC-22 production and consumption (the base chemical for HFC-23) in China in 2020 will be 35 percent less than in 2010 (NDRC).

⁸ The shares reflect only the World Bank’s share in the primary Certified Emission Reduction and Emission Reduction Unit markets because the World Bank Group was not involved in the secondary market transactions, which were much larger. As the imminent end of the first commitment period approached, there was huge uncertainty about the future and the second commitment period of the Kyoto Protocol. There was lack of clarity especially on (i) whether the second commitment period would be agreed, and (ii) whether the pre-2012 assets would be eligible under the second commitment period, if agreed. A large portion of the post-2012 Emission Reduction Purchase Agreements were therefore canceled around the world as the prices plunged. In an effort to stabilize the market, the World Bank created the UCF-T2 to help transition some projects into the next Kyoto commitment period. The World Bank’s intervention to create demand for some promising projects while other market players were deserting the market raised its share to 23 percent in 2011.

⁹ The Kyoto funds were conceived as public-private partnerships, and the private sector was one of the main stakeholders buying emission reductions. The World Bank indicated that out of the 74 distinct participants in the Kyoto carbon funds, 55 were private firms, contributing up to 56 percent of the capital invested in the Kyoto Funds.

- ¹⁰ The share of the private sector increases from 23 percent in low-income countries to 59 percent in lower-middle-income countries and 61 percent in the upper-middle-income countries, indicating the World Bank Group's growing collaboration with the private sector as this sector develops and invests in mitigation projects.
- ¹¹ The top 10 countries account for 93 percent of the emission reduction issuances in the World Bank Group portfolio: China (61 percent), followed by Poland (13 percent), and Brazil (7 percent). The top 10 countries in the rest of the Clean Development Mechanism portfolio account for 92 percent, of which China (54 percent) and India (14 percent).
- ¹² A baseline methodology defines how to estimate the emissions that would have been generated in the most plausible alternative, business-as-usual scenario to the implementation of the project activity as well as the emissions from project implementation. A monitoring methodology defines how to gather the data required to calculate emission reductions from the project.
- ¹³ Although the Carbon Finance Unit (CFU) has been divided recently into two units: Climate Fund Management Unit and Climate Markets and Innovation Unit, this report uses the former abbreviation (CFU) for ease of reference.
- ¹⁴ This allows standardizing the emission reductions from each unit or households, enhancing efficiency and reducing monitoring costs.
- ¹⁵ The clear exceptions are the two World Bank methodologies (large-scale and small-scale) directed at grid-connected electricity generation from renewable sources which together have been used by almost 65 percent of all registered CDM projects.
- ¹⁶ Following the market collapse, IFC's business model shifted to focus more on climate finance and mobilizing capital, including the use of results-based finance as offered by voluntary and other carbon markets, especially in the context of forests as demonstrated by the pioneering Forests Bond that is currently being considered for replication under the jurisdictional REDD+ approaches.
- ¹⁷ Minutes of meeting with Vikram Widge, Manager of both Climate Finance and Climate Policy units at IFC, on September 2, 2016.
- ¹⁸ Minutes of meeting with Vikram Widge, Manager of both Climate Finance and Climate Policy units at IFC, on September 2, 2016.
- ¹⁹ IFC. 2014. Master Purchase Agreement Termination Deed.
- ²⁰ Following the collapse of the carbon market in 2012, IFC shifted its focus from carbon finance to pursuing climate finance and climate business more broadly.
- ²¹ The IEG case study indicated that Colombia has adopted a carbon tax, which was regulated by the Ministry of Environment in June 2017, and is considering a new Climate Change Law, currently being reviewed in Congress.
- ²² The BioCF ISFL initiated large-scale landscape programs in Ethiopia (Forested Landscape Program, Oromia Region), Zambia (Integrated Forest Landscape Program in Eastern Province), Colombia (Integrated Sustainable Landscape Program in Orinoquia Region) and Mexico.
- ²³ The IEG case study mission found that in Ethiopia, the BioCF ISFL support for Oromia Forested Landscape Program was selected by the National REDD+ Secretariat as the first national landscape Emission Reduction Program, working closely with support from the national Forest Carbon Partnership Facility (FCPF). In Colombia, the case study found that the FCPF REDD+ strategy has been drafted but has not yet been adopted, while the World Bank is already moving to develop a parallel technical assistance and jurisdictional crediting support under BioCF ISFL in the Orinoquia Region.
- ²⁴ The Participants Committee approved the United Nations Development Programme (UNDP) as the Delivery Partner for Cambodia, Kenya, Honduras, Panama, Paraguay, Papua New Guinea, and Suriname, and the Inter-American Development Bank (IDB) as the Delivery Partner for Guyana, Guatemala, and Peru. Transfer Agreements were signed between the World Bank, acting as the Trustee, and the UNDP on August 9, 2012, and between the World Bank and the IDB on October 9, 2012, respectively.

- ²⁵ The decision-making bodies with voting powers are the Participants Committee (for the Readiness Fund) which meets twice a year and is composed of 14 REDD Countries and 14 financial contributors, and the Carbon Fund Committee (for Carbon Fund) meeting twice a year and is composed of 11 Carbon Fund financial contributors.
- ²⁶ The following paragraphs draw from these evaluations (FCPF 2011; FCPF 2016) complemented by IEG interviews and case studies in three countries (Colombia, Ethiopia, and Uganda) as well as a 2012 IEG Review of the FCPF (World Bank 2012c).
- ²⁷ The Forest Carbon Partnership Facility has also developed a suite of 14 training modules, provided knowledge products and tools to help navigate the readiness preparation processes, and generated valuable lessons. Several South-South exchanges across countries also allowed networking and sharing of experiences.
- ²⁸ By June 2018, the World Bank, in its comments on the Draft evaluation report, indicated that “Sixteen countries (Chile, Costa Rica, Democratic Republic of Congo, Ethiopia, Ghana, Guatemala, Indonesia, Lao People’s Democratic Republic, Liberia, Madagascar, Mexico, Mozambique, Nepal, Nicaragua, the Republic of Congo, and Vietnam) out of 47 finalized Readiness Package (R-Package).” The World Bank, as shown also in the Forest Carbon Partnership Facility dashboard, further indicated that 8 countries (Chile, Costa Rica, Democratic Republic of Congo, Ghana, Mexico, Mozambique (provisionally), Republic of Congo, Vietnam) out of 19 countries in the Carbon Fund pipeline have their Emission Reductions Program Documents selected into the Carbon Fund portfolio and are in the process of developing and negotiating emissions reductions purchase agreements.
- ²⁹ By 2015, the Forest Carbon Partnership Facility planned for five of the country participants to have signed emission reduction purchase agreements (ERPAs), but no ERPAs were signed as of December 2017.
- ³⁰ This is relevant for the proposed countries selected into the Forest Carbon Partnership Facility Carbon Fund pipeline (for example, Democratic Republic of Congo) and other countries planning large-scale emission reductions under the related BioCF ISFL pipeline (for example, Ethiopia-Oromia region, Colombia-Orinoquia region).
- ³¹ The external evaluation indicates the need to present clearly formulated business cases that would attract the private sector actors’ interest and offer business opportunities to de-risk. In addition, the threshold to join the Carbon Fund (\$5 million) was considered a barrier for smaller private sector actors. The case studies also indicated lack of an agreed approach on how small-scale community or private sector REDD+ initiatives will be nested into the jurisdictional program.
- ³² The delays are caused by various internal and external factors such as long review and approval procedures and due diligence as well as safeguards requirements for procurement by the Delivery Partners, and long country-level processing time and weak capacity for processing paperwork for grant agreements in some countries (FCPF 2016). The initial uncertainty regarding the international REDD+ architecture and regulatory systems, until the Warsaw Framework of 2013, contributed to the slow early take-off. Because of this the 2012 IEG evaluation expressed concerns about the uncertain global regulatory framework and the prospects for large-scale compliance markets in REDD+ credits. It proposed a strategic approach to REDD+ for the World Bank Group that will minimize risks while also moderating stakeholder expectations and own commitments. However, grant disbursements from the Readiness Fund have continued to accelerate recently; at the end of FY17 reaching \$90 million for 34 countries (increase from \$16.4 million in 2015), excluding disbursements made by Delivery Partners other than the World Bank. The FCPF also leveraged \$186 million in 23 countries from other partners and created the Platform for coordination and multi-stakeholder engagement.
- ³³ According to the external evaluation (PMR 2015) the most successful objective of the Partnership for Market Readiness (PMR) was in activities related to convening and thought leadership, more specifically in creating a platform to enable policy makers of government agencies, practitioners, and public and private entities to share experiences and information regarding elements of market readiness, to learn from one another, promote South-South cooperation, and explore and innovate together in new instruments and approaches. The PMR has also developed and used several instruments for the dissemination of knowledge on market instruments. However, the sharing of lessons with the UNFCCC has been limited mainly because of the limited experience in the early stages until the Market Readiness Proposals are implemented.

³⁴ The term “carbon pricing” includes all forms of policies where economic value is attached to greenhouse gas emissions including taxes, emissions trading schemes, and carbon crediting mechanisms. The carbon price negotiated in a contract normally reflects the supply and demand equilibrium, which is in turn determined by governmental policies. The market price of carbon may, however, not reflect the full economic cost of a unit of greenhouse gas emissions (that is, the social cost of carbon).

³⁵ The appropriate carbon price levels to induce socially optimal levels of emission reduction may vary across countries partly depending on the complementary policies. In lower-income countries for example it may be lower than the ranges proposed if complementary actions may be less costly and the distributional and ethical issues may be more complex. Such complementary policies may include the introduction of performance standards; new rules for urban development and land and forest management, and investments in infrastructure; the development of new methods and technologies; removal of perverse policy incentives such as fossil fuel subsidies; and the use of financial instruments that foster private sector participation and reduce the risk-weighted capital costs of low-carbon technologies and projects (Fay et al. 2015; Bhattacharya, Oppenheim, and Stern 2015). These policies would work alongside carbon pricing and generally reduce the carbon price required to bring about the necessary emission reductions. The Paris target may also be achievable with lower near-term carbon prices if countries follow stronger action through other policies and instruments and/or higher carbon prices later (CPLC 2017).

³⁶ Such feedback on the regulatory experience was one of the objectives of the PCF: “Provide parties to the UNFCCC, private sector, etc., with learning-by doing opportunities to develop policies and processes for achieving emission reductions under Kyoto’s market mechanisms.”

³⁷ The regulatory delays and long timeframe associated with the Clean Development Mechanism (CDM) approval process (initially taking up to 18 months) increased project risks, and reduced incentives and the overall impact of the CDM. The regulatory risks, and the delays in the regulatory decision making under the relatively short first commitment period, undermined incentives for investment and limited the private sector’s investment horizon. The lost carbon finance revenues associated with regulatory delays are estimated at €800 million. The question is whether the commensurate environmental benefits (that is, avoided non-eligible tons) resulting from the intensive regulatory scrutiny were higher than the added costs of the regulatory process (World Bank 2010b). However, from 2009 onward the delays were reduced significantly.

³⁸ The 2010 synthesis based on the 10 years’ experience of carbon finance at the World Bank lists several recommendations made for improving the efficiency and effectiveness of the Clean Development Mechanism.

³⁹ Several methodologies relating to nonrenewable biomass had been rejected by the Clean Development Mechanism (CDM) Executive Board because they dealt with issues of avoided deforestation and land use change that are currently ineligible under the CDM. The World Bank submissions helped to clarify the technical issues, thus facilitating the approval of methodologies that promote the switch to renewable energy sources such as bio-digesters and solar cookers and improvements to the combustion efficiency of stoves (World Bank 2007b).

⁴⁰ The regulatory approval for the Program of Activities (PoA) approach has allowed the cost-effective implementation of small-scale activities over wide geographic regions and time periods. This is useful for initiatives with many dispersed activities including energy access, rural electrification, energy efficiency, renewable energy, waste management, and land-based sequestration in low-income countries. New Clean Development Mechanism activities involving efficient cookstoves, waste management, bio-digesters, and off-grid renewable energy in Africa are developed using this approach. This also facilitates programmatic mainstreaming of carbon finance into development programs. Under PoA, the World Bank is supporting initiatives for energy efficiency, renewable energy, and land-based sequestration initiatives.

⁴¹ The World Bank, in its review of the 10 years’ experience in CF (not validated by IEG), indicates that for the entire CDM, during 2002–09, forward contracts of about 2.2 billion CERs were agreed to for a cumulative value of approximately \$25.6 billion, benefiting some \$106 billion in underlying low-carbon investment, for an average leverage ratio of 1 to 4.6 (World Bank 2010b).

5

Comparative Advantages, Internal Synergies, and the Future of Carbon Finance

highlights



Relative to other actors, the World Bank Group has institutional memory and deep expertise in carbon finance (CF). It has largely retained its technical and operational capacity over the years, mainly through its comparative advantage in project financing, capacity building, innovation, convening global and national partnerships, and supporting regulatory frameworks.



The World Bank Group is criticized for its rigidity, its procedure- and instrument-driven programs, its association with governments and large corporates, and its fragmentation of efforts.



The reduced engagement with CF operations at the country level post-2012 limited recent progress in integration, collaboration, and scale-up of CF activities, except in the forestry sector.



The limited integration with World Bank Group operations has reduced the capacity to leverage CF internally to augment its operational core business and to combine with development and climate finance.



Uptake and integration of CF with other World Bank Group instruments and operations can be enhanced by improving internal coordination and moving toward larger funding with lower transaction costs.



The future of CF is being built on a different foundation and policy environment from the past.



A smooth transition from the Kyoto Protocol to the Paris Agreement is needed to restore confidence and inject new momentum to revive the carbon markets.



The emerging needs and priorities for piloting and demonstration under the Paris Agreement echo the early period of Clean Development Mechanisms. Since the signing of the agreement in 2015, the World Bank has initiated several integrated large-scale sectoral and policy crediting approaches linked with country-level engagements.

Landscape of Major Institutional Actors in CF

The World Bank Group is one among many actors in CF. To identify the global positioning of the World Bank Group in CF, the IEG desk review of the institutional mapping assessed the main actors in CF around four key functions: regulation, project operation, capacity building, and finance. In addition, there are facilitators of various kinds—consultants, lawyers, auditors, intermediaries—playing a diversity of functions. Table 5.1 shows the main actors along the four main functions.

- (i) **The regulatory function** includes setting up general legislation, guidelines, and modalities, including monitoring and accrediting for the operation of a given CF scheme, such as the CDM.¹ At the global level, regulators operated under the auspices of the UNFCCC. At the national level, in countries that have ratified the Kyoto Protocol, DNAs are the official interlocutors of the UNFCCC. The DNA also plays a key role in assessing the sustainable development co-benefits of a CDM project and issues the letter of approval, necessary for the registration of project. Domestic regulators are also in charge of identifying changes in the legislation required to ensure a suitable framework for implementing carbon pricing.² The World Bank Group does not have a regulatory function but has provided methodologies, technical advice, and recommendations for improving the efficiency and effectiveness of the regulatory systems.
- (ii) **The operational function includes all components of project design and implementation and monitoring of GHG emissions.** Project owners (also referred to as project entities) are private or public entities that implement and are responsible for a mitigation activity. They play an important role in performing appropriate MRV activities of the mitigation measure under their control. In addition, the World Bank Group and other players support the operation function at different levels.³
- (iii) **The capacity building function** relates to technical assistance and the creation and transfer of knowledge to both public and private stakeholders. It may include the organization of workshops, training programs, and internships, and is often led by international organizations such as the United Nations Environmental Program, the World Bank Group, and others.⁴
- (iv) **The finance function** relates to the provision of up-front financing for projects, refinancing of debt at later stages, and procurement and brokerage of carbon credits. The key difference between financing a typical investment project and a CDM project lies in additional costs related to the UNFCCC certification, MRV costs, and additional revenues stemming from the sale of carbon credits. Beyond commercial finance from banks, public financial institutions and multilateral development banks (MDBs) may provide concessional finance in the form of grants, subsidies, concessional loans, and credit guarantees in addition to carbon credit purchases. Though many of the MDBs have supported CF activities, the World Bank Group was consistently the largest financier and global leader in providing capacity building and operational support to CF activities (see appendix K).

TABLE 5.1 | Actors and Stakeholders in Carbon Finance

Main Functions	Main Actors		
	Global	Regional	National
Regulatory	Public: UNFCCC, CDM EB, JI-SC Private: Voluntary Carbon Standard, Gold Standard or Climate, Community & Biodiversity	European Commission and others	DNAs, DFPs, Environmental Protection agencies or other Ministries
Financing	World Bank Group, Bilateral and multilateral donors operating globally	Regional multilateral Banks (for example, ADB, AfDB, IDB, EBRD, EIB)	National Banks; Other national public finance (for example, China CDM Fund, Argentina Carbon Fund, Mexico Carbon Fund)
Capacity building	World Bank Group, FAO, UNEP, UNDP	UNFCCC Regional Collaboration Centers (for example, EADB, CAF, WADB, IGES)	Consultants; technology providers; Bilateral development agencies (for example, GIZ)
Operation	World Bank Group, Private Banks, Consultants (e.g., Ecosecurities), DOEs (e.g., DNV, TÜV, Bureau Veritas), Lawyers, Brokers (e.g., Natsource, Noble Carbon); NGOs (e.g., Carbon Market Watch, Sandbag)	Regional DOEs, other auditors, NGOs	Project owners, technology providers, national auditors, local NGOs

Source: Independent Evaluation Group desk study and stakeholder mapping exercise.

Note: ADB = Asian Development Bank; AfDB = African Development Bank; CAF = Latin American Development Bank; CDM EB = Clean Development Mechanisms Executive Board; DNA = Designated National Authority; DNV = Det Norske Veritas; DOE = Designated Operational Entity; EADB = East African Development Bank; EBRD = European Bank for Reconstruction and Development; EIB = European Investment Bank; FAO = Food and Agriculture Organization; IGES = Institute for Global Environmental Strategies; JI-SC = Joint Implementation Secretariat; NGO = nongovernmental organization; UNDP = United Nations Development Programme; UNEP = United Nations Environment Programme; United Nations Framework Convention on Climate Change = United Nations Framework Convention on Climate Change; WADB = West African Development Bank.

World Bank Group Positioning Relative to Other Actors

The World Bank Group has certain advantages in CF that distinguish it from other institutional actors. Though other MDBs engage in multiple roles regionally, the World Bank Group's experience and authority to act in the public and private sectors extends globally. The case studies, desk reviews, and various interviews indicate that this has been possible through strong innovation, ability to deliver high-quality results, and donor trust that it has garnered to finance their diverse programs. Global experts interviewed identified the comparative advantages of the World Bank Group in terms of its deep expertise in CF and retention of technical and operational capacity over the years; its ability to integrate finance with technical know-how; its long institutional memory from Kyoto to Paris; its global

reach and trust with governments and finance ministries to influence change; and the trust of the donors that it can transform “big ideas” into projects and results in the field. The experts agree that the World Bank Group is positioned uniquely with its convening role to bring in the climate agenda at the highest level in a given country, which is a significant advantage in implementing the Paris Agreement. Most notably, the World Bank Group was identified as the only institution among the financial institutions which has effectively sustained its CF voice and support since the late 1990s. CF experts also indicated that the World Bank Group is uniquely positioned to convene and collaborate with other MDBs, and that the World Bank Group needs to make space for other actors to participate.

Nonetheless, several missteps were identified, ranging from rigidity to fragmentation to overreach. Some interviewed stakeholders and experts regard the World Bank Group as being too rigid and too driven by procedures and instruments. In addition, the World Bank Group’s engagement in some initiatives tended to be driven by the public sector (for example, FCPF). Some nongovernmental organizations regard the World Bank Group as too closely allied with large private corporations, while some private participants regard the World Bank Group as working excessively through governments. Experts also note that heavy reliance on donor funding for CF has generally led to fragmentation, many small projects, lack of flexibility, limited learning, and intra-competition because of the parallel governance for separate funds, and because of differences in practices and accountabilities which, with their many distinct requirements, can be burdensome. In addition, with the reduced engagement at the country level after 2012, there is a growing risk of losing the operational capacity, institutional memory, and ground-level experience, especially in some of the World Bank Group country offices. Experts interviewed regarded the key challenge for the future to be leveraging the World Bank Group’s fundamental strength to build and cement new forms of partnership, tapping donor resources without fragmentation, and creating space for the private sector and other players.

Leveraging CF Internally to Augment Operations

CF has largely remained an externally supported trust-funded and project-focused activity poorly integrated into the World Bank Group’s financing operations. Only about 20 percent of the World Bank Group’s carbon market initiatives (ERPAs) were blended with standard World Bank financing operations. Many factors have constrained this integration, such as differing project cycles and the complexity of the carbon component, raising concerns that this could distort the smooth operations of development projects, as well as the focus on piloting and lack of sufficient scale to add value to development programs. The streamlining of CF activities in World Bank Group operations was more successful, especially within country portfolios (for example, China) and in some regions (for example, Ci-Dev in Africa) and sectors (for example, energy and environment).

However, the many small, early projects served as a learning ground on how to implement carbon projects and allowed flexibility to respond to client demand (that is, host countries and the private sector). The case studies and interviews indicate that the early CF projects demonstrated technologies, were demand-driven, and generated learning and awareness of low-carbon solutions.

Over time, experiences from these pilot projects constituted a knowledge repository which grew inside and outside the World Bank and enhanced the learning of operational teams. Another recognized benefit was the building of a cadre of staff in World Bank Group operations who understood energy efficiency and renewable energy projects. The guiding steps of early small-scale CF projects leveraged capital for climate-friendly projects in many host countries and brought in the private sector.

The need to move from isolated projects to a programmatic approach for GHG mitigation was recognized by the World Bank Group relatively early in the Kyoto Protocol implementation. Realizing that the project-based approach was inefficient and ineffective for scaling up ERs, the World Bank Group actively supported the move to PoAs under the CDM. However, the early interventions remained small and stand-alone because the CF instrument continued to be perceived as complex and institutional incentives were weak. The experience in the implementation of PoAs also fell short of triggering a major expansion. In 2012, the World Bank Group adopted a strategy to “move from a project-by-project to an integrated programmatic approach to manage risks and support scaling up of emission reductions” with the aim to blend and cofinance with World Bank and IFC operations and other climate finance instruments. However, this has not yet been achieved.

The overall contribution of CF to sustainable development has been constrained by the limited integration with development operations and by the small scale. In addition, the lack of a transparent framework for capturing development results has limited learning and knowledge building. Since CF has been largely dependent on external trust funding, governance and oversight are provided through external entities rather than by the Board of Directors of the World Bank Group. Very few of the CF vehicles have explicit and transparent M&E systems and requirements for external evaluations. Past IEG evaluations show that although many trust funds also use self-evaluations, the reported success rates can be questionable. Periodic evaluations also often result from donor pressure rather than from program management needs and do not always produce the desired evidence to ensure accountability and learning to guide future directions (see appendix J).

Internal coordination and collaboration among the principal agencies of the World Bank Group have been limited. Although both IFC and MIGA supported CDM and CF activities, CF activities in the World Bank Group have generally developed and evolved separately, except for a brief period when World Bank and IFC activities were jointly managed.

The reduced engagement with CF operations at the country level has limited recent progress in integration, collaboration, and scaling-up of CF activities, except in the forestry sector. The desire to integrate with development programs, combined with donor preferences, has already favored an integrated approach. However, at this stage, the conversation with World Bank Group shareholders is ongoing, along with the UNFCCC negotiations on the rules and procedures of the Paris framework that need to be finalized.

To increase uptake and integration, the desk review and interviews suggest the value of moving toward larger-scale funding with lower transaction costs. Some of the new initiatives and approaches for large-scale crediting have taken the lead in integrating closely with development and climate

finance (for example, Ci-Dev, CPF, FCPF, and TCAF). The selective experiences in integrating CF with climate finance (for example, CPF with the Clean Technology Fund, and FCPF and BioCF ISFL with the Forest Investment Program) can provide useful insights. These experiences indicate that integration has gradually improved, and this could complement the 2020 commitment of the World Bank Group toward the 28 percent target for projects with climate co-benefits.

Future Directions in CF Post-Paris

The future of CF is uncertain but is being built on a different foundation and policy environment from the past. The rationale for rebuilding and revitalizing carbon markets originates in (i) NDCs of 88 countries⁵ call for markets or carbon pricing mechanisms as tools for meeting their NDC commitments; (ii) the Paris Agreement establishes market-based instruments under a cooperative approach (Article 6.2); and (iii) the future “sustainable development mechanism” (Article 6.4) is likely to replace the CDM and will be similarly regulated by UNFCCC. In addition, several client countries have either adopted or expressed interest in carbon pricing instruments including carbon markets and carbon taxes. Existing research also shows significant gains from international trade.⁶

However, there is no assurance that countries would use international offsets instead of credits generated locally. Though the emerging domestic markets and strong political commitment could be the new foundations for relaunching international carbon markets, policy clarity, long-term demand, and high and stable prices are essential to incentivize the private sector and other investments.

The low prices, fragmentation of markets, and the challenges regarding stringency of baseline setting and additionality remain after Paris. With the wider scope for eligible mitigation activities under the Paris Agreement, there is an increasing fragmentation of carbon markets, including bilateral mechanisms (for example, Japan) and domestic ETS (for example, China), raising the need for linking various carbon pricing initiatives. Additionality under article 6 is complicated by factors related to baseline setting and conditionality of the NDCs, and the need for comparable metrics (Michaelowa and Hoch 2017; Spalding-Fecher et al. 2017).⁷

There is ambiguity on the position of REDD+ under the Paris mechanisms. Despite reference to REDD+ and the importance of forests in the Paris Agreement (article 5), the IEG expert interviews indicate that there are no clear financial incentives nor a regulatory mechanism for REDD+.⁸ Under the Paris Agreement, REDD+ seems to be included under the cooperative approaches (Art. 6.2) but whether it will be part of Art. 6.4 remains unclear at this stage.

A smooth transition from Kyoto Protocol to the Paris Agreement is also needed to restore confidence and inject new momentum to revive the carbon markets. The IEG case studies and expert interviews indicate lack of investor trust in market instruments following the market crisis. Hence, there is a pressing need to restore trust and consolidate the fragmented market landscape. The new momentum could initially come from available public funds while leveraging the private sector through results-based finance and underserved sectors such as land use, energy access, and REDD+. Many

projects under threat of closing or unable to commercialize their CERs after the ERPAs ended require support to transition to the Paris Agreement.

The emerging needs and priorities for piloting and demonstration under the Paris Agreement echo the early period of CDM. As in the early 2000s, there is a need to test the characteristics of new mechanisms and launch pilot activities under Article 6, especially expanding beyond projects and PoAs. The IEG interviews and desk reviews emphasize the need to continue and extend capacity building, especially in LICs, to put in place MRV systems and implement climate policies across sectors.

The key challenge in revitalizing market mechanisms is to counter the tendency toward fragmentation built into the bottom-up structure of the Paris Agreement. The post-2012 situation has shown how quickly fragmentation can erode a seemingly stable carbon market ecosystem. Article 6.2 can in principle accommodate a global approach to a carbon market, with Article 6.4 providing offset credits from countries that would not yet be able to participate in cap-and-trade schemes. Given the Kyoto experience, this target requires a coherent long-term strategy.

The World Bank Group's response during the post-Paris period is primarily shaped by the signing of the Paris Agreement in 2015. The World Bank developed new initiatives to support the development of the next generation of carbon markets under the new architecture of the Paris Agreement. The TCAF was launched to pilot the Paris mechanisms and help countries to develop approaches for increased crediting, including sectoral and policy crediting. The Carbon Pricing Leadership Coalition was launched at COP21 to accelerate deployment of carbon pricing initiatives around the world. The Networked Carbon Markets is simulating and analyzing a post-2020 scenario with a multimarket global environment linking different jurisdictions and allowing communications and potential transactions.

The World Bank Group has also drafted its new climate markets strategy (2017–20) and initiated several integrated large-scale sectoral and policy crediting approaches linked with country-level engagements. IEG interviews indicate that, building on the project-level experience, the World Bank is moving toward scaled-up mitigation approaches both to increase impact and in response to the high ambition of the Paris Agreement. The crediting of policy instruments and sectoral mitigation approaches is led by CPF and TCAF. The CPF has been developing scaled-up crediting methodologies to pioneer programmatic and sector-based approaches for the post-2012 carbon market. TCAF is developing a pipeline to test various methods for policy crediting, and for sectoral and integrated programs. TCAF and CPF could therefore play an important role in developing methodologies and piloting the new market mechanisms (Articles 6.2 and 6.4) of the Paris Agreement. The draft World Bank Group climate markets strategy (2017–20) also identifies various approaches for catalyzing future markets and piloting the new market-based approaches. This effort is now hampered by the limited available funding relative to the magnitude of the task. Capacity building would remain relevant for enhancing the functioning of the Paris Mechanisms and client country contributions in reaching their NDCs, reconciling development and climate agendas.

- ¹ Regulators are normally public entities—with the exception of some voluntary carbon offset standards—that define the rules and the procedures for the operation of a given carbon pricing mechanism. Two different layers can be distinguished: (i) international regulators, which set the framework for the deployment of carbon pricing mechanisms in the case of international agreements or bilateral cooperation, and (ii) national entities, that define the rules and legislation for mechanisms deployed at the national level, such as a domestic emissions trading scheme, or support the implementation of international mechanisms—for example, Designated National Authorities in the case of the Clean Development Mechanism or Designated Focal Point in the case of Joint Implementation.
- ² On the other hand, Voluntary Carbon Standards are often managed by private companies or nongovernmental organizations (NGOs) that act as regulators for certification of carbon offsets under a given standard. NGOs such as Carbon Market Watch and Sandbag can play a watchdog role by identifying and raising issues related to environmental integrity, perverse incentives, conflicts of interest, and windfall profits, among others.
- ³ On the demand side, carbon credit buyers and intermediaries create primary demand—that is, purchasing of carbon credits from project owners—and secondary (or end-use) demand from compliance or voluntary buyers. End-use demand may come from both public and private actors. For example, Japan, the EU, and New Zealand were among the major players in carbon trading under the Kyoto Protocol during the first Commitment Period (2008–12). However, the largest source of end-use demand for carbon credits came from the private sector—most notably from companies under the EU Emissions Trading Scheme.
- ⁴ Consultants can play many roles: helping project owners and buyers to access the carbon market; exploring new areas of business and identifying mitigation opportunities in new sectors; identifying knowledge gaps and supporting domestic and international institutions in researching aspects of market functioning; providing capacity building and training for private and public entities; and facilitating access to mitigation finance, especially for low-income countries.
- ⁵ Three of the world's five largest economies (China, Japan, and India) have stated that they are planning or considering the use of carbon pricing or market mechanism as a tool to meet their Nationally Determined Contribution commitments; 76 Parties mention international carbon pricing, 5 Parties mention domestic carbon pricing, and 7 Parties mention both in their Nationally Determined Contributions (PAF 2018).
- ⁶ World Bank research shows significant gains from international trade in terms of cost savings at the global level in implementing National Determined Contributions (NDCs) and helping countries meet their Paris commitments. The research suggests that availability of international carbon markets and trade from 2020 could reduce the costs associated with meeting the NDCs in 2030 by about 32 percent (equivalent to a cost saving of about \$115 billion on an annual basis by 2030). Similarly, use of the international carbon market throughout the period to 2050 could reduce global mitigation costs by around 54 percent in 2050 (or \$3,940 billion) (World Bank, 2016d). The increasing availability of data, and advances in technology and its affordability, expand the potential to develop methods and monitoring, reporting, and verification systems which were not feasible in the past.
- ⁷ Using the Nationally Determined Contribution pledges for crediting baselines assumes that these pledges are set below business-as-usual emissions, which may not be the case in practice and may generate “hot air.”
- ⁸ Article 5 in the Paris Agreement contains two paragraphs: 1) Parties should take action to conserve and enhance, as appropriate, sinks and reservoirs of greenhouse gases as referred to in Article 4, paragraph 1(d), of the Convention, including forests; and 2) Parties are encouraged to take action to implement and support, including through results-based payments, the existing framework as set out in related guidance and decisions already agreed under the Convention for: policy approaches and positive incentives for activities relating to reducing emissions from deforestation and forest degradation, and the role of conservation, sustainable management of forests, and enhancement of forest carbon stocks in developing countries; and alternative policy approaches, such as joint mitigation and adaptation approaches for the integral and sustainable management of forests, while reaffirming the importance of incentivizing, as appropriate, noncarbon benefits associated with such approaches.

Conclusions and Recommendations

THE WORLD BANK GROUP was successful in raising resources and was generally responsive to changes in markets and regulatory systems and to the needs and priorities of its client countries, including LICs. Following the proof of concept, it expanded its effort to build, expand, and sustain markets through various initiatives. It has been responsive to changing conditions and increasing its support to LICs with a better balance in its project portfolio across sectors and regions compared with the non-World Bank Group global CDM portfolio. However, the strong initial success in catalyzing and developing carbon markets was not sustained following the decline of CDM and JI because of external factors, despite the World Bank Group's continued support to "keeping the torch alive." In addition, the significant growth in CF came at the expense of fragmentation and proliferation of carbon funds and facilities, resulting in difficulties in internal and external coordination. This has also reduced internal synergy across the different CF initiatives. The governance mechanisms and M&E frameworks also remained uneven. Many of the older Kyoto funds lacked M&E frameworks while some of the newer initiatives (for example, PMR and FCPF) have more transparent governance and results frameworks.

In the early 2000s, the World Bank Group acted proactively, took a pioneering role, assumed significant risks, and was successful in catalyzing and developing markets for climate mitigation. It moved early enough to provide global leadership, conceptualizing carbon markets, testing the proof of concept, and demonstrating the potential of markets for low-cost climate mitigation. It developed pioneering models and methodologies and enhanced global confidence and trust in the market mechanism by piloting and operationalizing the CDM and JI

before the Kyoto Protocol came into force in 2005. It was instrumental in creating the first tradable carbon asset and in demonstrating CF in key sectors, usually through pioneer projects which served as examples and stimulated other CDM projects across countries.

Despite the uncertain global regulatory framework, the World Bank Group has been effective in supporting emissions reductions, with some sectoral gaps. Compared with the rest of the CDM projects at the global level, the registered World Bank Group projects were more likely to have positive CER issuances and produce higher verified ERs, though the additionality of attained ERs from certain technology types remains questionable. More important, despite the increased engagement and higher representation of LICs, the share of the LICs in the emission reduction issuances remains very low. The markets collapsed as these countries were just beginning to actively engage in markets and could not benefit fully from the World Bank Group's support.

The World Bank Group has been less successful in generating local development co-benefits and faced challenges in documenting development results from its CF activities. The CDM was launched with the dual objective of reducing the cost of compliance with Kyoto targets and contributing to sustainable development in developing countries. The World Bank Group generally designs CF projects to meet these dual objectives of the CDM, but there was significant variability in generating local development co-benefits, and in some cases there were trade-offs between climate and development outcomes. Further, many of the interventions were small prototypes and not integrated with the development operations in client countries, and the development outcomes as well as the social and environmental benefits were not systematically monitored. The World Bank Group has some way to go to consistently tailor its support to country needs and priorities with a focus on leveraging CF to demonstrate development results, especially in LICs. However, it could build from examples of innovative projects that contribute to both mitigation and economic development (for example, Ci-Dev, CDCF).

The World Bank Group has been largely effective in innovating CF and in building capacity for its client countries. The World Bank developed multiple methodologies and financial instruments which helped expand and deepen markets and reduce delivery and price risks. While some CDM methodologies have been very popular, many have not been used widely. IFC developed new financing instruments but was not able to scale them up for various reasons (including the regulatory and market uncertainty) and did not operate in LICs because of the limited opportunities and small size of projects for emission reduction. MIGA provided the first political risk guarantees for CDM projects, but uptake has been limited. The World Bank has also provided technical assistance to client countries in several key areas, including CDM project design and implementation, carbon market readiness or domestic carbon pricing, and expanding markets to new sectors (for example, forests and landscapes). More innovation is needed in the underserved sectors, especially agriculture and transport. Building on the project-level experience, there is a need to move toward scaled-up mitigation approaches both to increase impact and in response to the high ambition of the Paris Agreement. Experience indicates that building capacity for carbon markets in LICs without well-developed financial sectors requires a patient, long-term approach.

The World Bank has been generally effective in thought leadership and convening for carbon pricing, but carbon pricing by itself will not be sufficient. As a key thought leader and convener, the World Bank has been more dynamic and flexible than in its other CF roles. It was successful in pioneering new forms of partnerships and initiatives. This has also allowed developing countries to experiment with their own carbon pricing instruments and identify relevant mitigation opportunities. However, the World Bank Group has been both proactive and reactive in the process. Although its overall role is valued by stakeholders, there is a need to move from small projects to integrated programs and from “working for buyers” to catalyzing partnerships, creating space for others, and working at scale. Given the current policy landscape where many developing countries cannot implement reasonably high prices, carbon pricing by itself is unlikely to provide the solution to expand mitigation and increase ambition unless it is supported by other complementary policies.

Key issues to consider for the future of CF arising from the evaluation include:

Greater programmatic integration and scaling-up of CF with development and climate finance are pertinent under the framework of the Paris Agreement. CF has largely remained an externally supported trust-funded and project-focused activity poorly integrated into World Bank Group financing operations. This has reduced the synergy with the World Bank Group’s core business. Though small projects served as learning grounds and allowed flexibility in response to client demand (host countries and private sector), it will be strategic to focus on replicable mitigation instruments that lead to large-scale mitigation and development outcomes. Additionality problems will become more relevant under the Paris Agreement, and identifying new ways to use CF as catalytic funding to unlock and enable transformational approaches and low-carbon technologies would be vital.

As part of Maximizing Finance for Development, attracting and leveraging private investments will be key. Initially the CDM was an instrument for governments to reduce their Kyoto compliance costs; private sector engagement was limited. However, the World Bank Group was able to crowd in the private sector, both as investors in the carbon finance instruments (credit buyers) and as project developers in host countries (credit sellers). But the World Bank Group lacked a clear exit strategy and has been strongly criticized for not leaving the market once it became operational as indicated in its 2006 strategy, potentially crowding out the private sector for low-risk and mainstream carbon market activities in some countries where the private sector could play the World Bank Group’s market development functions. Greater participation of the private sector is required as the World Bank Group moves toward large-scale and sectoral crediting approaches under the Paris mechanisms. As part of Maximizing Finance for Development, it will be useful to assess where and how CF can be leveraged to support private investments. The selective experiences in integrating CF with climate finance and development finance could provide useful insights.

The World Bank Group can build on its global position and its comparative advantages. The World Bank Group has the advantages in CF of deep experience and institutional memory, its ability to mobilize and channel donor resources, its ability to integrate finance with technical know-how, and its international convening power in CF, which distinguish it from other institutions. However, some of this capacity is being lost with reduced country-level engagement in recent years. In some cases, it

was also criticized as being too rigid and procedure- and instrument-driven and tending toward being public sector-driven. The opportunity for the future is to leverage its fundamental strength to build new forms of effective partnerships, to tap donor resources without fragmentation, and to create sufficient space for the private sector and other players.

A key strategic challenge for the Bank Group is to contribute to building the next generation of carbon markets under the new framework of the Paris Agreement. The future of CF is being built on a different foundation and policy environment from the past. Whereas the international carbon market has declined and fragmented since 2012, several client countries have adopted carbon pricing instruments including emission trading and carbon taxes. International trade can lower the costs of implementing NDCs. Yet such gains are not guaranteed. Policy clarity, long-term demand, and attractive and stable prices are essential to incentivize the private sector and other investments. Availability of improved data, and advances in technology and its affordability would further facilitate this. A global approach to carbon markets also requires a coherent long-term strategy. The World Bank Group's new draft strategy for developing the next generation of carbon markets as part of the World Bank Group Climate Markets Strategy (2017–20) identifies new approaches for catalyzing future markets and piloting the new market mechanisms. TCAF is developing a pipeline to test various methods for policy crediting, sectoral and integrated programs which could play an important role in piloting and operationalizing the new mechanisms (Articles 6.2 and 6.4). This effort is now hampered by the limited available funding relative to the magnitude of the task. While facilitating the transition, countering the tendency toward local fragmentation built into the bottom-up structure of the Paris Agreement would be the key in moving forward.

Recommendations

With the launch of the Paris Agreement, experts and client stakeholders believe that the World Bank Group can play a strong role. The evidence, lessons, and identified gaps from the World Bank Group's experience suggest that the World Bank Group can support the transition from Kyoto to Paris and facilitate the development of a new generation of carbon markets built on a different foundation and policy environment from the past. The Bank Group can leverage its experience, multiple instruments and teams, knowledge, and other comparative advantages to build effective partnerships, institute better coordination, create conditions and space for the private sector, and leverage CF to support the climate mitigation and development priorities of its client countries. However, some uncertainties remain at this stage until the regulatory frameworks for the market mechanisms under the Paris Agreement are defined, negotiated, and adopted. Nevertheless, assuming that the World Bank Group will continue to play an important role in developing the next generation of carbon markets, IEG's specific recommendations are:

Recommendation 1. The World Bank Group should further strengthen coordination among its different CF initiatives and instruments to enhance complementarity, avoid fragmentation, and harmonize their results frameworks. The World Bank Group should strive for complementarity between the relevant instruments and emphasize development of fewer, more harmonized, and

consolidated carbon vehicles with shared vision, common governance systems, simpler rules, and well-functioning and consistent results frameworks for enhanced accountability and learning. For IFC, it should deepen its coordination and complementarity where and when it engages in carbon finance (for example, coordinate Forests Bonds with FCPF, BioCF ISFL), just as MIGA can strengthen complementarity of any relevant guarantees. Learning from the Kyoto experience, this may require donors and other stakeholders to support such harmonization and consolidation to avoid proliferation of carbon funds and facilities under the new framework of the Paris Agreement.

Recommendation 2. The World Bank Group should increase its use of CF instruments to attract and mobilize finance that supports transformational activities and leverages private investments. The World Bank Group should identify new ways to use CF as catalytic funding for enabling transformational approaches (low-carbon technologies and policies) which may not otherwise be feasible or commercially viable under “business as usual” conditions (for example, innovative low-carbon investments in technologies currently limited by bankability and other barriers). Through its selective and catalytic use of CF for climate mitigation to support such transformational interventions that meet the relevant additionality criteria (under the Kyoto or Paris mechanisms), the World Bank Group should also continue to use CF to crowd-in or leverage private sector finance (for example, by packaging CF with climate finance to provide some up-front financing or mitigate risks), where possible, in line with Mobilizing Finance for Development objectives and the Cascade Approach, seeking private sector solutions and minimizing the use of scarce public finance resources. If IFC re-engages in carbon markets, it should build on its recent (for example, Forests Bonds) and prior experience to leverage private finance and investments. MIGA should identify opportunities to enhance demand for its guarantees to support transformational projects.

Recommendation 3. The World Bank Group should strengthen the client country focus of its CF activities, integrating them with country programs, in accordance with client demand and international agreements, enhancing their economic development benefits in client countries, and especially promoting poverty reduction co-benefits in LICs. This is consistent with both the continuing commitment of the Paris Agreement to development co-benefits and the World Bank Group’s own developmental goals. CF must be host country client-driven and increasingly streamlined into country programs and financing operations, with a clear vision toward bundling or packaging of all CF activities in host countries with other relevant World Bank Group operations. The design for integrating CF into country development programs and operations should be flexible, consider unique features of CF operations and associated legal commitments and risks, engage the private sector for scaling up successful pilots, and ensure delivery of development results, especially in LICs. Sustainable social and economic development co-benefits should be systematically targeted and promoted. Conditional on client demand, this would also apply to future IFC activities, if it re-engages in CF activities with the private sector in client countries, and to MIGA guarantees, to strengthen support for climate mitigation and development efforts in client countries.

Recommendation 4. The World Bank Group should identify complementary and country-specific interventions that enhance the GHG emission reduction impact of carbon pricing solutions, consistent with countries’ NDCs. Many client countries are unlikely to implement

carbon prices that will be high enough to provide strong price signals to bring significant changes in emissions soon. At the country level, low carbon prices mandate identification and structuring of complementary and synergistic programs, policy and institutional reforms and instruments (for example, removal of fossil fuel subsidies, energy efficiency standards, and so on), closely aligned or synchronized with carbon pricing approaches (for example, carbon taxes, emission trading schemes). Initiatives to remove any binding constraints at the country, market, or sector level offer the potential to improve the efficiency and effectiveness of the carbon pricing approaches and create an enabling environment for private sector solutions. Where relevant and when they are active, IFC, through its engagement with the private sector under the Bank Group's Carbon Pricing Leadership Coalition (CPLC), and MIGA should coordinate in the identification of constraints and complementary approaches to carbon pricing in client countries.

Recommendation 5. The World Bank Group should continue to pilot new market-based and scalable approaches for reducing GHG emissions, including those that focus on underutilized sectors and underserved countries. To do so the World Bank Group should further sharpen the focus of its capacity building, technical assistance, and innovation on scalable approaches that contribute to raising the mitigation ambition. This includes piloting of new and scalable financial products (such as the PAF) as well as programmatic, sectoral, and policy crediting approaches (such as TCAF) that are useful to support the transition to the new market mechanisms under the Paris framework. IFC and MIGA could also pilot scalable business models and de-risking instruments to support scaled-up crediting approaches. The World Bank Group should identify and scale up innovative crediting approaches for carbon assets from forests, agriculture, land use (such as FCPF and BioCF ISFL) and transport, and urban building infrastructure.

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APPENDIXES

Carbon Markets for Greenhouse Gas Emission Reduction in a Warming World

An Evaluation of the World Bank Group's
Support to Carbon Finance



IEG
INDEPENDENT
EVALUATION GROUP

WORLD BANK GROUP
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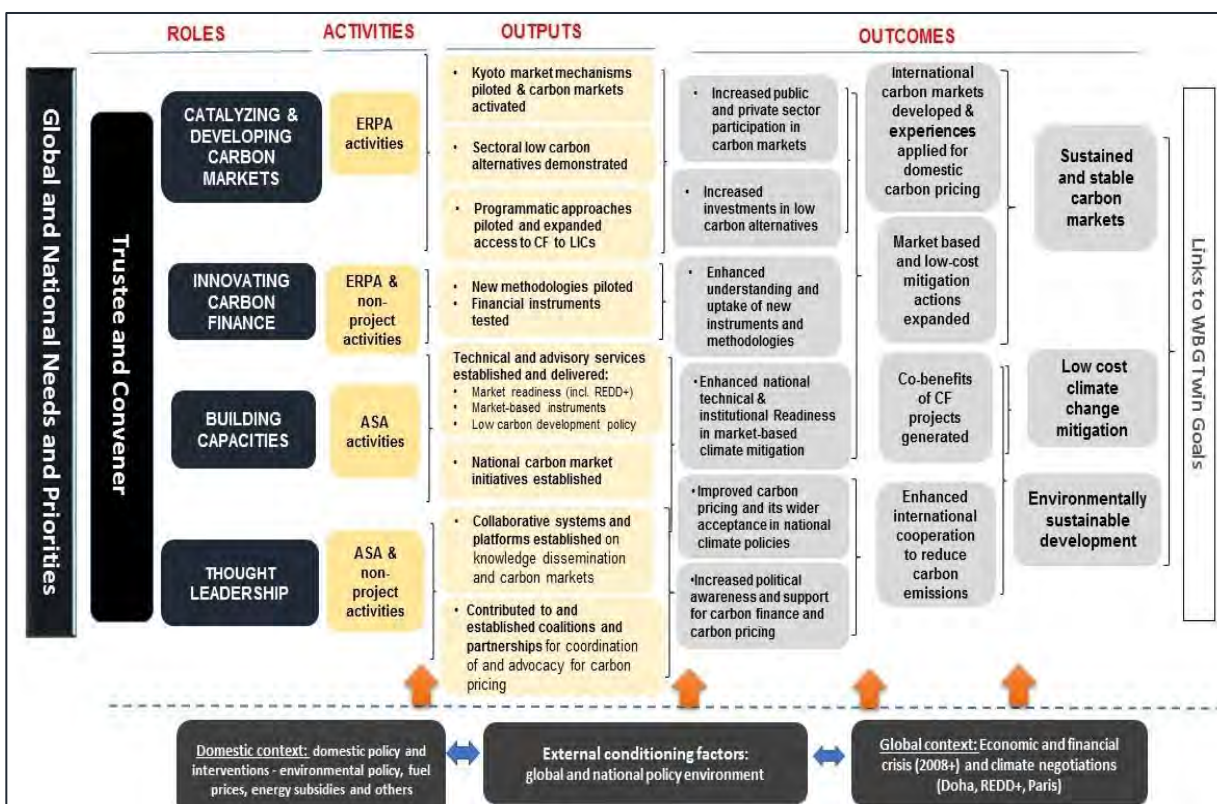
Appendix A. Methodology

1. Theory of Change

The main roles of the World Bank Group evolved based on its responses to the changing needs and priorities in carbon markets. The theory of change was developed around the four main roles of carbon finance (CF), shaped by the changes in global needs and priorities, with a focus on the following components: (i) creating and developing markets, (ii) innovating carbon finance; (iii) building capacity of the clients; and (iv) thought leadership and convening. The framework shows several outputs and outcomes which could produce a set of outcomes from CF interventions around these four key roles, conditional on domestic and external factors (see figure A.1).

- Activities related to “catalyzing and developing” carbon markets contribute to piloting and operationalizing the Kyoto market mechanisms, which together with investments in low-carbon alternatives and upscaling of emission reductions and expanded access to CF would lead to increased private and public sector participation and further development of international carbon markets and generation of cobenefits for sustainable development.¹
- CF innovations and development of new methodologies, tools and financing instruments would support further development of carbon markets and market-based climate mitigation actions.
- The increased transfer of knowledge and technologies through technical assistance and advisory services also contributes to improving capacity and institutional and technical readiness in client countries for carbon pricing and market-based mitigation policies.
- The World Bank Group’s thought leadership and convening role in CF manifests itself through project and non-project activities which help harness internal and external expertise and resources and creating content/knowledge; strengthening global and national partnerships for carbon pricing; and establishing collaborative systems and platforms for knowledge sharing, networking, outreach and advocacy. These in turn contribute to building domestic political support and wider acceptance of carbon markets and market-based climate mitigation actions in national climate policies.
- These outputs, conditional on domestic and external factors, produce a set of outcomes which culminate in the three eventual results that contribute to the twin goals of the World Bank Group: (i) Sustained and stable carbon markets, (ii) Low-cost climate change mitigation, and (iii) Environmentally sustainable social and economic development.

Figure A.1 Synthetic Theory of Change for World Bank Group Carbon Finance Activities



2. Evaluation Questions

Based on the underlying theory of change and the overarching question, the evaluation aimed to answer selected evaluation questions identified to understand the strategic opportunities and comparative advantages of the World Bank Group in CF, with special emphasis on four dimensions: (i) interventions, experience and capacity, (ii) needs and priorities, (iii) results achieved, and (iv) role and value added of the World Bank Group.

Interventions, Experience, and Capacity

Question 1: What has been the nature and extent of engagement of World Bank Group support to CF since its inception around 2000?

1.1. What has been the nature and the evolution of the World Bank Group's support to carbon finance over time?

1.2. What has been its strategic objective and to what extent has the support been underpinned by and aligned to relevant World Bank Group strategies?

Needs and priorities of clients:

Question 2: What have been the evolving needs and priorities in CF for stakeholders at global and national levels from Kyoto to Paris and how did the World Bank Group respond to these?

2.1. How have stakeholder needs and priorities at global and national levels evolved over time and how are they likely to evolve in the near future? How have markets and global regulatory regimes evolved over time?

2.2. How and to what extent did the World Bank Group adjust or respond to changes and uncertainties in markets and in the global regulatory regime? How and to what extent has the World Bank Group been responsive to the evolving needs and priorities of its clients (funders and countries)?

Results achieved:

Question 3: To what extent and in what ways has the World Bank Group contributed to developing and innovating carbon markets and building capacities through its multiple roles and support to CF?

3.1. How effectively has the World Bank Group been able to fulfill its role in

- Catalyzing and developing carbon markets and leveraging private investments; innovating CF;
- Building capacity of its clients; and
- Convening and thought leadership at the global and national levels?

3.2. What does the existing and new evidence tell us about the effectiveness of the main CF interventions in reducing GHG emissions and generating cobenefits for sustainable development?

Role and value added relative to other actors:

Question 4: To what extent and in what ways does the World Bank Group support to CF distinguish itself from support provided by other institutional actors and contribute to its own operations?

4.1 How has the World Bank Group positioned itself relative to other major institutional actors in its CF support?

4.2 How and to what extent has the World Bank Group been able to leverage CF internally to augment its operational core business and scale up results (for example, through 'blending' or more coherent programmatic integration of CF with other World Bank Group operations)?

3. Methods: Data Collection and Analysis

To collect and analyze data and establish the necessary evidence to answer the evaluation questions, the evaluation used a mix of methodological approaches: portfolio review and analysis, comparative analysis of World Bank Group and CDM/JI data, econometric analysis of global CDM data, case study design for in-depth causal analysis, country-level analysis of case studies, desk reviews, structured literature reviews (SLRs), stakeholder interviews, interviews of World Bank Group staff and Management, interviews of external experts, and project evaluations (PPARs)². The evaluation benefits from this multidimensional approach which was used to triangulate the evidence based on information collected using different methods (table B1). The quality of the information gathered from the relevant methods to answer the main questions is then assessed with greater weight given to internal and external validity of the findings. For example, the theory-based causal analysis provides stronger evidence on the effectiveness of the World Bank Group roles which is triangulated with evidence from the SLRs, econometric analysis and portfolio review and analysis and desk reviews.

- i. Portfolio review and analysis. Different portfolio review and analysis exercises were conducted sequentially and in parallel to understand the extent and nature of engagement, structure and architecture of the CF portfolio around the main CF vehicles as well as the various ERPA, ASA and non-project activities that the initiatives support. The main portfolio review and analysis exercise concerns the overall mapping and description of the global CF portfolio, including the depth and breadth of the sectors covered, the technologies used for emission

reduction, the combination of capacity building support and the mapping of implemented activities under each of the main roles of the World Bank Group in CF. Subsequently, the evaluation included several additional portfolio review and analysis exercises:

- Architecture of fund and facilities and project interventions (question 1.1)
- World Bank Group responsiveness to needs/priorities—portfolio changes over time, differences by region, and sectors/technologies (question 2.1/2.2)
- The effectiveness of World Bank Group roles (question 3.1)
- The effectiveness of ERPA interventions in reducing emissions (question 3.2)
- The nature and extent of integration of CF for reinforcing other World Bank Group operational activities (question 4.2)

Table A.1. Summary of Methodologies by Evaluation Question

Methods	EQ1	EQ2	EQ3	EQ4
Portfolio review and analysis	***	*	***	*
Desk review—Global needs and priorities	***	***		*
Desk review—Effectiveness of World Bank Group roles		*	***	*
Desk review—Institutional mapping and positioning of the World Bank Group	*	*	*	***
SLR—changes in markets and regulatory systems and World Bank Group responses	*	***	***	
SLR—Additionality and Cobenefits			***	
Case study—country-level analysis/interviews of stakeholders	*	***	**	**
Case study—causal analysis			***	
Econometric analysis (global CDM data)			***	
Comparative analysis of CDM/JI and World Bank Group data	***	***	*	**
Interviews – World Bank Group staff and management	***	**	***	***
Interviews—Global experts	**	***	***	***
Country strategy reviews (CPF/CAS)	**	***		

Note: CAS = country assistance strategy; CPF = Country Partnership Framework.

The stars (*) indicate the extent to which the specific methodology was relevant to answering specific evaluation questions (*** indicate strong relevance and * indicating low relevance of the information from the specific method without considering the quality of the evidence, which was considered in the next stage in the process of triangulation of the evidence). EQ = evaluation question; PRA = portfolio review and analysis; SLR= structured literature review.

- ii. **Case study design for in-depth causal analysis.** Considering time and available resources, the case study design for the causal analysis focused on understanding the effectiveness for selected ERPA interventions

alone. The case studies were planned in four selected countries (see criteria below) to allow comparative analysis on similar types of projects (for example, type of the technology deployed for emission reduction or removal) (table B2). The tools required for collecting comparative data and information were developed and case study leads and local experts trained in implementing the case studies for in-depth causal analysis.

The case study design encompassed the following main elements:³

- Development of a **causal theory of change** of ERPA the interventions, which captures in detail the main causal pathways as well as underlying assumptions for each of the causal steps. The detailed causal theory ('nested' within the broader more general theory of change (discussed above) for the causal analysis of the ERPA projects covering the process from motivating the CF project to designing, validation, registration, commissioning, monitoring of emission reduction/emission removals, verification/CER certification, flow of cobenefits and sustaining technology and ensuring environmental integrity of the ERPA intervention.
- A desk review of the available information including Bank documents and reports on the selected projects was undertaken to understand the main activities, the expected results, the contextual factors influencing implementation and processes of change and different types of outcomes. This was conducted as part of the case study mission planning by each of the case study leaders with inputs from support staff.

Table A.2. Case Studies for ERPA Interventions in Selected Countries (Causal Analysis)

Intervention Categories	Country				
	China	Ethiopia	Uganda	Colombia	Chile
Carbon market or ERPA activities (markets, innovation, convening)					
Renewable energy	X	X	X	X	X
Forestry or agriculture	X	X	X	X	X
Waste management	X		X	X	

Note: For details on the selected projects for causal analysis under each category, see appendix C. ERPA = Emission Reduction Purchase Agreement.

- **Data collection and analysis at the level of specific interventions** using the common template in selected countries. Interviews with different project-level stakeholders were conducted (project entity (owner), designated national authority (DNA), government, other stakeholders).
 - The **methodology for causal inference** used theory-driven causal analysis, whereby the causal theory of change will continuously be refined and populated with new empirical evidence to eventually support a grounded causal narrative on "what works under what circumstances." The evaluation explored the use of case-based methods for causal inference and finally employed the pattern matching approach (see details in appendix C).
- iii. **Country-level analysis.** The country-level analysis was done in six countries (five countries included for causal analysis of case studies plus India) (see table B3). The country-level analysis used a common set of questions to understand the needs and priorities in the country and how it changed over time; how and to what extent the World Bank Group been responsive to the evolving needs and priorities; how the clients see the World Bank Group ability to adjust and respond to changes and uncertainties in markets and in the global regulatory regime; how they the World Bank Group's role in innovating CF, convening and thought leadership; overall effectiveness of the main CF interventions in reducing GHG emissions and generating cobenefits; how the World Bank Group has positioned itself relative to other major institutional actors in its CF support in your

country; and the performance of the main capacity building interventions in the country (which may include the Partnership for Market Readiness [PMR], Forest Carbon Partnership Facility, BioCarbon Fund, CF-Assist). The main areas of the CF interventions for ERPA and ASA activities in each of the case study countries is given in table B3.

The data were collected through extensive in-country consultations and interviews of respondents from government agencies, project entities, the DNAs, private sector, World Bank Group staff, other funders and stakeholders. This was supported by a desk review of relevant documents, country strategies and climate mitigation policies. A portfolio review provided information on all CF activities implemented in the country. The case study leads for each country summarized the information from each of the country-level questions into a brief report which was used to inform the evaluation (on the needs and priorities and effectiveness of the World Bank Group roles and selected CF interventions). Selection and sampling issues are described below.

Table A.3. Proposed Case Studies in Selected Countries (Country-Level Analysis)

Main Intervention Types (Categories) and Subcategories	Country					
	China	India	Ethiopia	Uganda	Colombia	Chile
Carbon market or ERPA activities (markets, innovation, convening)						
Renewable energy	X	X	X	X	X	X
Energy efficiency	X	X			X	
Forestry/Agriculture	X	X	X	X	X	X
Waste management	X	X			X	X
Industrial gases	X					
ASA activities (capacity building, thought leadership, convening)						
Market readiness (PMR)	X	X			X	X
REDD+ readiness (FCPF/ISFL)			X	X	X	X
Other capacity building (CF-Assist)		X	X		X	X

Note: ASA = Advisory Services and Analytics (including economic and sector work); CF-Assist = Carbon Finance Assist; ERPA = Emission Reduction Purchase Agreement; FCPF = Forest Carbon Partnership Facility; ISFL = Initiative for Sustainable Forest Landscapes; PMR = Partnership for Market Readiness; REDD+ = Reducing Emissions from Deforestation and Forest Degradation in Developing Countries.

- iv. **Econometric analysis.** The evaluation took advantage of the global UNEP DTU CDM database to assess whether the World Bank Group–supported projects were different from other similar projects in terms of attained levels of emission reduction (CER issuances) and the rate of success in achieving expected levels of issuance during the first and second commitment periods (CP1, CP2). The analysis was done controlling for project and level (for example, effective crediting period, technology/sector, investment and the internal rate of return, and so on.) and country (for example, share of nonrenewable energy sources, electricity access, average per capita emissions, air pollution, forest cover) and regional effects (see appendix D for details).
- v. **Structured literature reviews (SLR) and desk reviews.** All SLRs are based on protocols that specify (in a concise manner) the search, identification, information extraction and synthesis processes of the literature reviews. The following desk reviews and SLRs were conducted:

- Desk review on architecture of World Bank Group CF initiatives, strategic objectives and activities (global/portfolio level; question 1.2)
 - Desk review on evolving stakeholder priorities at global and national levels and how the World Bank Group responded to changes in needs and priorities (global/portfolio level; question 2.1/2.2)
 - SLR on changes in markets and regulatory regimes from Kyoto to Paris and how the World Bank Group responded to such changes (global/portfolio level; question 2.1/2.2)
 - Desk review on World Bank Group country strategies (CAS/CPF) from 2000–2016 and national strategy documents relating to CF in case study countries (country level; question 2.1)
 - Desk review on the effectiveness of World Bank Group’s roles: catalyzing and developing markets, innovating CF, capacity building and convening and thought leadership in key global debates/platforms/during major events related to CF within the evaluation period (global/portfolio level; question 3.1)
 - SLR on the additionality of CDM/JI emission reductions (question 3.2).
 - SLR on the effectiveness of CDM projects in generating sustainable development cobenefits. 4
 - Desk review on the global institutional landscape in CF and how the World Bank Group distinguishes itself from other actors (websites and strategy documents of key institutions) (global/portfolio level; question 4.1).
- vi. **Interviews** were conducted at multiple levels of analysis covering the following stakeholder groups and levels using structured instruments:
- **World Bank Group staff and management** (global/portfolio level) on the nature and extent of the World Bank Group’s activities and main roles in CF, strategic objectives, alignment between strategies and activities, country needs and priorities in selected countries, effectiveness of the main roles, World Bank Group responsiveness to evolving needs and priorities (markets, regulatory regimes, priorities); and how World Bank Group has been able to leverage CF to reinforce its operations (questions 1.1, 1.2, 2.1, 2.2, 3.1, 4.2). a total of 12 directors/senior directors/managers and 17 fund managers and task team leaders with hands-on experience in CF projects were interviewed.
 - **World Bank Group stakeholders** (country level) on country’s needs and priorities, World Bank Group responsiveness to evolving needs (markets, regulatory regimes, priorities) in CF, effectiveness of the main roles the World Bank Group has been playing in CF, effectiveness of selected interventions, the institutional landscape of CF in selected countries, and the nature and extent of CF in reinforcing other World Bank Group operational activities (questions 2.1, 2.2, 3.1, 3.2, 4.1, and 4.2). This was complemented by interviews of selected global stakeholders (private, public sector, UNFCCC) on “needs and priorities” at the global level and responsiveness of the World Bank Group to the evolving needs of its clients.
 - **Expert interviews.** A selected group of CF/carbon market experts from think-tanks, universities, international agencies, private and public sectors were interviewed. Out of 20 experts identified and contacted, about 17 responded positively and were interviewed by a senior CF consultant or Independent Evaluation Group (IEG) staff with focus on the following questions.
 - Global emerging needs and priorities in CF (markets, regulatory regimes, client needs and priorities) (global/portfolio level; question 2.1)

- The effectiveness of the World Bank Group's roles including the convening role and thought leadership (in relation to other key institutions in the field) (global/portfolio level; question 3.1)
 - The global institutional landscape in CF and the role of the World Bank Group therein (global/portfolio level; question 4.1)
- vii. **PPARs** were conducted on two selected International Bank for Reconstruction and Development (IBRD) / International Development Agency (IDA) attached CF projects waste management (Brazil) and supply side energy efficiency on district heating (Bulgaria). These attempted to shed some light on the performance of blended CF activities where IEG currently does not have any project-level verified evidence (no PPARs conducted). These PPARs were selected to supplement case studies in the six countries with project-level evidence on issues related to effectiveness in demonstrating and promoting new technologies, the driving factors and constraints for delivering carbon emission credits or social and environmental cobenefits (questions 3.1 and 3.2) and the practical challenges and opportunities in combining CF to augment IDA/IBRD operations (question 4.2). Together with the SLR on additionality, the PPARs also provided useful insights on the extent to which the resulting emission reductions could be considered additional (meet stringent environmental integrity requirements).

Sampling and selection of countries, projects and stakeholders

To ensure acceptable levels of generalization of findings as well as trade-offs between depth and breadth of analysis, the evaluation carefully considered the following sampling/selection issues at multiple levels:

- **Selection of countries.** The countries for in-country data collection and analysis were purposively selected based on screening criteria to identify a set of countries that will give the best combination and diversity of CF cases (both carbon credit and ASA activities in the same country) to capture the relevant heterogeneity of the interventions and the socioeconomic, policy and biophysical context which could influence the outcomes. The sample was selected based on multistage criteria. In the first stage, 55 countries (out of 77 total) with at least one ERPA activity during the first 10 years were retained. In the second stage, 31 countries (out of 55) which hosted at least one ASA activity during the first 10 years were retained. The next level of screening retained 25 countries that hosted at least three projects during the past 10 years (2006–16). Additional criteria were applied to further narrow the sample considering:
 - Presence of Implementation Completion and Results Reports;
 - Presence of the most common CF operations (for example, sector, technologies used);
 - Potential to generate socioeconomic and environmental cobenefits;
 - Coverage and depth of capacity building (for example, PMR, CF-Assist, and Forest Funds);
 - Distribution of cases across regions and income groups; and
 - Presence of interventions pertaining to the selected intervention category(ies) for in-depth causal analysis.
- Applying these additional considerations to the 25 countries selected in third stage led to the purposive selection of six countries (two from Africa, Latin America and Asia) for case studies (see table B.3).⁵ This leaves out the Middle East and North Africa and Europe and Central Asia Regions mainly because of the limited diversity of CF activities (especially carbon market/ERPA and ASA activities in the same country) in these

regions. However, considering the available budget and time, only five countries were included for the in-depth causal analysis of case studies while all the six countries were included for the country-level analysis. Table B4 shows that the six countries together account for 30 percent of the ERPA and close to 20 percent of the ASA CF portfolio of the World Bank Group.

- **Selection of intervention subcategory(ies)** for in-depth causal analysis (table B2). The intervention subcategory selected for in-depth analysis was based inter alia on the following criteria: volume in portfolio, stakeholder demand, innovative nature of work, existing evidence on effectiveness and potential to generate comparable information across case studies.
- **Selection of specific interventions** (choice of specific ERPA activities). In the selection of specific interventions (projects under a given subcategory) for in-depth causal analysis, the comparability of the case across countries under the selected subcategory was taken into account. While the country-level analysis and the desk reviews attempted to cover the entire population of interventions (of the selected intervention category) in a particular country, in practice it was not possible to identify all the stakeholders and information on some projects was missing because of staff turnover or availability. Comparison of the World Bank Group CF portfolio in the country with the rest of the CDM portfolio based on UNFCCC data was used to see how the World Bank Group support compares to other CF activities in the country.
- **Selection of stakeholders** for interviews at the country level. Purposive samples of relevant stakeholder groups were developed for each interview exercise at country or intervention category level (see above). Taking into account time and resource constraints, the number of stakeholder interviews was optimized to allow for the largest diversity in coverage and coverage of key stakeholders at a minimum cost. The principles of triangulation and reaching the “point of theoretical saturation” was used to inform a decision on the number of interviews to be conducted.
- **Selection of experts** for interviews at the global level was based on purposive selection of professionals based on their knowledge of World Bank Group CF activities as well as evolution of the global needs and priorities from Kyoto to Paris and consideration of sectoral differences (for example, renewables, energy efficiency, Reducing Emissions from Deforestation and Forest Degradation in Developing Countries). The list of potential respondents was developed based on expert knowledge and consultation supplemented by LinkedIn and other profile search and included experts from academia, MDBs, bilateral donors, international organizations, climate think-tanks as well the private sector. Some of the experts were also interviewed separately as global stakeholders.

Table A.4. ERPA and ASA Activities in Selected Countries

Country (Income Group as of June 2017)	Region	Project Type	2000–05	2006–11	2012–17	Totals
China (UMIC)	EAP	ERPA	1	24 (+4 IFC)	1	30
		ASA	0	3 (+1 IFC)	2 (+1 IFC)	7
India (LMIC)	SAR	ERPA	1 IFC	12 (+5 IFC)	1	19
		ASA	0	4	2	6
Ethiopia (LIC)	AFR	ERPA	0	1	2	3
		ASA	0	2	3	5
Uganda (LIC)	AFR	ERPA	1	5	0	6
		ASA	0	3	0	3
Colombia (UMIC)	LCR	ERPA	3	4	1	8
		ASA	0	2	5	7
Chile (HIC)	LCR	ERPA	3	4	0	7
		ASA	0	3	1	4
Total		ERPA	9	59	5	73
		ASA	0	18	14	32

Note: SFR = Africa; ASA = Advisory Services and Analytics including economic and sector work studies; EAP = East Asia and Pacific; ERPA = Emissions Reduction Purchase Agreement; IFC = International Finance Corporation; LCR = Latin America and the Caribbean; LIC = low-income country; LMIC = lower-middle-income country; SAR = South Asia; UMIC = upper-middle-income country.

4. Limitations

Despite its unique and many strong features, the evaluation approach and methodology have some limitations.

Second, while this evaluation looked at carbon finance activities of the World Bank Group more comprehensively, it did not attempt to provide an in-depth evaluation of the performance of each of the different CF instruments separately. Wherever available, the evaluation combined evidence from external evaluations, previous IEG evaluations, interviews of external experts and World Bank Group staff and management and light reviews to arrive at performance assessment on selected capacity building and technical assistance initiatives (for example, CF-Assist, PMR, Forest Carbon Partnership Facility).

Third, because of budgetary limitations, the sampling design and the coverage of case study countries was limited to few country cases although the country-level analysis included major players including China and India.

Fourth, the case studies and country-level analysis in the field also did not cover all the relevant CF projects supported by the World Bank Group in the country. The interest was to understand the overall performance trends and challenges facing World Bank Group–supported CF activities rather than assessing and rating each activity separately.

Fifth, the qualitative causal analysis of case studies does not cover all the different technology groups or sectors in a given country. The selected technologies and sectors were targeted based on an underlying and nested theory of change which requires consistent data collection for comparative analysis across countries. While the main technologies

and sectors relevant at the global level were selected to capture the overall diversity and heterogeneity in the ERPA activities, this does not allow full coverage and may limit generalizability across the entire ERPA portfolio.

Sixth, the Multilateral Investment Guarantee Agency guarantees for CDM projects do not require the World Bank Group to become an active player in commercializing or buying the resulting emission reductions and hence the computed GHG reductions from CF activities of the World Bank Group do not include any such emission reductions.

Finally, the evaluation did not fully investigate the “trustee” role of the World Bank Group which includes the hosting, fiduciary, governance and program management aspects in managing the different CF trust funds and facilities. Only the existing governance arrangements in terms of the decision-making mechanisms in the selection and approval of carbon projects and funds and the monitoring and evaluation systems to facilitate accountability and learning were reviewed.

In addition to these overall limitations, the specific limitations of each of the methods used are also further described under the relevant sections (for example, portfolio reviewed and analysis, appendix B; causal analysis, appendix C; econometric analysis, appendix D).

¹ The Kyoto Protocol's flexible mechanisms were developed with the aim of mitigating climate change while at the same time contributing to sustainable development in host countries. Accordingly, the cobenefits from CF include the additional benefits beyond climate change mitigation in terms of improvements in public health, education, energy security, increased income from employment or higher productivity, and environmental sustainability gains that contribute to sustainable development in host countries. The cobenefits linked to CDM projects may include: (i) enhanced local infrastructure (for example, roads, health clinics, schools, water, parks, community centers); (ii) access to cleaner and affordable energy for heating and/or cooking; (iii) improved income and employment; (iv) improved access to electricity and/or energy-efficient lighting; and (v) improved natural resource and environmental services (for example, reduced pollution, natural resource conservation, forest protection, biodiversity).

² Since the Independent Evaluation Group does not validate standard Carbon Finance self-evaluations, there are only 8 Implementation Completion and Results Report Reviews on carbon finance activities attached to International Bank for Reconstruction and Development/International Development Agency operations. Project Performance Assessment Reports were conducted only on selected projects based on existing Implementation Completion and Results Report Reviews.

³ For simplicity, we refer to the complex carbon market activities for establishment of ERPAs that involve development of the required market architecture for carbon credit transactions to occur as “ERPA”. The signing of the transaction agreement (ERPA) on its own does not however capture the associated activities involved in establishing the institutional architecture for creating and operationalizing the underlying carbon markets, especially at the early stages where significant learning and experimenting was needed to catalyze carbon markets.

⁴ The structured literature reviews did not attempt to causally isolate the effects of carbon projects on emission reductions or cobenefits. They (i) looked at the literature on “additionality” and how it was used to ensure ‘environmental integrity’ of achieved levels of emission reductions, and how this varied across projects, technologies and sectors; and (ii) reviewed the existing evidence on social and environmental cobenefits associated with CF projects.

⁵ Within the limited resources available for case studies, the selected countries allowed capturing the existing diversity of the key CF interventions (ERPA/ASA activities) within the same country as well as generating comparable data using similar and consistent methodologies from different socio-economic and policy environments.

Appendix B. Portfolio Review and Analysis

1. World Bank Group Support for Carbon Finance, FY00–17: A Snapshot

1.1 Defining and identifying the portfolio between the evaluation period

The first step in defining the scope of the carbon finance (CF) evaluation was to identify all World Bank Group interventions that involved support for CF activities between FY00–17. Based on the selection criteria outlined in the Approach Paper and illustrated in table B.1, the following two types of CF interventions were identified:

- i. Carbon market or Emission Reduction Purchase Agreement (ERPA) related projects consist of activities that aim to mitigate GHG emissions by purchasing carbon credits through interventions that deploy clean low-carbon technologies or replacing or modernizing activities and processes that improve energy efficiency or environmental performance and reduce GHG emissions.
- viii. World Bank CF Advisory Services and Analytics (ASA) and International Finance Corporation (IFC) Advisory Services (AS) activities consist of technical assistance, training or analytical work that aim to strengthen regulations, build capacity for specific CF initiative development and national readiness strategies, and piloting of carbon pricing policy instruments.

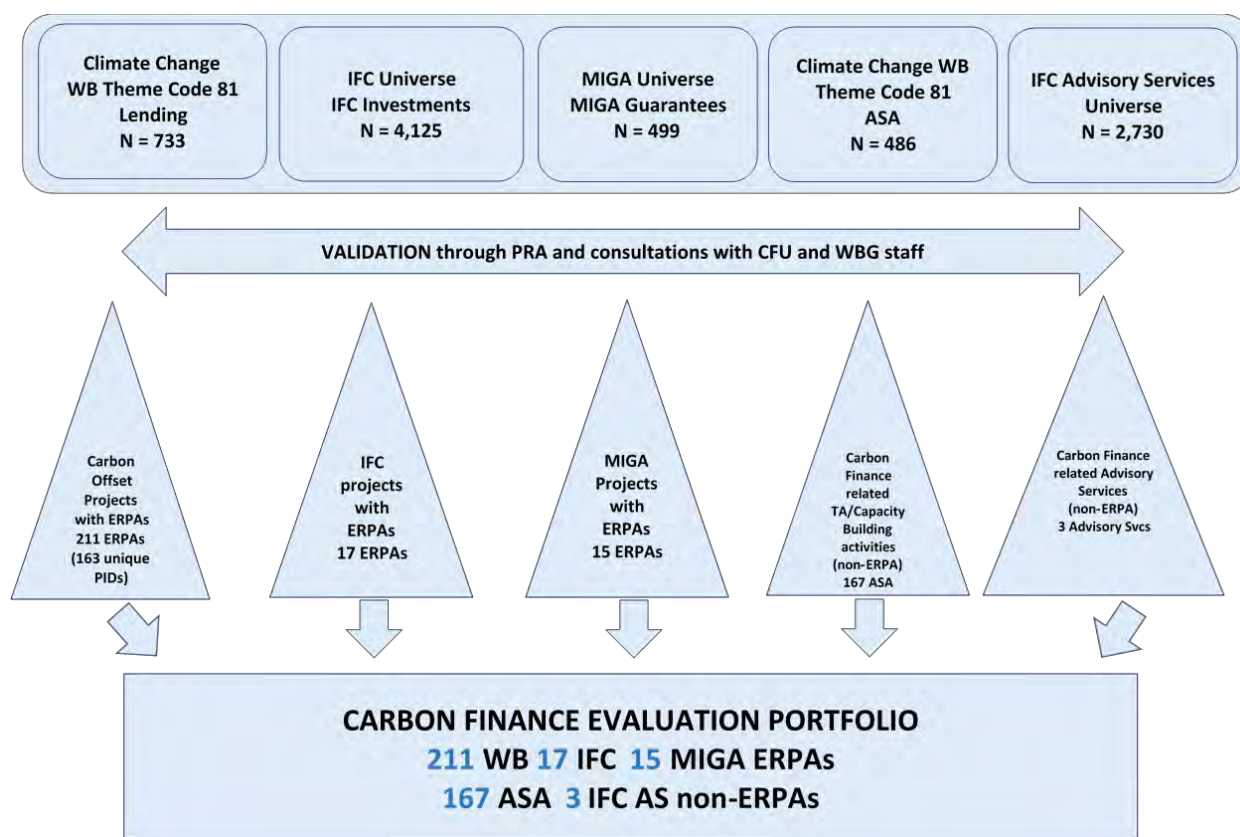
Table B.1. Carbon Finance Portfolio Identification Summary

Institution/CF intervention	World Bank	IFC	MIGA
(1) ERPA related projects	Institutional data from A. Business Intelligence Lending report: (i) Climate change theme code 81 (ii) Carbon Offset product line B. Carbon Finance Unit database	Institutional data from A. IFC Management Information System: (i) Text analytics (ii) IFC Climate Finance team	Institutional data from: A. MIGA Portal B. MIGA Environment, Social and Integrity team
(2) ASA and IFC AS	Business Intelligence AAA report: (i) <i>Climate change</i> theme code 81 (ii) Text analytics	AS Operational Portal: Text analytics	n/a

Note: AS = Advisory Services; ASA = Advisory Services and Analytics; CF = carbon finance; ERPA = Emission Reduction Purchase Agreement; IFC = International Finance Corporation; MIGA = Multilateral Investment Guarantee Agency.

Given the absence of a coordinated system for tracking all the World Bank Group support for CF activities, the portfolio was constructed through a multistage process involving sourcing, triangulation and validation of data from all available sources (that is, literature review, consultations with experts and World Bank Group staff). Figure B.1 below describes the overall portfolio identification process.

Figure B.1. Process for Identification of the Carbon Finance Portfolio



Source: Independent Evaluation Group portfolio review.

1.2 Portfolio distribution by World Bank Group and Global Practices

The World Bank Group has been involved in the design and implementation of CF projects as well as the development of carbon markets and delivery of AS and capacity building in developing countries. The portfolio analysis showed that the World Bank Group has undertaken 243 ERPAs from 2000–2017. Similarly, the World Bank Group has also implemented 167 World Bank ASA and 3 IFC AS projects for delivery of advisory services and capacity building (table B.2).

The IFC CF investment portfolio consists of 17 carbon credit projects (mostly renewable energy) that enable clients to sell carbon credits to IFC under the Kyoto mechanisms. It also offers three AS. IFC also had a specialized carbon finance-specific product, Carbon Delivery Guarantee (CDG), which provided risk cover for companies that are unwilling to take risks in emerging markets for buying carbon credits and for companies in developing countries selling carbon credits wanting an opportunity to access a wider range of potential buyers. The IFC AS projects provide technical assistance and capacity building to clients for acquiring new skills and tools to expand their internal procedures to incorporate CF or to support use of new approaches and broaden market participation in carbon markets.

The Multilateral Investment Guarantee Agency (MIGA) portfolio consists of 15 projects —mostly in Renewable Energy— providing guarantees that cover risks of expropriation, war and civil disturbance and breach of contract—for example, the government's commitment under a Letter of Approval for the undertaking of a CDM carbon emission reduction.

project in a given country. MIGA guarantees are important carbon market innovations and provide an insurance mechanism but do not create demand for carbon credits.

Table B.2. Carbon Finance Initiatives by Institution (Calendar Year)

Institution	Amount (\$, millions)	2000–05		2006–11		2012–17		Total	
		ERPA (no.)	ASA (no.)	ERPA (no.)	ASA (no.)	ERPA (no.)	ASA (no.)	ERPA (no.)	ASA (no.)
World Bank	4,288.7	32	2	147	78	32	87	211	167
IFC	443.12	3	0	13	2	1	1	17	3
MIGA	2,253.5	0	0	1	0	14	0	15	0
Total	6,985.32	35	2	161	80	47	88	243	170

Source: Independent Evaluation Group portfolio review and Carbon Finance Unit (World Bank), IFC, and MIGA.

Note: There are 243 ERPAs (211 World Bank + 17 IFC + 15 MIGA) but 195 emission reduction projects (unique project IDs), indicating that some projects contract more than one entity to supply the required volume of carbon credits. ASA include capacity building and advisory activities such as technical assistance, training and analytical studies. The amount shown for MIGA is the value of the gross exposure for the guarantees. ASA = Advisory Services and Analytics; ERPA = Emission Reduction Purchase Agreements; IFC = International Finance Corporation; MIGA = Multilateral Investment Guarantee.

1.3 Evolution of CF Activities Over Time

The evolution of CF at the World Bank Group could be seen in four phases—each addressing different major needs, priorities and/or challenges. As table B.2 shows, most of the ERPAs were signed in the 2006–11 period while most of the ASAs were implemented in the 2012–17 period, respectively. The 2006–11 period (also referred to as the “gold rush” period) is when the carbon markets are most active and the post-2012 period is when the carbon markets are on the decline and therefore technical assistance and capacity building activities were more in demand. Figure B.2 shows how CF evolved in the World Bank Group over different periods considering the demonstration of emission reductions using different technology types. Similarly, figure B.3 illustrates the architecture and evolution of CF in the World Bank Group through the development of various CF vehicles during different periods as the World Bank Group responded to varying needs, priorities and/or challenges. The portfolio was mapped under these phases in calendar years to reflect the inflection years for the carbon markets (2006 and 2012) and to align the projects accurate to the global phenomena and facility implementation years.

2000–05

During this period, the main interest of the World Bank Group was to catalyze and kick-start the global carbon market. The process started with Prototype Carbon Fund (PCF) which helped prototype the carbon market and pilot the CDM/JI as the market mechanisms of the Kyoto Protocol. A total of 11 CF initiatives were developed during this period, including two by IFC. Some initiatives such as CF-Assist focused on capacity building to support countries participate in carbon markets. The Community Development Carbon Fund (CDCF) and BioCarbon Fund (BioCF) were keen in supporting small-scale mitigation efforts that also generate cobenefits for sustainable development, especially in poor communities. The 35 ERPAs during this period were mostly implemented by the PCF in the Latin America and the Caribbean region. The ERPAs were also predominantly implemented by the private sector and were concentrated in Renewable Energy projects (mostly hydro). About 49 percent of these ERPAs produced fully delivered emission reductions (combining fully delivered and closed) within the contracted period.

2006–11

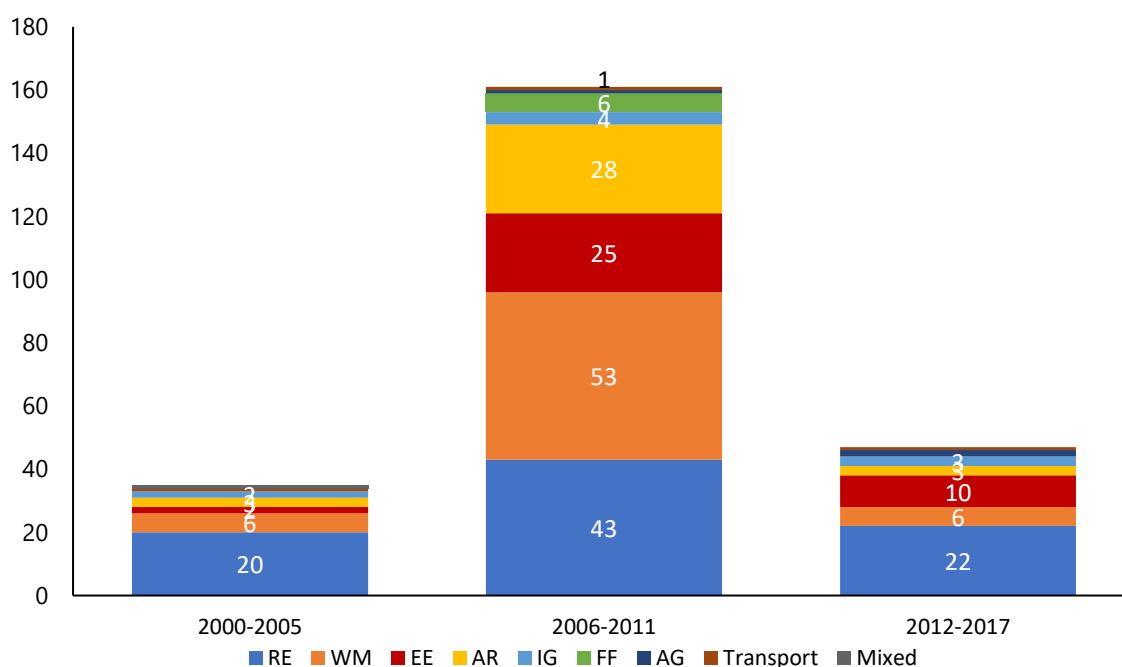
The World Bank Group developed eight CF initiatives during this period, including two by IFC. Some of the initiatives such as Forest Carbon Partnership Facility (FCPF) targeted capacity building to support carbon market participation in the forestry sector through Reducing Emissions from Deforestation and Forest Degradation in Developing Countries

(REDD+). The Partnership for Market Readiness (PMR) was also developed to support domestic carbon markets and carbon pricing efforts in certain countries with potential to develop domestic emission trading schemes (ETS) or carbon taxes with carbon offsets. Its activities were more relevant under the post-2011 situation following the drastic fall in carbon prices which prompted the World Bank to re-orient its efforts toward domestic markets. The Umbrella Carbon Facility-Tranche 2, launched in 2011, aimed to provide demand for stranded supply of emission reductions while credit prices are variable and were not intended to stabilize markets. IFC developed the CDG instrument in 2007 and the P12CF in 2011. About two-thirds of the ERPA portfolio was signed during this period as a response to the growing demand for carbon credits and expansion of the carbon market after 2005. Over one-third of the projects were in Waste Management and about a third were in Renewable Energy (figure B.2). In terms of income group, these ERPAs were mostly in middle-income countries (MICs). CF initiatives: CDCF, BioCF, the Spanish Carbon Fund, and Netherlands Clean Development Mechanism Facility were most active during this time in supporting ERPAs.

2012–16

The decline of the carbon markets prompted the World Bank Group to develop initiatives to limit the negative impacts of the carbon market crisis. The PAF aimed to provide price insurance to some affected projects. The PMR moved strongly in building capacity for domestic carbon pricing instruments. IFC closed its CF business following the credit price collapse. As a result, the World Bank signed fewer ERPAs primarily with the private sector. MIGA has provided most of its CF guarantees (14 ERPAs) during this period supporting renewable energy projects.

Figure B.2. Evolution of Carbon Finance Activities by Technology During Different Phases (Calendar Year)



Source: Independent Evaluation Group portfolio review.

Note: AG = sustainable land management (agriculture); AR = afforestation or reforestation; EE = energy efficiency; FF = fossil fuel switch; IG = industrial gases; Mixed = EE+RE; RE = renewable energy; WM = waste management/methane.

Post-Paris Agreement (2017 to Present)

After the signing of the Paris Agreement, the World Bank developed three CF initiatives—Transformative Carbon Asset Facility (TCAF), Carbon Pricing Leadership Coalition (CPLC) and Networked Carbon Markets as part of its effort to support the post-Paris process. TCAF and CPLC were launched at COP21 during the 2015 Paris Climate Conference. TCAF was set up to assist countries to develop large-scale mitigation activities using new approaches such as sectoral, programmatic and policy crediting under article 6 of the Paris framework. The CPLC provides a convening function and a platform for government, business and civil society leaders to exchange experience. IFC also indirectly returned to the carbon markets by launching its first pilot on Forests Bonds to buy carbon credits from REDD+ activities linked to capital markets.

Figure B.3. Architecture and Evolution of Carbon Finance Vehicles at the World Bank Group



Source: Independent Evaluation Group literature and portfolio review.

1.4 Portfolio distribution by CF vehicles

Table B.3 describes the breakdown by Global Practice or cross-cutting solutions area (CCSA) compared with the rest of approved World Bank Group projects during the same period. The Environment and Natural Resources and Energy and Extractives Global Practices account for the largest share for both ERPA and ASA activities followed by the Climate Change CCSA. These activities were supported through several CF funds and vehicles implemented across many developing countries. Table B.4 illustrates each CF funds and vehicles, total funding amount and volume of ERPA and Non-ERPA projects across three phases.

Table B.3. World Bank Group Climate Change and Carbon Finance Commitments, by Global Practice or Sector, FY00–17

Global Practice, CCSA, or Sector	Climate Change Projects ^a	Carbon credit Projects (P-Codes)	Carbon Credit Activities (ERPAs) ^b	Non-lending and Non-ERPA projects ^c	Carbon Credit Activities (ERPAs) ^d	Non-lending and Non-ERPA projects ^e	Carbon Credit Activities (ERPAs) ^f
Agriculture (World Bank)/Agribusiness (MIGA)	54	8	10	10			1
Climate Change	9	15	23	24			
Climate Business/Finance (IFC)					12	1	
Education	3						
Energy & Extractives	305	58	75	19			
Environment & Natural Res.	229	65	80	107			
Finance & Markets	2						
Financial Institutions Group (IFC)						2	
Macro-Economics & Fiscal Management	5						
Power (MIGA)							13
Social Protection & Labor	1						
Solid Waste Management (MIGA)							1
Social, Urban, Rural and Resilience	62	15	16	7			
Trade & Competitiveness	2						
Transport & ICT	40	3	4				
Water	18	2	2				
Other/Not assigned	3	1	1		1		
Infrastructure (IFC)					1		
Manufacturing, Agribusiness & Services (IFC)					3		

Appendix B
Portfolio Review and Analysis

Total	733	167	211	167	17	3	15
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Sources: Business Intelligence, MIS, ASOP. Fiscal Year was used for identification purposes.

Note: CCSA = cross-cutting solution area; ERPA = Emission Reduction Purchase Agreement; IFC = International Finance Corporation; MIGA = Multilateral Investment Guarantee Agency.

a. World Bank projects relevant to climate change with theme code 87. Carbon finance portfolio includes carbon market activities including purchase of carbon credits (ERPA activities) and other activities targeting capacity building and partnerships (non-ERPA activities). The latter group includes ASA activities—technical assistance, training and analytical studies.

b. Emission Reduction Purchase Agreements (ERPA).

c. Non-ERPA ASA activities include projects targeting capacity building and technical assistance and advisory services.

d. IFC Investment projects provided by IFC.

e. IFC Advisory Services validated by IFC.

f. MIGA portfolio based on projects identified through expert consultation and validation by MIGA.

Table B.4. Carbon Finance Portfolio, by Vehicle

Carbon Finance Vehicle (Year)	Total Funding (\$, millions equivalent)	2000-05		2006-11		2012-17		Total ER EAs	Total ASA
		EA	Non- EA	EA	Non- EA	EA	Non- EA		
1. PCF (2000)	185.4	18	1	5	1	1	0	24	2
2. IFC INCaF ^a (2002)	89.2	3	0	7	0	0	0	10	0
3. World Bank NCDMF ^a (2002)	93.7	7	1	10	1	0	0	17	2
4. CDCF (2003)	92	4	0	32	6	0	0	36	6
5. ICF (2003)	155.6	0	0	6	0	0	0	6	0
6. SCF T1 and T2 (2004)	290	1	0	26	0	6	1	33	1
7. BioCF– T1 and T2 (2004)	90.4	0	0	31	24	6	6	37	30
8. IFC NECaF ^a (2004)	35.8	0	0	2	0	0	0	2	0
9. World Bank NECaF ^a (2004)	22.3	0	0	4	0	0	0	4	0
10. DCF ^a (2005)	69.6	0	0	9	0	0	0	9	0
11. CF-Assist (2005)	22.09	0	0	0	28	0	17	0	45
12. UCF ^a (T1, 2006; T2, 2010)	1,113	2	0	14	0	1	0	17	0
13. IFC CDG (2007)	99.5	0	0	3	0	0	0	3	0
14. CFE ^a (2007)	32.5	0	0	8	0	1	0	9	0
15. FCPF (2008)	1,100	0	0	0	15	0	20	0	35
16. CPF ^a (2009)	133.7	0	0	2	1	7	3	9	4
17. PMR (2010)	127	0	0	0	2	0	30	0	32
18. CI-DEV (2011)	125	0	0	0	0	10	3	10	3
19. IFC P12CF ^a (2011)	205.1	0	0	1	0	0	0	1	0
20. BioCF ISFL–T3 ^a (2013)	353.7	0	0	0	0	0	5	0	5
21. PAF ^b (2013)	53	0	0	0	0	0	0	0	0

Carbon Finance Vehicle (Year)	Total Funding (\$, millions equivalent)	2000-05		2006-11		2012-17		Total ER EAs	Total ASA
		EA	Non- EA	EA	Non- EA	EA	Non- EA		
22. TCAF ^c (2016)	220	0	0	0	0	0	0	0	0
23. IFC FB (2016) ^d	12	0	0	0	0	1	0	1	0
24. CPLC (2016)	3.9	0	0	0	0	0	1	0	1
25. NCM (2016)	5.81	0	0	0	0	0	1	0	1
26. MIGA	2,253.5	0	0	1	0	14	0	15	0
27. IFC AS	1.52	0	0	0	2	0	1	0	3
Total	6,985.32	35	2	161	80	47	88	243	170
World Bank Total	4,288.7	32	2	147	78	32	87	211	167
IFC Total	443.12	3	0	13	2	1	1	17	3
MIGA Total	2,253.5	0	0	1	0	14	0	15	0

Source: Independent Evaluation Group summary based on World Bank Group data. Calendar Year was used for accurate analysis of portfolio.

Note: AS = Advisory Services; ASA = Advisory Services and Analytics; BioCF = BioCarbon Finance; CDCF = Community Development Carbon Fund; CDG = Carbon Delivery Guarantee; CF-Assist = Carbon Finance Assist; CFE = Carbon Fund for Europe; Ci-Dev = Carbon Initiative for Development; CPF = Carbon Partnership Facility; CPLC = Carbon Pricing Leadership Coalition; DCF = Danish Carbon Fund; EA = Emission Reduction Purchase Agreement; ER = emission reduction; FB = Forests Bond; FCPF = Forest Carbon Partnership Facility; IFC = International Finance Corporation; INCaF = IFC Netherlands CDM Facility; ISFL = Initiative for Sustainable Forest Landscapes; ICF = Italian Carbon Fund; MIGA = Multilateral Investment Guarantee Agency; NCDMF = Netherlands Clean Development Mechanism Facility; NECaF = Netherlands European Carbon Facility; NCM = Networked Carbon Markets; P12CF = Post-2012 Carbon Facility; PAF = Pilot Auction Facility; PCF = Prototype Carbon Fund; PMR = Partnership for Market Readiness; SCF = Spanish Carbon Fund; T = tranche; TCAF = Transformative Carbon Asset Facility; UCF = Umbrella Carbon Facility.

a. Euro denominated funds (including adjustments for exchange rate movements, extra fees, and changes in capitalization)..

b. Final target is to reach \$100 million.

c. Final target is to reach \$500 million.

d. Includes total capitalization of the Bond (not amount allocated to Reducing Emissions from Deforestation and Forest Degradation in Developing Countries credits). Carbon Pricing Leadership Coalition, Initiative for Sustainable Forest Landscapes, NCM, and IFC Forests Bond are included in the portfolio mainly to look at their design features and strategic directions but not evaluated. The IFC Advisory Services portfolio is not linked to a particular Fund/Facility because they are implemented primarily for IFC business development activities. The MIGA portfolio is also not linked to Carbon Funds or Facilities and only include guarantees to ERPA projects. The MIGA commitments are in gross exposure (\$M) for guarantees provided to CDM projects.

1.5 ASA Portfolio and Activities by CF Vehicle

Carbon finance ASA activities consists of technical assistance, training, analytic work on carbon pricing policy, programmatic approach, knowledge management forums, capacity building for CF initiative development and national readiness strategies. The Independent Evaluation Group (IEG) identified 170 such ASA activities of which 64 were active and 20 closed. Notably, there are 39 ERPAs that have technical assistance, training or capacity building components. The ASA portfolio is predominantly implemented by the CF-Assist, FCPF, PMR and BioCF CF vehicles to build capacity in support of various objectives. Table B.5 shows the distribution of the ASA activities by CF vehicle.

Table B.5. Advisory Services and Analytics Portfolio Distribution by Fund or Facility and Status

Fund or Facility	Active	Closed/Complete	Dropped	Pipeline	Total
BioCF	22	7		1	30
CDCF	2	4			6
CF-Assist	11	27	7		45
Ci-Dev	1	1		1	3
CPF	3	1			4
CPLC	1				1
FCPF				35	35
ISFL	1		1	3	5
NCDMF	2				2
NCM	1				1
PCF	1	1			2
PMR	18	5	6	3	32
SCF		1			1
IFC AS	1	2			3
Total	64	40	14	43	170

Source: Independent Evaluation Group portfolio review based on World Bank data (Carbon Finance Unit, OP, and BI).

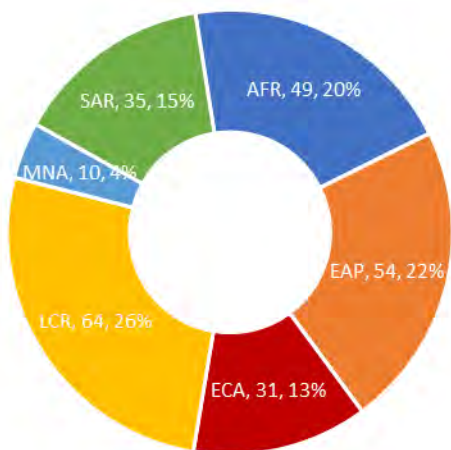
Note: AS = Advisory Services; BioCF = BioCarbon Fund; CDCF = Community Development Carbon Fund; Ci-Dev = Carbon Initiative for Development; CPLC = Carbon Pricing Leadership Coalition; FCPF = Forest Carbon Partnership Facility; ISFL = Initiative for Sustainable Forest Landscapes; NCDMF = Netherlands Clean Development Mechanism Facility; NCMs = Networked Carbon Markets; PCF = Prototype Carbon Fund; SCF = Spanish Carbon Fund.

1.6 Portfolio Distribution by Region

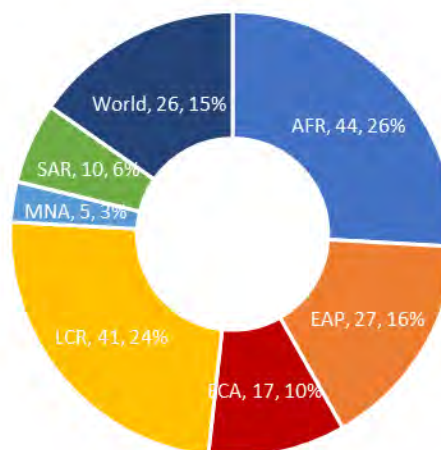
The distribution of the carbon market activities (ERPAs) is evenly distributed between Latin America and the Caribbean, East Asia and Pacific, and Africa Regions. More than a quarter of the total number of carbon credit contracts are in the Latin America and the Caribbean Region, mostly in Brazil, Mexico, and Chile. About 22 percent are in East Asia and Pacific, especially in China, Indonesia, and the Philippines. About 20 percent are in Africa, 15 percent in South Asia, 13 percent in Europe and Central Asia and 4 percent in MNA. For ASA activities, the Africa Region (26 percent) and Latin America and the Caribbean Region (24 percent) account for half of the total number of activities (figure B.4).

Figure B.4. Total Carbon Finance Projects and Commitments, by Region (\$, millions)

a. Total ERPA Projects by Region CY00–16 (n = 243)



b. Total ASA Projects by Region CY00–16 (n = 170)



Source: Independent Evaluation Group portfolio review and Carbon Finance Unit.

1.7 Portfolio distribution by technology and income group

Table B.6 shows the distribution of technology across World Bank Group institutions in which 35 percent of the activities are in the renewable energy sector, followed by waste management/methane avoidance (27 percent), and energy efficiency (15 percent), and afforestation/reforestation (14 percent). These sectors jointly account for a little over 90 percent of the carbon credit projects (numbers). Table B.7 presents the portfolio distribution by mechanisms and technology. Close to 90 percent of the ERPAs were in CDM and 5 percent in JI. Verified Carbon Standards accounted for 2 percent and the Green Investment Schemes (GISs) for 4 percent.

Table B.6. ERPA Activities by Technology.

Technology or Type	IBRD/IDA	IFC	MIGA	Total	Percent
Energy efficiency	35	2	0	37	15
Renewable energy	65	7	13	85	35
Afforestation/Reforestation	32	1	1	34	14
Agriculture	3	0	0	3	1
Waste Management /Methane	57	7	1	65	27
Industrial gases	9	0	0	9	4
Fossil fuel switch	6	0	0	6	2
Transport	3	0	0	3	1
Mixed	1	0	0	1	0
Total	211	17	15	243	100

Source: Independent Evaluation Group portfolio review.

Note: ERPA = Emission Reduction Purchase Agreements; IBRD = International Bank for Reconstruction and Development; IDA = International Development Agency; IFC = International Finance Corporation; MIGA = Multilateral Investment Guarantee.

In addition, 77 percent and 63 percent of the ERPA and ASA portfolio, respectively, is hosted in lower-middle-income countries and upper-middle-income countries (UMICs). Only about 12 percent of the ERPAs and 15 percent of the ASAs were in low-income countries (LICs). Figure B.5 illustrates the distribution for both types of CF interventions and table B.8 illustrates the distribution by CF vehicle. The main vehicles targeting LICs are the Ci-Dev, CDCF, and BioCF CDCF and BioCF were designed to respond to the needs and priorities of poor communities in LICs and MICs. Unlike the World Bank, IFC did not target the LICs and targeted mainly the lower-middle-income countries. The same is true for MIGA although it had one ERPA in LICs.

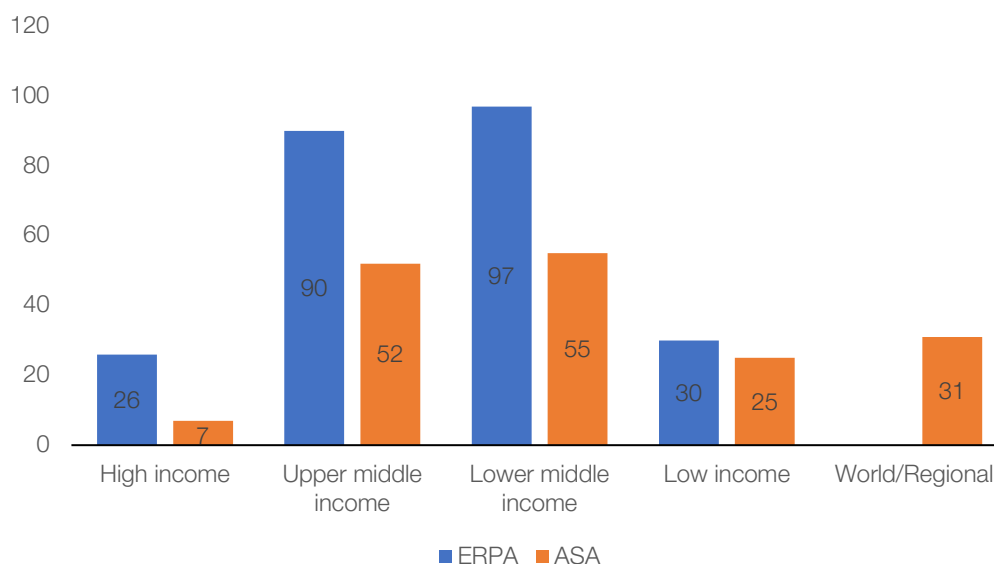
Table B.7. World Bank Group ERPA Portfolio Distribution by Mechanism and Technology

Technology	CDM	JI	GIS	VCS	Total	Percent
AGRI	0	0	0	3	3	1
A/R	30	1	0	3	34	14
EE	27	2	8	0	37	15
FF	4	2	0	0	6	2
IG	9	0	0	0	9	4
Mixed	0	1	0	0	1	0.4
RE	81	4	0	0	85	35
Transport	3	0	0	0	3	1
WM	62	2	1	0	65	27
Total	216	12	9	6	243	100
Percent	89	5	4	2	100	

Source: Independent Evaluation Group portfolio review and Carbon Finance Unit.

Note: AGRI = sustainable land management (agriculture); A/R = afforestation or reforestation; EE = energy efficiency; ERPA = Emission Reductions Purchase Agreement; FF = fossil fuel switch; GIS = Green Investment Scheme; IG = industrial gases; Mixed = EE+RE; RE = renewable energy; VCS = Verified Carbon Standard; WM = waste management/methane.

Figure B.5. Carbon Finance Portfolio Distribution by Client Country Income Level



Source: Independent Evaluation Group portfolio review and Carbon Finance Unit.

Note: ASA = Advisory Services and Analytics; ERPA = Emission Reductions Purchase Agreement.

Table B.8. ERPA Portfolio by Carbon Finance Instrument and Income Group of Target Countries

CF Instrument	Institution	Low Income	Lower Middle Income	Upper Middle Income	High Income	Total
Ci-Dev	World Bank	9	1			10
CDCF	World Bank	7	19	10		36
BioCF	World Bank	7	14	13	3	37
UCF	World Bank	3	7	6	1	17
PCF	World Bank	1	4	13	6	24
CPF	World Bank	1	6	2		9
SCF	World Bank	1	6	18	8	33
NECaF	World Bank		2		2	4
NCDMF	World Bank		7	8	2	17
DCF	World Bank		5	4		9
ICF	World Bank		3	2	1	6
CFE	World Bank		3	3	3	9
CDG	IFC		2	1		3
INCaF	IFC		4	6		10
Post-2012	IFC		1			1
NECaF	IFC		2			2
Forests Bond	IFC		1			1
MIGA	MIGA	1	10	4		15
Grand Total		30	97	90	26	243

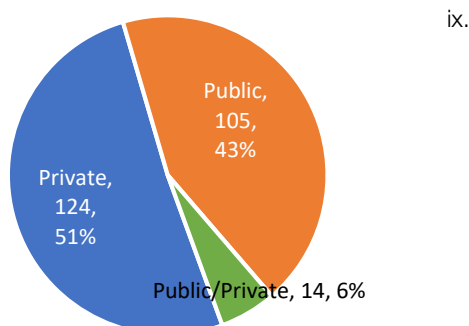
Source: Independent Evaluation Group portfolio review and Carbon Finance Unit.

Note: ASA = Advisory Services and Analytics; CDCF = Community Development Carbon Fund; CF = carbon finance; Ci-Dev = Carbon Initiative for Development; ERPA = Emission Reduction Purchase Agreements; ICF = Italian Carbon Fund; IFC = International Finance Corporation; INCaF = IFC-Netherlands Carbon Facility; MIGA = Multilateral Investment Guarantee; NCDMF = Netherlands Clean Development Mechanism Facility; PCF = Prototype Carbon Fund; SCF = .

1.8 Private and public sector engagement in CF

While the public sector plays an important role in reducing GHG emissions, the volume of funding required to support low-carbon investments and raising the mitigation ambition requires active participation of the private sector. More than half of the ERPA portfolio was implemented by the private sector between CY00–17. A total of 14 projects were executed by Public-Private partnerships mostly in Latin America and the Caribbean and AFR regions (figure B.6).

Figure B.6. ERPA by Type of Implementing Entity



Source: Independent Evaluation Group portfolio review and United Nations Framework Convention on Climate Change project documents.

1.9 Portfolio distribution by carbon market mechanism

Tables B.9 and B.10 present the CF portfolio by the Kyoto mechanisms, indicating that most of the ERPAs were under the CDM while JI accounted for few projects. Some ERPAs were also outside the Kyoto compliance markets using VCS. This includes agriculture and sustainable land management, REDD+ and related projects that generate carbon assets for voluntary markets or early phase carbon market projects undertaken before the CDM-JI validation systems were put in place.

Table B.9. Portfolio Distribution by Mechanism and Type of Project

Period	CDM		JI	GIS	VCS	Total
	PA	PoA				
Catalyzing Carbon Markets (2000–05)	19	-	6	1	-	26
Building and Expanding Markets (2006–11)	124	9	6	2	4	145
Mitigating the Impact of Market Crisis (2012–16)	38	26	-	6	3	72
Total	181	35	12	9	6	243

Source: Independent Evaluation Group portfolio review and Carbon Finance Unit.

Note: CDM = Clean Development Mechanism; PA= Project Activity; PoA = Program of Activities; JI= Joint Implementation; GIS = Green Investment Scheme; VCS = Verified Carbon Standard.

Table B.10. Portfolio Summary by Mechanism and World Bank Group Institution.

World Bank Group	CDM					Total
	PA	PoA	JI	GIS	VCS	
World Bank	152	32	12	9	6	211
IFC	16	-	-	-	1	17
MIGA	12	3	-	-	-	15
Total	181	35	12	9	6	243

Source: Independent Evaluation Group portfolio review and Carbon Finance Unit.

Note: CDM = Clean Development Mechanism; GIS = Green Investment Scheme; IFC = International Finance Corporation; JI = Joint Implementation; MIGA = Multilateral Investment Guarantee Agency; PA = Project Activity; PoA = Program of Activities; VCS = Verified Carbon Standard.

2. ERPA Portfolio Analysis

2.1 Blending of CF with IDA/IBRD Projects

i. Definition: ERPAs With a World Bank Lending Related Project

Unlike the stand-alone CF activities, blended CF projects are actively linked with other World Bank Group financed projects (for example, IDA, IBRD). In this case, the World Bank Group buys credits from activities tied to its own operations. Table B.11 shows the extent of packaging or blending of CF ERPAs with other World Bank lending operations. About 21 percent of the total number of ERPAs (52) activities are blended with World Bank Group lending operations. On the other hand, only 5 percent of the ASA activities are blended. IFC has five blended projects and MIGA has four blended project guarantees including two involving both the World Bank and IFC (joint noncarbon finance projects). Tables B.12 shows emission reductions generated by these projects and the success rates against its targets. Without attribution of causality as this does not control for multiple factors, the success rates for blended projects are lower. As the World Bank Group moves toward integration of CF into its programs and operations, it would be key to identify ways to enhance the success of integrated projects.

Table B.11. Blending Status of ERPA Projects across World Bank Group Institutions

World Bank Group	Stand-Alone (no.)	Blended (no.)	Total (no.)	Stand-Alone (percent)	Blended (percent)
World Bank	168	43	211	80	20
IFC	12	5	17	71	29
MIGA	11	4	15	73	27
Total	191	52	243	78.6	21.4

Note: ERPA = Emission Reduction Purchase Agreements; IFC = International Finance Corporation; MIGA = Multilateral Investment Guarantee.

Table B.12. Achieved Emission Reductions by Ownership and Blending Status (tCO₂e, thousands)

ERPAs	Blended Total ERs	Stand- alone Total ERs	Total	Blended (percent achieved)		Stand-Alone (percent achieved)	
				Under Original ERPA	Under Last Amended ERPA	Under Original ERPA	Under Last Amended ERPA
Private	2,289	151,613	153,902	19	21	73	84
Public	5,850	47,121	52,970	30	37	54	66
Private-Public	823	2,770	3,593	36	44	61	73
Total	8,962	201,503	210,465	27	32	65	76

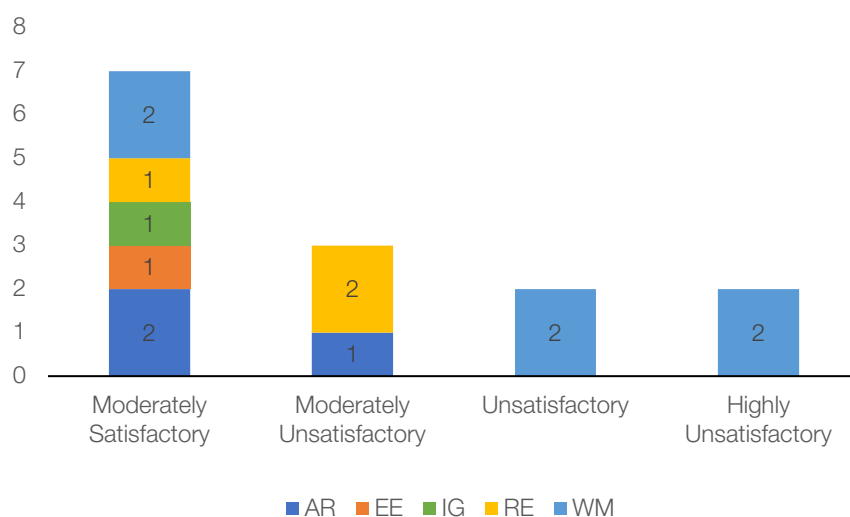
Source: Independent Evaluation Group calculations and Carbon Finance Unit.

Note: ER = emission reduction; ERPA = Emission Reduction Purchase Agreements; tCO₂e = tons of carbon dioxide equivalent.

ii. Evaluated Projects

Collectively, 28 percent of the total CF projects are Closed or Fully Delivered. However, including the 80 Terminated and Early Terminated projects subject to self-evaluation, 88 out of 243 (36 percent) projects have Implementation Completion and Results Reports (ICRs) or Note on Canceled Operations.¹ From this subset, only 14 were validated by IEG (blended projects only) with half of them rated as Moderately Satisfactory and the rest Moderately Unsatisfactory or below (figure B.7). These blended projects are mostly in Waste Management. The sample is too small to make any substantial inferences regarding project performance.

Figure B.7. Independent Evaluation Group–Evaluated Project Performance



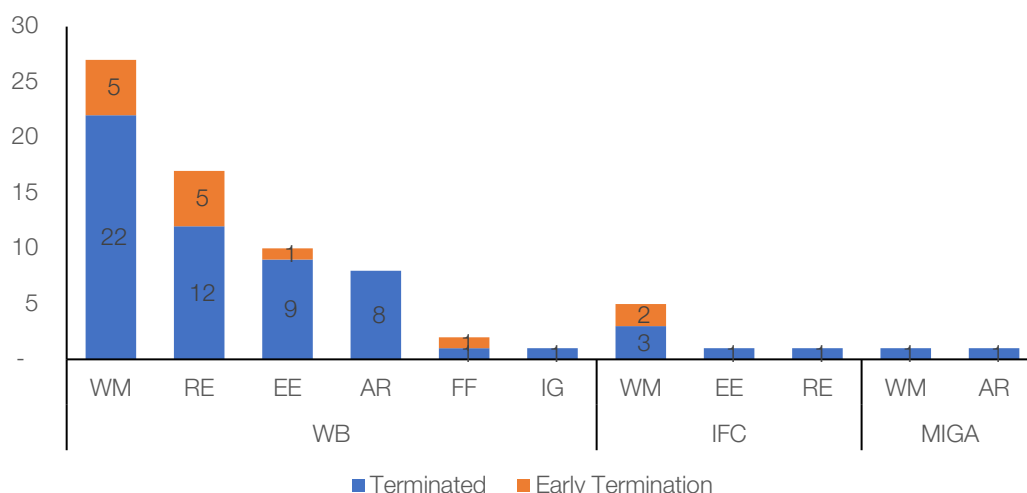
Source: Independent Evaluation Group ratings data.

Note: n = 14. AR = afforestation or reforestation; EE = energy efficiency; IG = industrial gases; RE = renewable energy; WM = waste management.

2.2 Attrition of ERPA Projects

About 25 percent of the ERPA portfolio has been either terminated (25 percent) or terminated early (8 percent)—indicating high levels of attrition and transaction costs for the World Bank Group in developing successful projects that generate emission reductions. A terminated project is canceled for various reasons before it has produced any verified emission reductions. An early termination occurs when the project is terminated ahead of the ERPA crediting period but after issuing some verified emission reductions. Of the 74 projects, 60 were terminated without issuing any emission reduction. Most of the terminations were in CDCF and BioCF (table B.13) which suggests that project design and development challenges and risks are higher for facilities targeting the low-income countries. The technical complexities and achieving financial closure for an ERPA project which should also meet the additionality requirements while also remaining economically viable after receiving the credit revenues is a significant hurdle for many project developers. A review of the first 10 years of the World Bank’s experience in CF shows that, approximately 40 percent of the approved Project Idea Notes (PINs) “survived” and became “active projects” in the World Bank’s pipeline (with the other 60 percent dropping out of the pipeline). The remaining 40 percent were still at various stages of project registration (World Bank 2010b).²

Figure B.8. Terminated ERPA Projects by Institution and Carbon Finance Initiative



Note: AR = afforestation or reforestation; EE = energy efficiency; ERPA = Emission Reduction Purchase Agreement; IFC = International Finance Corporation; IG = industrial gases; RE = renewable energy; WM = waste management; MIGA = Multilateral Investment Guarantee Agency.

i. Terminated versus Early Terminated

During CY00–17, the majority of the ERPA terminations occurred in the 2012–17 period when the carbon markets were in decline. The average years between ERPA signing and termination is five years with the shortest being 90 days (default notice) and the longest being 10 years after signing. The total original contracted volume for this subset of projects is 42.2 million tons of carbon dioxide equivalent (tCO₂e), which was later amended to 34.6 million tCO₂e. Only 4.1 million tCO₂e were generated by the early terminated projects. As for type of CF initiative (figure B.8), waste management/methane projects had the most terminated ERPAs (33) followed by renewable energy (23) and energy efficiency (11) projects. Seventy-two of the 80 terminated/early terminated projects were World Bank ERPAs, six were IFC ERPAs and the remaining two were MIGA ERPAs.

Table B.13. Status of ERPA Projects by CF Vehicle.

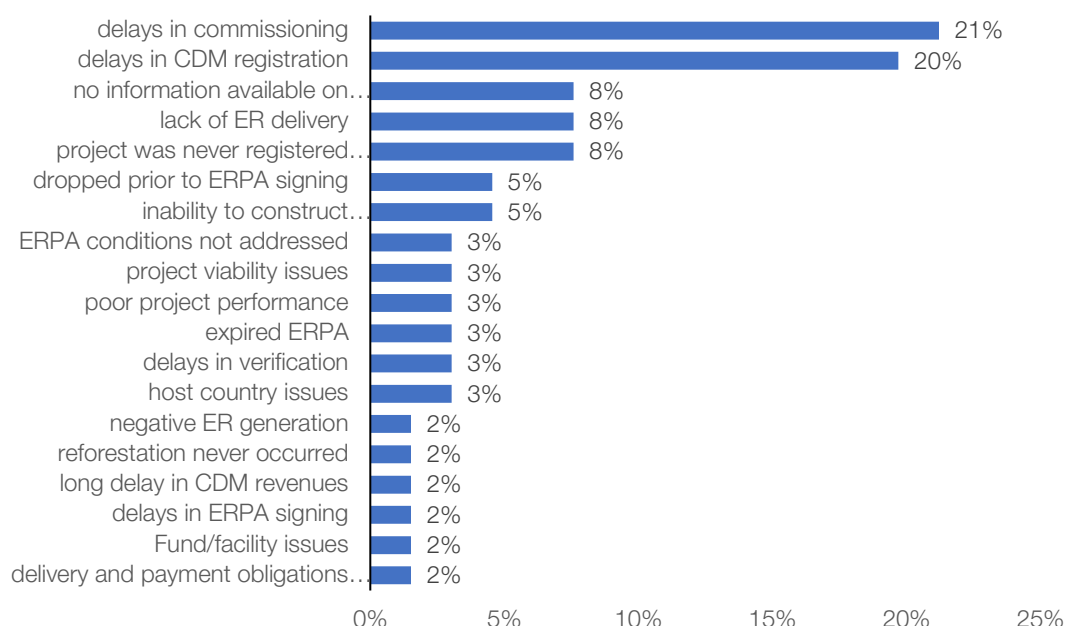
ERPA Status	Terminated	Early Termination	Fully Delivered/Closed	Signed/Active	Transferred	Total
BioCF	9		4	23	1	37
CDCF	17	10	5	4		36
SCF	9	3	16	4	1	33
PCF		2	11	10	1	24
UCF	2		6	9		17
NCDMF	7	4	5		1	17
Ci-Dev				10		10
CPF				9		9
DCF	4		4	1		9
CFE	5		2	2		9
ICF			1	5		6
World Bank NECaF			4			4
IFC INCaF	2		7			10
IFC CDG	1	1	2			3
IFC NECaF	1		1			2
IFC Post-2012	1					1
IFC Forests Bond				1		1
MIGA	2			13		15
Total	60	20	68	91	4	243

Note: CDCF = Community Development Carbon Fund; CDG = Carbon Delivery Guarantee; Ci-Dev = Carbon Initiative for Development; IFC = International Finance Corporation; INCaF = IFC-Netherlands Carbon Facility; NCDMF = Netherlands Clean Development Mechanism Facility; PCF = Prototype Carbon Fund; SCF = Spanish Carbon Fund.

ii. Reasons for Termination

The portfolio review and analysis showed that there are several reasons for ERPA termination. Figure B.9 illustrates the main reasons for ERPA project termination. About 50 percent of the terminations were related to delays in commissioning and delays in registration. The underlying issues for delays in commissioning and registration are related to challenges in achieving financial closure, safeguard requirements, project validation and CDM methodology complexities. Other factors also include inability to setup the infrastructure of facility, economic viability or poor performance or delays in generating verified credits. Reasons for early terminations (not shown) include “force majeure” (that is, natural disasters), ambitious emission reduction targets, low resource availability, technical problems after commissioning, regulatory uncertainties and problems (that is, government and project entity misalignments), delays in CDM registration and financial (that is, high transaction costs) and management issues.

Figure B.9. Primary Reasons for ERPA Termination



Source: Independent Evaluation Group portfolio review
Note: n = 60. ERPA = Emission Reduction Purchase Agreement.

2.3 Generating Emission Reductions

i. Top 10 Countries

Table B.14. Comparison of the World Bank Group and the CDM Portfolio's Supply of Emission Credits

Global CDM Portfolio			World Bank Group ERPA Portfolio		
Country	CER Issuances (millions)	Share in Total Portfolio (percent)	Country	CER Issuances (millions)	Share in Total Portfolio (percent)
China	908.5	54	China	128.9	61
India	233.9	14	Poland	26.5	13
Republic of Korea	162.6	10	Brazil	14.5	7
Brazil	117.7	7	India	6.3	3
Mexico	26.3	2	Czech Republic	5.1	2
Chile	23.2	1	Mexico	3.3	2
Indonesia	22.6	1	Chile	3	1
Vietnam	21.3	1	Ukraine	2.7	1
Uzbekistan	17.8	1	Indonesia	2.6	1
Argentina	15.9	1	Moldova	2.3	1
Total	1,549.7	92	Total	195.1	93

Source: Independent Evaluation Group analysis based on UNEP DTU CDM database and World Bank database

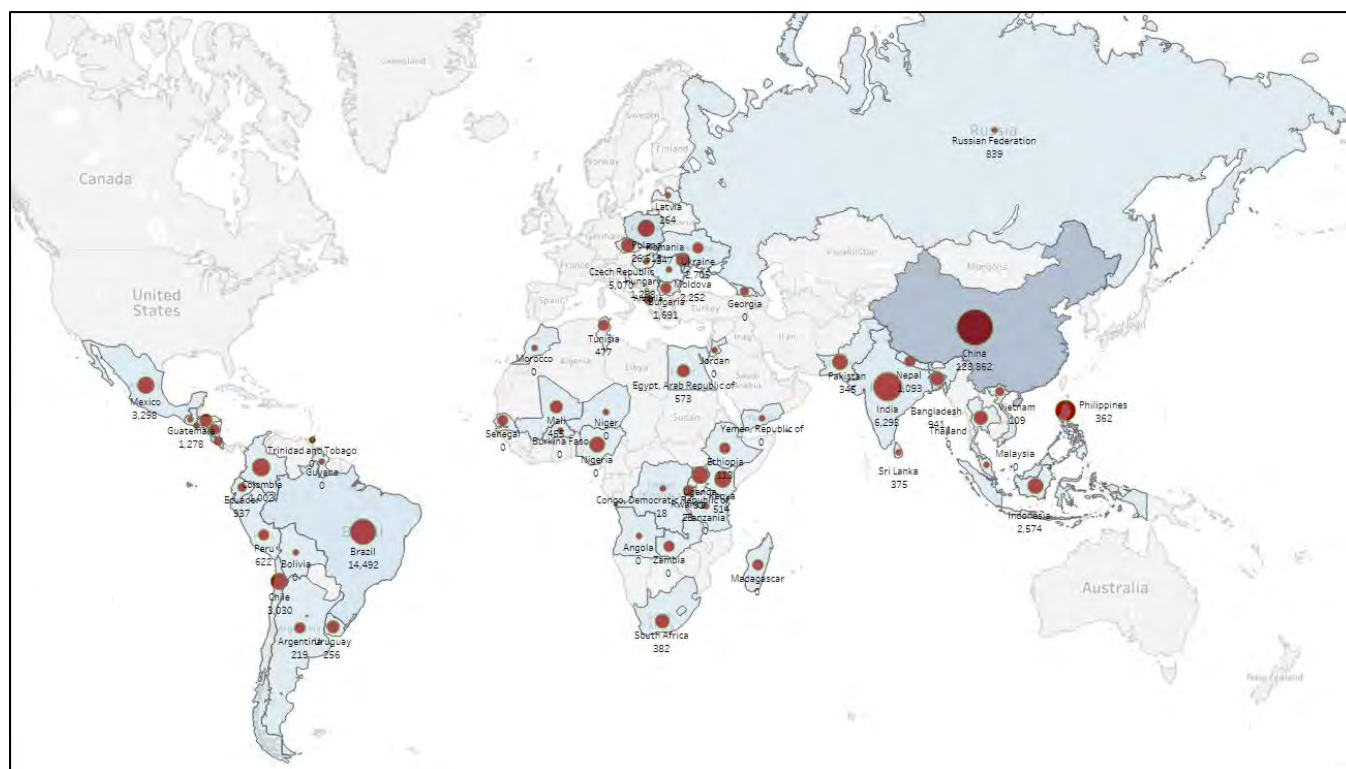
Note: Global CDM portfolio are for PAs and PoAs projects, excluding World Bank Group projects. Issuances till December 2017. CDM = Clean Development Mechanism; CER = Certified Emission Reduction

There is strong similarity between the top 10 countries in CER issuances under the World Bank Group portfolio and the rest of the global CDM. China is the predominant supplier of CDM related emission reductions: China accounts for 61 percent of the issuances in the World Bank Group and 54 percent in the rest of the global CDM. India and Brazil are the other key countries in both, but the Republic of Korea was also important in the global portfolio. China, India, and Brazil together account for 71 percent of the issuances in the World Bank Group and 75 percent in the rest of the global CDM portfolio. The top 10 countries in the World Bank Group portfolio supplied 93 percent of the emission credits but 92 percent of the total emission reductions generated in the rest of the global CDM portfolio (table B.14). Figure B.10 shows the intensity of emission reductions achieved and ERPA project activities in host countries from the World Bank Group portfolio.

ii. Issuance Success Rates

Institutionally, the World Bank achieved the highest rate of success (67 percent), followed by IFC (32 percent) in meeting its targets in planned emission reductions through the ERPAs (table B.15). Given that some of the projects are still active and likely to issue credits in the future this does not show the final outcomes in emission reduction. The issuance success rate is higher if one looks at the closed or fully delivered projects. The highest success rates (table B.16) were achieved in mixed projects involving both renewable energy and energy efficiency (100 percent), followed by industrial gas projects (100 percent) and energy efficiency projects (73 percent). The lowest success rate is in ERPAs which focused on waste management and sustainable land management (agricultural) projects, suggesting the unique challenges in implementing emission reductions in these activities. Looking at the entire portfolio, projects were most successful in high-income countries (92 percent) and least successful in low-income countries (table B.17). This may not however reflect the final outcome; Ci-Dev also initiated new ERPAs in Africa which have opened new opportunities for the LICs to participate in the markets during the post-2012 period.

Figure B.10. ERPA Country Coverage and Intensity of Emission Reductions (tCO₂e, thousands)



Source: Independent Evaluation Group Portfolio Review, Carbon Finance Unit data.

Note: Data as of August 2017. The color shade for the country indicates the intensity of emission reductions achieved from the ERPA projects with darker colors indicating larger emission reductions (for example, China has 128.8 million tCO₂e). The size of the circle indicates the number of ERPA projects in the country with larger circles indicating a larger number of ERPA projects (for example, China had 30 ERPA projects while Angola only had 1 ERPA project). tCO₂e = tons of carbon dioxide equivalent.

Table B.15. Achieved Emission Reductions by World Bank Group Institution and Project Status (tCO₂e, thousands)

Institution	Term.	Early Term.	Fully Delivered/ Closed	Signed or Reg.	Trans.	Total ERs	Percent Achieved	
							Under the Original ERPA	Under the Last Amended ERPA
World Bank	—	3,907	152,923	46,362	1,387	204,579	67	80
IFC	—	219	5,666	—	0	5,886	32	32
MIGA	—	0	0	0	0	0	0	0
Total ER	—	4,127	158,589	46,362	1,387	210,465	65	76
% achieved ^a	0	34	82	56	29	65		
% achieved ^b	0	42	95	64	73	76		

Note: Data as of August 2017. — = not available; ER = emissions reduction; ERPA = Emission Reductions Purchase Agreement; IFC = International Finance Corporation; MIGA = Multilateral Investment Guarantee Agency; tCO₂e = tons of carbon dioxide equivalent; Term. = terminated; Trans. = transferred.

a. Achieved from planned ERs under the original ERPA.

b. Achieved from planned ERs under the last amended ERPA.

Table B.16. Achieved Emission Reductions by Technology and Project Status (tCO₂e, thousands)

CF Initiatives	Term.	Early Term.	Fully Delivered/ Closed	Signed or Reg.	Trans.	Total ERs	Under Orig. ERPA (percent achieved)	Under Last Amended ERPA (percent achieved)
AG	—	—	—	187	—	187	45	45
A/R	—	—	1,823	5,580	844	8,246	42	49
EE	—	4	7,311	26,883	—	34,199	72	73
FF	—	1,186	2,048	—	—	3,234	41	50
IG	—	—	121,384	—	—	121,384	87	100
Mixed	—	—	500	—	—	500	100	100
RE	—	1,328	13,480	11,003	—	25,811	49	57
Transport	—	—	357	218	—	575	59	49
WM	—	1,608	11,687	2,492	543	16,330	30	45
Total ER	—	4,127	158,590	46,362	1,387	210,465	65	76
Percent achieved ^a	0	34	82	56	29	65		
Percent achieved ^b	0	42	95	64	73	76		

Note: Data as of August 2017. — = not available; AG = sustainable land management (Agriculture); A/R = afforestation or reforestation; EE = energy efficiency; ER = emission reduction; ERPA = Emission Reductions Purchase Agreement; FF = fossil fuel switch; IG = industrial gases; mixed = EE+ R E; RE = renewable energy; Reg. = registered; tCO₂e = tons of carbon dioxide equivalent; Term. = terminated; Trans. = transferred; WM = waste management/methane.

a. Achieved from planned ERs under the original ERPA.

b. Achieved from planned ERs under the last amended ERPA.

Table B.17. Achieved ERs by Host Country Income Group (tCO₂e, thousands)

Technologies	Low Income	Lower Middle Income	Upper Middle Income	High Income	Total
IG	—	—	121,384	—	121,384
EE	23	4	3,575	30,596	34,199
RE	1,598	12,168	8,071	3,974	25,811
WM	17	2,127	13,701	485	16,330
A/R	155	2,387	5,147	556	8,246
AG	—	187	—	—	187
FF	—	1,879	1,095	260	3,234
Transport	—	218	357	—	575
Mixed	—	—	—	500	500

Technologies	Low Income	Lower Middle Income	Upper Middle Income	High Income	Total
Total	1,793	18,971	153,330	36,372	210,465
Percent achieved ^a	13	31	73	92	65
Percent achieved ^b	15	36	89	95	76

Note: Data as of August 2017. — = not available; AG = sustainable land management (Agriculture); A/R = afforestation or reforestation; EE = energy efficiency; ER = emission reduction; ERPA = Emission Reductions Purchase Agreement; FF = fossil fuel switch; IG = industrial gases; mixed = EE+ R E; RE = renewable energy; tCO₂e = tons of carbon dioxide equivalent; WM = waste management/methane.

a. Achieved from planned ERs under the original ERPA.

b. Achieved from planned ERs under the last amended ERPA.

The distribution of the emission reductions by technology and the different Kyoto mechanisms is shown in table B.18. About 82 percent of the emission reductions come from CDM while Green Investment Scheme projects contributed 15 percent, JI contributed 3 percent.

Table B.18. World Bank Group Emission Reductions by Mechanism and Technology (tCO₂e, millions)

Technology	CDM	JI	GIS	VCS	Total	Percent
AG	0.0	0.0	0.0	0.2	0.2	0.1
A/R	7.9	0.3	0.0	0.0	8.2	4
EE	2.4	1.2	30.6	0.0	34.2	16
FF	1.6	1.6	0.0	0.0	3.2	2
IG	121.4	0.0	0.0	0.0	121.4	58
Mixed	0.0	0.5	0.0	0.0	0.5	0.2
RE	23.5	2.3	0.0	0.0	25.8	12
Transport	0.6	0.0	0.0	0.0	0.6	0.3
WM	14.8	1.3	0.3	0.0	16.3	8
Total	172.2	7.3	30.9	0.2	210.5	100
% achieved ^a	62	357	101	9	65	
% achieved ^b	73	94	100	9	76	

Note: AG = sustainable land management (agriculture); A/R = afforestation or reforestation; EE = energy efficiency; ER = emission reduction; ERPA = Emission Reductions Purchase Agreement; FF = fossil fuel switch; IG = industrial gases; mixed = EE+ R E; RE = renewable energy; VCS = Verified Carbon Standard; WM = waste management/methane.

a. Achieved from planned ERs under the original ERPA.

b. Achieved from planned ERs under the last amended ERPA.

Table B.19. Contracted Volume and Carbon Credits Delivered (tCO₂e, thousands)

Fund, Facility, or Initiative	Last Contracted Volume	Total ERs Paid as of August 2017	Success Rate (percent)
UCF	121,347	114,494	94
SCF	45,353	37,555	83
PCF	20,487	18,438	90
ICF	8,018	7,183	90
BioCF	14,370	6,833	48
NCDMF	11,312	6,109	54
INCaF	9,820	4,452	45
CDCF	4,423	3,981	90
CFE	4,519	3,574	79
World Bank NECF	2,846	2,631	92
DCF	4,447	2,263	51
CPF	9,063	1,519	17
IFC CDG	1,820	883	49
IFC NECaF	2,975	550	18
P12CF (Post-2012)	1,500	—	0
Ci-Dev	7,018	—	0
IFC FB	2,400	—	0
Total	271,719	210,465	76

Note: — = not available; BioCF = BioCarbon Finance; CDCF = Community Development Carbon Fund; CFE = Carbon Fund for Europe; CPF = Carbon Partnership Facility; DCF = Danish Carbon Fund; FB = Forests Bond; CDG = Carbon Delivery Guarantee; Ci-Dev = Carbon Initiative for Development; ICF = Italian Carbon Fund; IFC = International Finance Corporation; INCaF = IFC Netherlands CDM Facility; NCDMF = Netherlands Clean Development Mechanism Facility; NECF = Netherlands European Carbon Facility; P12CF = Post-2012 Carbon Facility; PCF = Prototype Carbon Fund; SCF = Spanish Carbon Fund; tCO₂e = tons of carbon dioxide equivalent; UCF = Umbrella Carbon Facility

Table B.19 provides a breakdown by fund and facility of the total volume of carbon credits delivered as of August 2017. It shows that the Umbrella Carbon Facility (UCF) which contracted the large HFC-23 carbon credits in China delivered the most at 114.5 million tCO₂e and represents over 50 percent of the total emissions reduced during this period.

3. ASA Portfolio Analysis

The ASA activities have mainly targeted the lower-middle-income countries, followed by upper-middle-income countries (table B.20). This is mainly because the recent capacity building support under the PMR on carbon pricing and FCPF on REDD+ market readiness target many of these countries. Some of the initiatives like CDCF, BioCF and Ci-Dev however concentrate in the low-income countries.

Table B.20. Total ASA Portfolio Distribution by Income Group of Countries and Status

Income Group	Active	Closed/Complete	Dropped	Pipeline	Total
High income	2	3	—	2	7
Upper middle income	25	12	4	11	52
Lower middle income	18	15	6	17	55
Low income	8	3	2	13	25
World/Regional	11	18	2	—	31
Total	64	49	14	43	170

Note: — = not available; ASA = Advisory Services and Analytics.

The top 10 recipient countries of CF ASA include Brazil, Colombia, Costa Rica, China, Ethiopia, India, Kenya, Madagascar, Mexico, and Vietnam. There are also 26 global/world region ASAs. Figure B.11 shows the ASA coverage during the evaluation period.

For the closed or complete projects, an objectives-based approach was used in categorizing the CF technical assistance and capacity building activities. Outputs were then mapped for each objective: (i) ERPA linked technical assistance or training (nontraditional ASA), (ii) technical assistance, (iii) training, (iv) programmatic approach, (v) economic and sector work, (vi) Advisory Services (IFC), and (vii) knowledge management.

IEG then conducted an in-depth review on the closed projects with interest to assess performance and effectiveness. However, such information was not available at the project level and no evaluative evidence is available. Nonetheless, the exercise gave a better understanding of what type of capacity building activities were undertaken and what kinds of outputs or outcomes were targeted.

3.1 Objectives

Table B.21 describes the main ASA objectives covering the CF portfolio by institution. The most frequent target areas were capacity building for carbon sequestration through forests and landscapes and technical assistance regarding tools, methodologies and institutional strengthening.

3.2 Outputs

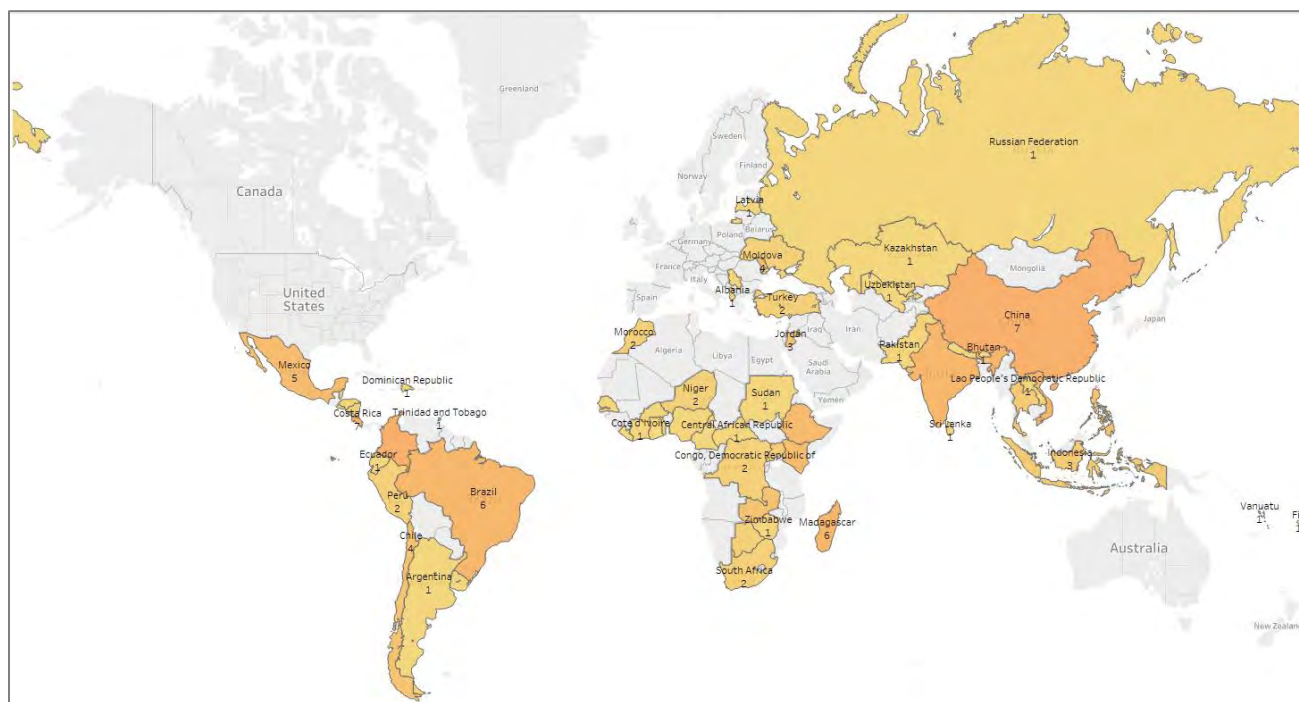
Table B.22 illustrates the number of ASA projects targeting different types of activities and outputs by CF vehicle to meet the objectives. Excluding the 39 ERPAs with technical assistance components, 102 projects (60 percent) in the rest of ASA portfolio provided technical assistance to 62 countries as well as four projects for regional and global support.

Table B.21. Main Target Areas for Capacity Building or Technical Assistance Activities

Main Targets for Capacity Building	World Bank	IFC	Total
Building capacity for carbon sequestration through forests and landscapes	70	0	70
Contribute to the design or implementation of carbon market readiness or carbon pricing approaches	32	1	33
Provide technical assistance, develop tools and methodologies and strengthen institutions	54	1	55
Stimulate or inform a debate at the country, regional, or global level	2	0	2
Enhance development benefits and regional distribution by focusing on the poorest countries (for example, CDCF, Ci-Dev)	9	1	10
Total	167	3	170

Note: CDCF = Community Development Carbon Fund; Ci-Dev = Carbon Initiative for Development; CPLC = Carbon Pricing Leadership Coalition; IFC = International Finance Corporation; ISFL = Initiative for Sustainable Forest Landscapes.

Figure B.11. World Bank Group Carbon Finance Advisory Services and Analytics Coverage



Source: Independent Evaluation Group portfolio review, Carbon Finance Unit data.

Table B.22. Outputs Produced by ASA Activities by Carbon Finance Vehicle

Output or Activities	Bio-CF	CDCF	CF-Assist	Ci-Dev	CPF	CPLC	FCPF/REDD+	IFC AS	ISFL	NCD-MF	NCM	PCF	PMR	SCF	Total
TA	3	1	24	1	2		35		5		1		30		102
TA for ERPAs	27	3		2	2					2		2		1	39
Training		2	16												18
PA			3										2		5
Advisory Services (IFC)								3							3
KM			1			1									2
ESW			1												1
Total	30	6	45	3	4	1	35	3	5	2	1	2	32	1	170

Note: ASA = Advisory Services and Analytics; BioCF = BioCarbon Fund; CDCF = Community Development Carbon Fund; Ci-Dev = Carbon Initiative for Development; CPLC = Carbon Pricing Leadership Coalition; ESW = Economic and Sector Work; ISFL = Initiative for Sustainable Forest Landscapes; KM = knowledge management; NCM = Networked Carbon Markets; PA = programmatic approach; PCF = Prototype Carbon Fund; PMR = Partnership for Market Readiness; SCF = Spanish Carbon Fund; TA = technical assistance.

3.3 Technical Assistance Linked to ERPA Projects

A subset of ASA projects (39 projects or 23 percent) were linked to ERPA projects with at least one component providing technical assistance/capacity building to the emission reduction activities or associated development cobenefits. Some specific examples include raising awareness of the economic, social, and environmental potential of Kyoto Protocol activities at national and regional levels; drafting community plans to generate social, economic and environmental cobenefits; and technical assistance to strengthen regulations and build capacity of concerned government bodies for renewable energy development. Most of these projects (27) were implemented by the BioCarbon Fund (BioCF) by strengthening community-based management of natural resource of the host country and strengthening institutional capacity.

3.4 General Indicators

Development objectives and results indicators were extracted from the closed and completed projects, but this was limited because relevant data were missing.³ Table B.23 provides a list of these indicators based on the minimal data recorded in the Activity Completion Summary of the closed ASA projects within the Operations Portal.

Table B.23. Carbon Finance Advisory Services and Analytics Development Objective and Results Indicators

Raise Awareness/Facilitate Knowledge Exchange
<ul style="list-style-type: none"> • Participant awareness/understanding raised (9 were fully/largely achieved and six were planned to achieve) • Participant confidence improved (1 achievement) • Actionable plan done • New conceptual frameworks learned (4 were fully achieved) • Learned knowledge applied to local circumstances (4 were fully achieved and one was partially achieved) • Improved Understanding of carbon finance (2 were fully achieved)
Enhance Skills:
<ul style="list-style-type: none"> • Participant knowledge/skills enhanced (4 were largely achieved and 6 had plans to achieve) • New/improved participant actionable plan done (1 was fully achieved and another had plans to achieve) • New knowledge/skills used (6 were largely achieved, 1 partially achieved, and another had plans to achieve)
Facilitate Consensus and Teamwork:
<ul style="list-style-type: none"> • Discussion initiated/resumed/activated (2 had plans to achieve) • Participatory process initiated/expanded (1 had plans to achieve) • Consensus reached, and teamwork improved (1 partially achieved) • New/improved action steps/plan formulated
Foster Networks:
<ul style="list-style-type: none"> • Discussion initiated/resumed/activated (1 had plans to achieve) • Participatory process initiated/expanded (1 had plans to achieve) • Informal network(s) created/expanded (2 were fully/largely achieved and three others had plans to achieve) • Formal partnerships or coalitions created/expanded (1 had plans to achieve)
Help Client Formulate Policy/Strategy and Institutional Changes:
<ul style="list-style-type: none"> • Civil society/private sector involved in process • Needs Assessment completed • Stakeholder agreement reached • Action steps/plan formulated (2 had plans to achieve) • Inclusiveness of stakeholder ownership strengthened (1 was achieved) • Efficiency of policy instrument(s) increased (1 was partially achieved) • Effectiveness of organizational arrangements improved • Increased capacity to design strategies/policies (6 were fully/largely achieved)

Source: Independent Evaluation Group portfolio review, Operations Portal.

3.5 Summary of Main Findings from the ASA Portfolio

The lack of capacity to promote CF opportunities was one of the constraints for host countries. The beneficiaries for 15 of the 47 closed ASA projects reviewed were the host country governments (either designated national authorities or members of ministries). Such projects aimed to undertake the following types of activities: (i) introduce the concept of CF and carbon trading under the Kyoto Protocol, (ii) develop a program to support a broad range of CF products, (iii) provide training/workshops on scaling up GHG mitigation, (iv) formulate work plans to achieve climate change targets, (v) establish legal institutional framework for MRV system in sectors, and (vi) secure stakeholder engagement/outreach by promoting awareness of climate issues.

Even though IEG was able to identify the higher-level objectives and some outputs, this was not sufficient to make a qualitative rating on the effectiveness of ASA outcomes. However, the number of projects targeting to produce different categories of outputs was identified. Most of the ASA activities are concentrated around technical assistance (stand-alone or linked to ERPAs) and provision of training. However, the desk review of major ASA initiatives for capacity building as well as the field-based case studies, expert interviews and external reviews were used in filling the gaps to assess the overall performance of the ASA support in CF.

Portfolio Data and Documentation Limitations

CF is primarily supported through multi-donor trust funds which do not regularly follow all the World Bank Group standard procedures and protocols for harmonized documentation, reporting, self-evaluation and independent verification. As a result, the evaluation was not able to undertake all the conventional portfolio review and analysis approaches, especially on the ASA components of CF. The ERPA projects also do not contain information on the social, economic and environmental cobenefits (or development impacts) of the projects.

Since identification of the portfolio relied on validation from institutional counterparts, evidence from a variety of sources has been collected and triangulated in bridging the missing information and in undertaking the portfolio review and analysis. This supplemental information and data was gathered from the following sources:

- Project appraisal document (PAD)/Board Report (IFC)/President's Report (MIGA), Emission Reduction Purchase Agreement (ERPA),⁴ project design document, Implementation Completion and Results Report (ICR), Note on Canceled Operations or Termination Letters.
- UNFCCC data and documentation provided rich information on the CDM process and methodologies as well as issuance of emission reductions at the global level by different technologies and time periods.
- Completed ICRs or Notes on Canceled Operations for 87 projects, 14 of which have IEG validation (ICRRs).

Reference

World Bank. 2010. *Ten Years of Experience in Carbon Finance: Insights from Working with the Kyoto Mechanisms*. Washington, DC: World Bank. <https://openknowledge.worldbank.org/handle/10986/2873>.

¹ Under certain circumstances, a Note on Canceled Operations is prepared in lieu of a Project Completion Report or Implementation Completion Report. This is common for carbon finance projects since they are supported through multi-donor trust funds and these projects do not follow the standard World Bank Group documentation procedures and protocols.

² The high attrition or drop-out rate between approved PINs and active projects was attributed to: (i) the challenges of project financing (mainly inability to reach financial closure); (ii) implementation delays due to the time and procedures required to obtain the necessary approvals and licensing from relevant national authorities; (iii) the challenges of the changing CDM or JI methodologies and regulatory delays; (iv) an insufficient carbon revenue stream in a market especially beyond 2012; and (v) the challenges of clearing due diligence screening processes, including meeting the World Bank social and environmental safeguards (World Bank 2010b).

³ CF as a trust funded operation does not always follow standard World Bank Group practices for M&E and data documentation.

⁴ ERPA documents which contain pricing information are confidential and therefore not disclosed in this report.

Appendix C. Causal Analysis of Emission Reduction Purchase Agreement Case Studies

1. Introduction

In the early 2000s, the World Bank initiated the development of carbon funds and facilities and used Emissions Reduction Purchase Agreements (ERPAs) to instigate the use of carbon finance (CF) in its client countries.¹ An ERPA is a purchase and sale agreement for the acquisition of what was at the time a new kind of commodity—a GHG emission reduction. ERPAs basically assign value to environmental benefits from GHG emission reductions and were progressively used by the World Bank and the International Finance Corporation (IFC) as an instrument to stimulate capital commitments to generate these environmental benefits. Pending the entry into force of the Kyoto Protocol, the World Bank sought to use ERPAs to motivate early-adopters of carbon finance (CF) and the early generation of projects to serve as examples for others and catalyze the carbon market. Over time, the World Bank Group also used ERPAs to catalyze the carbon market under regulatory and market uncertainties or to help sellers of carbon emissions develop complex CF projects with new technologies and methodologies. The key question then is to what extent the World Bank Group succeed in using ERPAs to achieve its objectives of catalyzing carbon markets and demonstrating the potential of carbon finance for GHG emission reduction and generating development cobenefits. Based on this, the specific causal questions underpinning this study are:

Evaluation Question 3.1 How effectively has the World Bank Group been able to fulfill its role in

- Catalyzing and developing carbon markets and leveraging private investments?
- Innovating with CF?
- Building capacity of its clients?

Evaluation Question 3.2 What does the existing and new evidence tell us about the effectiveness of the main CF interventions in reducing GHG emissions and generating cobenefits for sustainable development?

2. Methodological Design

The evaluation design underpinning this causal analysis fits squarely in the theory-based evaluation tradition, specifically following the logic of what Trochim popularized as Pattern Matching (Trochim 1985). This type of design models the stages through which an intervention is implemented to achieve its objectives while also identifying the key assumptions on which the model relies. We refer to this model as the intervention's theory of change or the causal chain represented in figure C1. The model originates from the review of the existing literature, and from consultation with CF experts, which was subsequently validated by the World Bank's CF team.

The theory of change was then tested based on new empirical evidence. The empirical strategy retained for this study consisted of a combination of two case-based methods that have a comparative advantage in providing robust evidence for causal analysis: process-tracing and qualitative comparative analysis applied to 16 cases of ERPAs. For each case, the evaluation team traced the contribution of the World Bank Group, the project entity and other critical actors throughout the process of development, implementation and follow-through of each ERPA. Data collection was broadly meant to include document review, field visits and a series of interviews with the key stakeholders engaged throughout the ERPA cycle and beyond. Patterns of convergence and divergence across cases were systematically analyzed, using the logic of qualitative comparative analysis, ultimately forming a robust empirical base.

The case selection (table C.1) was informed by a preliminary review of the entire portfolio of ERPAs. An additional consideration was the need to accommodate for other evaluation components, notably country-level case studies for which the countries had already been selected (based on other relevant selection criteria). Within the constraints of already preselected countries, the additional selection criteria for ERPA cases were as follows:

- Ensuring representation of the four primary technologies, aiming for four cases by technology: (i) afforestation/reforestation (A/R); (ii) hydro power; (iii) non-hydro renewable energy; and (iv) waste management.
- Ensuring representation of various level of country capacity and maturity with CF, aiming for at least four cases by country income group: Chile, China, Colombia, Ethiopia, and Uganda.
- Ensuring representation of various levels of maturity of the CDM process and carbon market, selecting cases that span a 20-year horizon.

Four types of analysis were undertaken:

- First, for each of the 16 cases, we traced the process of change at play throughout the 15 steps of the theory of change (developed in detail in a separate common template for data collection; the main steps are shown in annex C.1) and the causal contribution of the World Bank Group and other contributory actors and factors, with rich and deep description.
- Second, a systematic analysis of patterns of convergence and divergence across cases for each step of the causal chain was performed.
- Third, the empirical patterns emerging from the cross-case comparison were linked to the theory of change, checking for match and mismatch.
- Fourth, given the causal complexity underlying the explanation of the five main outcomes of interest, the team resorted to crisp-set qualitative comparative analysis (QCA) to formally test the theory of change. Crisp-set QCA is a well-established technique which resorts to Boolean minimization² to “simplify complex data structures in a logical and holistic manner” (Ragin 1987, p. viii).

Figure C.1. Theory of Change of Emission Reduction Purchase Agreements

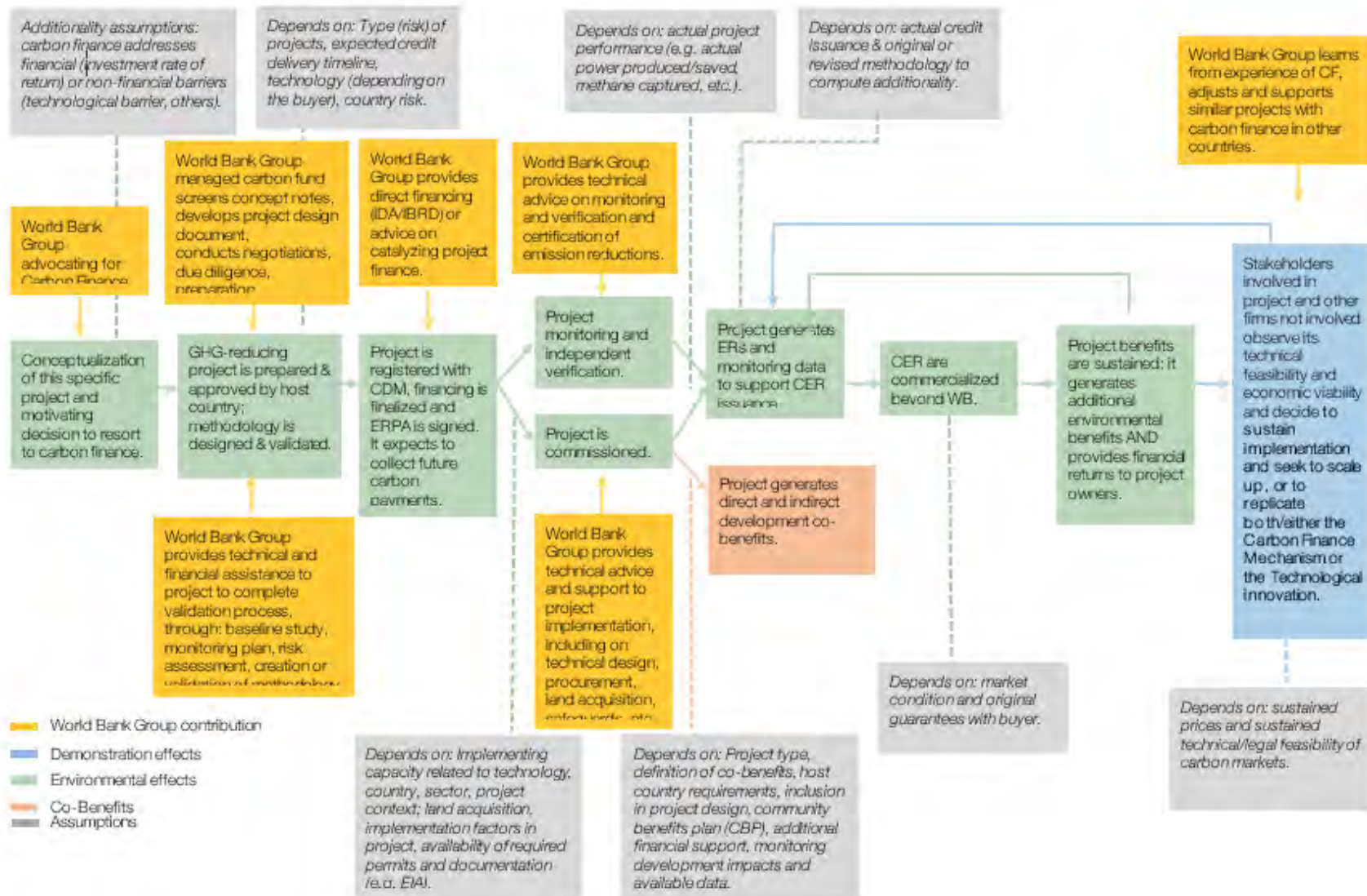


Table C.1. Case Selection

Technology	China	Chile	Colombia	Ethiopia	Uganda	Total
Afforestation / Reforestation (14% of World Bank Group portfolio)						6
	Guangxi Watershed (P090649) [CASE 2]	Chile SIF Forest Carbon (P11918) [CASE 8]	Magdalena Bajo Seco Commercial Reforestation (P132851) [CASE 12] AND Colombia San Nicolas Carbon Sequestration (P098615) [CASE 10]	Humbo natural regeneration project (P098428) [CASE 13]	UG Nile Basin Reforestation (P097742) [CASE 16]	
Renewable Energy (35% of World Bank Group Portfolio)						7
Hydropower	Xiaogushan Hydropower (P087153) [CASE 3]	Hydro Chacabuquito (P074619) [CASE 7] AND Laja Hydroelectric project (P104759) [CASE 6]			UG West Nile Hydro (Small) (P072090) [CASE 14]	4
Other Renewable Energy	Inner Mongolia Wind (P087292) [CASE 4] AND Deqingyuan Biogas Power Project (IFC- 556565) [CASE 5]		Colombia Jeparachi Wind (P074426) [CASE 11]			3
Waste Management (27% of World Bank Group Portfolio)						3
	CN Tianjin landfill gas (P086035) [CASE 1]		Rio Frio waste management (P088752) [CASE 9]		Solid Waste Composting (P093856) [CASE 15]	
Total	5	3	4	1	3	16

3. Findings

3.1 The first part of the Causal Chain: World Bank Group's contributions to proximate outcomes

a. Motivating the Adoption of CF

The first step in the causal chain consisted of motivating the adoption of CF to initiate CDM projects. This was a crucial step which would set in motion the rest of the project cycle. It was also a complicated causal mechanism which required negotiation, persuasion and risk-taking.

The World Bank Group **made a significant contribution to motivating the PE to resort to CF across all countries and technologies** (Cases: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 15, 16). The exception being the Magdalena Bajo Seco Project, which the World Bank was not involved with until its second ERPA. In most cases the project was a pioneer CDM project in the country or was the first CDM project in a specific sector, even though the general CDM market was already active at the time. One case, the Uganda waste management project, was initiated when the CDM market was active and carbon prices were high, but the PE had very limited awareness of the CDM market and how it works.

The World Bank Group's critical contribution was threefold: (i) introducing the PE to the concept of CF; (ii) providing the PE with a guaranteed buyer of potential Certified Emission Reductions (CERs) through ERPA agreements; and (iii) In some cases, it assumed additional upfront risks and financed the CDM process by prepaying for expected CERs or guaranteeing to buy CERs even if the country did not ratify the Kyoto Protocol.

Most of the PEs had little to no awareness of CF (1, 2, 3, 5, 6, 7, 9, 10, 11, 14, 15, 16), **but even when they did, the World Bank Group's role was critical**, as demonstrated by the Chile SIF Forestry Project. This project's developer had knowledge of the voluntary carbon market independent of the World Bank but was unable to access the CDM markets without a guaranteed buyer. CF was an integral part of the original project design which sought to utilize the voluntary carbon market in 1999. At that time the PE planned to obtain carbon finance through United States Initiative on Joint Implementation —a pre-Kyoto Clinton administration pilot initiative to test how CF projects would work in practice. Initiative on Joint Implementation terminated before the project could obtain CERs. The project developer continued to work on the forest project without carbon credits, but at a much smaller scale, while they continued to look for other potential carbon buyers in the voluntary markets. The BioCarbon Fund (BioCF) revived the original project model by offering to sign an ERPA that provided the sought-after guaranteed buyer. The World Bank also agreed to prepay for CERs to finance the CDM process, further motivating the PE to pursue CF under the auspice of CDM.

In nine cases (1, 2, 3, 5, 9, 10, 11, 12, 16) a third party was also instrumental in motivating the decision to pursue CF. In these cases, the third party had knowledge of the CDM markets and was instrumental in linking the World Bank with the PE. In China and Colombia, the government was active in identifying priority sectors for CDM development and was instrumental in linking the World Bank Group to potential candidates for CDM project development.

The question of the additionality of CF comes into play as an additional causal condition which should have influenced the decision to pursue CF. In most cases (1, 2, 3, 4, 5, 6, 7, 9, 11), across technologies except A/R, additionality was justified based on financial arguments. In these cases, there was an explicit claim that the expected revenues from the CERs would increase the internal rate of return of the project, to a level that made the risk acceptable to investors. For A/R projects the additionality argument was made using the UNFCCC barrier analysis. For all cases, the World Bank Group's position on determining additionality was to defer to the UNFCCC process and accepts its judgment.

For this first causal step, there is one outlier case to be highlighted, which does not however invalidate the theory of change. The World Bank played no role in motivating the use of CF in the Colombia Magdalena Bajo Seco

Commercial Reforestation Project because that project was prepared by another development bank and the World Bank only engaged through the project's second ERPA.

b. Preparing Projects for CDM Registration (Preparing CDM Project Design Document, Development or Selection of Methodologies, Validation)

Once the causal chain was set in motion with the decision to resort to CF for reducing emissions, many technical steps needed to be undertaken to prepare projects for CDM registration. Consistent patterns emerged regarding the World Bank Group's critical role or complementary role to the PE for these preparatory tasks, which were sine qua non conditions for the projects to move forward.

The World Bank Group made critical contributions to project preparation and validation to almost all cases (1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 15, 16). The World Bank was a crucial actor in this phase of the causal chain because the CDM process was under development or not widely known and there was little domestic expertise in developing CDM projects. The World Bank role was critical even in cases when the PE had some familiarity with the CF concept. For example, although the PE for the Inner Mongolia Wind Project had prior experience with a CDM project, also developed with the World Bank, they did not have sufficient capacity to prepare the project design document on their own. The World Bank played a critical role in walking them through the CDM process and providing technical assistance with the more technically challenging aspects of design such as the additionality barrier analysis.

The World Bank provided critical knowledge of the CDM process and requirements and in seven cases (1, 6, 8, 10, 11, 13, 16) the World Bank provided financial support for the preparation process, through grants or by upfront payment for expected CERs. The World Bank's critical contribution to the validation step generally consisted of providing technical and financial assistance to the PE with the preparation of the validation protocol and documents to fit the CDM requirements and selecting and hiring the Designated Operational Entity.¹ In some cases, the World Bank was also instrumental in ensuring that the Designated Operational Entity delivered in a timely manner with sufficient quality.

In about half of the projects, the World Bank played the lead or sole role in these preparatory steps. In the other half the PE or another implementing partner played the main role, but the World Bank played a valuable supporting role through the provision of technical peer review and guidance. The prominence of the World Bank Group vs. PE role was determined by the capacity of the PE staff or the availability of third-party implementers.

The three outlier cases, where the World Bank made no contribution do not invalidate the theory of change. Instead they are illustrations of assumptions not met or prior causal steps not achieved. First, the Colombia Rio Frio project did not reach the validation step, the PE withdrew from the CDM process earlier.² No project design document form or monitoring plan were ever produced. Second, The Colombia Magdalena Bajo Seco Commercial Reforestation project was prepared by another development Bank and the World Bank was not involved until a later step in the causal chain. Third, for the Chile Laja Hydro project, the World Bank was involved in helping the first PE to prepare the project for registration with the UNFCCC. The project was then acquired by a larger conglomerate with obligations under the European Emission Trading Scheme. While this new PE was originally drawn to the project because of the World Bank's involvement in developing a CDM operation, it refused to sign an ERPA with the World Bank to retain its rights on the CER. The World Bank withdrew at this point, but the new PE continued to develop the project and registered it on its own.

The World Bank's contribution was even more significant when it came to devising methodologies to estimate and forecast emissions reductions. The World Bank played a key role in either developing new methodologies or adapting and consolidating existing methodologies, across all countries and technologies. A credible methodology to measure emission reductions is essential to participate in CDM markets. Developing a rigorous methodology is technically demanding.

Six projects (cases 1, 2, 3, 7, 8, 16), developed new methodologies. In these cases, the project preparation coincided with the early stages of the development of CDM markets or the project was the first of its kind in a sector. The World Bank provided critical technical and sometimes financial support to develop these methodologies. Even in cases in which the project entity had high capacity staff, such as in the Chile Chacabuquito Hydro Project, who did most of the work to develop the methodology, the World Bank was recognized for providing critical input through technical peer reviews.

Seven projects (cases 4, 5, 6, 10, 11, 13, 14) utilized existing methodologies. In two cases, the methodology they adopted had been developed by the World Bank in earlier CDM projects. The World Bank contributed in identifying applicable methodologies for the project and in several cases (10,11,13) provided technical and financial support to adapt them to project specific conditions.

There were two outlier cases in the development of methodologies step: both projects in which the World Bank was not engaged with at this stage: Chile Rio Frio (waste management) failed prior to this step. Colombia Magdalena Bajo Seco Commercial Reforestation (A/R), for which the preparation and registration were supported by another development Bank.

The intervention logic of the CDM process also involves another actor, the Designated National Authority (DNA), whose role was to provide approval on behalf of the government for the CF endeavor, including by approving the cobenefits plan. All but one project obtained DNA approval. Two patterns emerge: when there is an already established DNA and when there is not.

In most cases (1, 2, 3, 4, 5, 6, 8, 9, 10, 14, 15, 16) when the DNA was established and fully operational, the World Bank Group played a supporting role to the PE, which carried out most of the work for this step. In these cases, there was no need for any substantive input from the World Bank. For projects that were prepared before the DNA in the country was fully operational, the World Bank Group played a more substantive role in this step. In such cases, the World Bank Group either worked with the PE to find an alternative to obtain some sort of national approval in the DNAs absence (Chile Chacabuquito, hydropower), or the World Bank Group provided support to the fledgling DNA, which in turn impacted the project's approval (Colombia Jepirachi, wind and Ethiopia Humbo, A/R).

c. Completing the First Phase of the Causal Chain: Registration, ERPA Signature and Financial Closure

- x. To complete the first phase of the causal chain, three key decisions moments needed to be completed (in various timing order): (i) registering with the UNFCCC; (ii) signing of an Emission Reductions Payment Agreement; and (iii) reaching financial closure.

All but one project achieved UNFCCC registration. For most of the cases that were registered, this step was almost automatic, and the World Bank Group's role was not very prominent (but World Bank Group's role was indirect through its support to prior steps in the CDM process). But when needed, the World Bank Group made a more direct or significant contribution to this step. In three cases (7, 13, 15) the World Bank facilitated the PE's interactions with specific individuals on the UNFCCC CDM board, which sped up acceptance of the registration application. In one of these cases (13), the World Bank also paid for the registration fee.

With regards to the World Bank's role in **reaching financial closure** for the operations, three patterns emerged from the cases. Of note, no technology specific pattern emerged related to project financing:

In seven cases (1, 7, 9, 10, 11, 12, 13) the project was financed by the PE and a Third Party and the World Bank made no contribution because they were stand-alone CF operations, and the World Bank's involvement was exclusive to shepherding the project through the CDM process and signing an ERPA to commercialize the CERs.

In six cases (2, 3, 5, 14, 15, 16), the project received financial support from World Bank or IFC because the CF operation was blended with a World Bank financing operation or IFC Guarantee (2,3,5,15) or in cases 14 and 16,

although they were stand-alone CF operations, the project received funding through a separate World Bank-financed operation.

In three cases (3, 6, 8) the World Bank's engagement contributed to financial closure of the project even though it did not provide any financing. In one case (Chile Laja, hydro) having a letter of intent from the World Bank helped the PE to attract other investors to the table. In another case (Chile SIF Forestry, A/R) the fact that the ERPA provided guaranteed buyer for potential CERs, made it possible for the PE to utilize a specific financing structure. Similarly, in the China Xiaogushan project (hydro) the agreement to the projects financing plan by various parties was dependent on acceptance of the PIN by the World Bank.

Finally, an ERPA was developed and signed in all but two cases. The World Bank Group played the main role in development of the ERPA in most cases with the PE having minimal input (cases 2, 3, 7, 8, 10, 11, 12, 14, 15, 16) or negotiation power. Several nuanced patterns nevertheless emerge regarding the conditions presiding over ERPA signing.

In many of these cases, the ERPA was developed early in carbon market development before carbon prices were well-established. Under these circumstances the World Bank bore considerable risks, and this was reflected to some extent in the ERPA price. For example, the Chacabuquito hydropower project was developed before Chile had ratified the Kyoto Protocol. The World Bank prepared a flexible ERPA that guaranteed purchase of emission reductions before Chile had even ratified the Kyoto Protocol. The ERPA specified two prices, one for VERs (if Kyoto was not ratified) and a higher price would be paid for CERs if the country had ratified Kyoto by the time of CER issuance.

In other cases, such as the Jepirachi Wind Project in Colombia, the World Bank designed the ERPA so that it provided an additional incentive for the PE to oversee high-quality implementation of the environmental and social (E&S) safeguards plan. That project was carried out in Indigenous Peoples Territory and the ERPA included a premium CER price above the guaranteed CER price.

Most PEs had insufficient understanding of carbon markets to negotiate the terms of the ERPA. Several PEs did not understand carbon markets even though the project was developed at a time when the carbon market was established, so their negotiating capacity was limited (cases 15, 16). The Uganda solid waste composting project, the PE did have the capacity to draft or negotiate the terms of the ERPA. The PE noted they did not have a good understanding of the terms of the ERPA and what was negotiated, they were unaware of there being room to negotiate the price or delivery schedule of CERs. The ERPA was shared with them only on signing.

In other cases, the PE played no role in negotiating the original ERPA but successfully negotiated favorable terms of amendments to the ERPA in subsequent years. This was the case for the Uganda West Nile Hydro project, which negotiated an amended ERPA in 2016 that maintained the CER price that it received under prior ERPAs. This was considerably favorable terms for the PE considering the global carbon price had dropped significantly by that time.

In four cases, the PE actively negotiated the terms of the ERPA (China Landfill Gas, China Inner Mongolia wind, China Deqingyuan Biogas, and Ethiopia Humbo A/R). For example, with the help of the Chinese government, the PE of the China Inner Mongolia Wind Project succeeded in doubling the CER price during negotiations. The PE of the Deqingyuan Biogas project negotiated directly with IFC as intermediary for the Dutch Government under INCaF.

There are two outlier cases (6, 9), where the causal chain broke at this stage (negotiating the terms of the ERPA). In the case of Colombia Rio Frio (waste management), an ERPA was signed but subsequently invalidated because of changes in the project entity management, with the new managerial team refusing to proceed with the CDM process. In the case of the Chile Laja Hydropower project, an ERPA was never signed with the World Bank because the new entity wanted to retain ownership of potential CERs in expectation that the price of carbon would increase in the future.

3.2 Further Down the Causal Chain: Contributing to Outcomes

As laid out in the theory of change, ERPA projects have a triple mission and in the processing of achieving these goals are designed to: (i) lead to significant emission reductions; (ii) to contribute to sustainable development in the host countries by generating cobenefits to local communities; and (iii) catalyze and develop carbon markets through three main channels, enabling the project entities to continue to commercialize CER beyond the ERPAs, (iv) having a demonstration effect on other initiatives to adopt CF, and (v) having a demonstration effect on adopting low-carbon technological innovations. In this section, we review the contribution to these five outcomes of interest.

As is often the case in development interventions, the further down the causal chain one moves, the more diffuse and complex causal processes become, with many combined factors and multiple causal pathways potentially leading to the same outcome. This is where causal analysis techniques, such as qualitative comparative analysis, have a comparative advantage. QCA allows the evaluators to systematically go through and make sense of the causal complexity at play and generate parsimonious results. Here we review the contribution of the World Bank Group to the five main intended outcomes of ERPA interventions:

Outcome 1: Generating Certified Emissions Reductions

CERs were generated in all but three cases. The three cases for which, no CER were produced are as follows: In one case (Colombia Rio Frio, waste management) no emission reductions were generated because the project was canceled before the technology was fully developed. In two cases, emission reductions were generated but no CERs were issued because the cost of verification exceeded the potential CER/tCER revenue. The Colombia San Nicolas A/R project was carried out in a conflict affected area raising the cost of monitoring and verification. In the case of the Chile Laja Hydro project, the project's registration date coincided with the crash in carbon market prices and the PE had not yet signed an ERPA.

Among the projects that generated CERs, all but one (the Colombia Bajo Seco project, A/R), fell short of their original CER target in the World Bank Group ERPA. There are four possible factors that contribute to the shortfall in meeting CER issuance targets, some projects experienced a combination of these factors:

Project operational inefficiencies or technical challenges were the most frequent factor contributing to CER under delivery. This was the case for eight projects (cases 1, 2, 4, 8, 11, 14, 15, 16). In some cases, such as the China projects the operational challenges were overcome in the final years of the project and emission reduction generation improved but there was insufficient time in the ERPA crediting period to meet the ERPA target. These projects may continue to generate emission reductions beyond the termination of the ERPA. There is little evidence of the World Bank Group playing a role to address operational and technical issues in generating emission reductions because the World Bank was usually focused only on the CDM process.

Issues with the methodology to calculate emission reductions contributed to the shortfall in three cases (5, 7, 8). In these cases, the project baseline and target were established using one methodology, but a different methodology was used at the time of verification. revised targets.

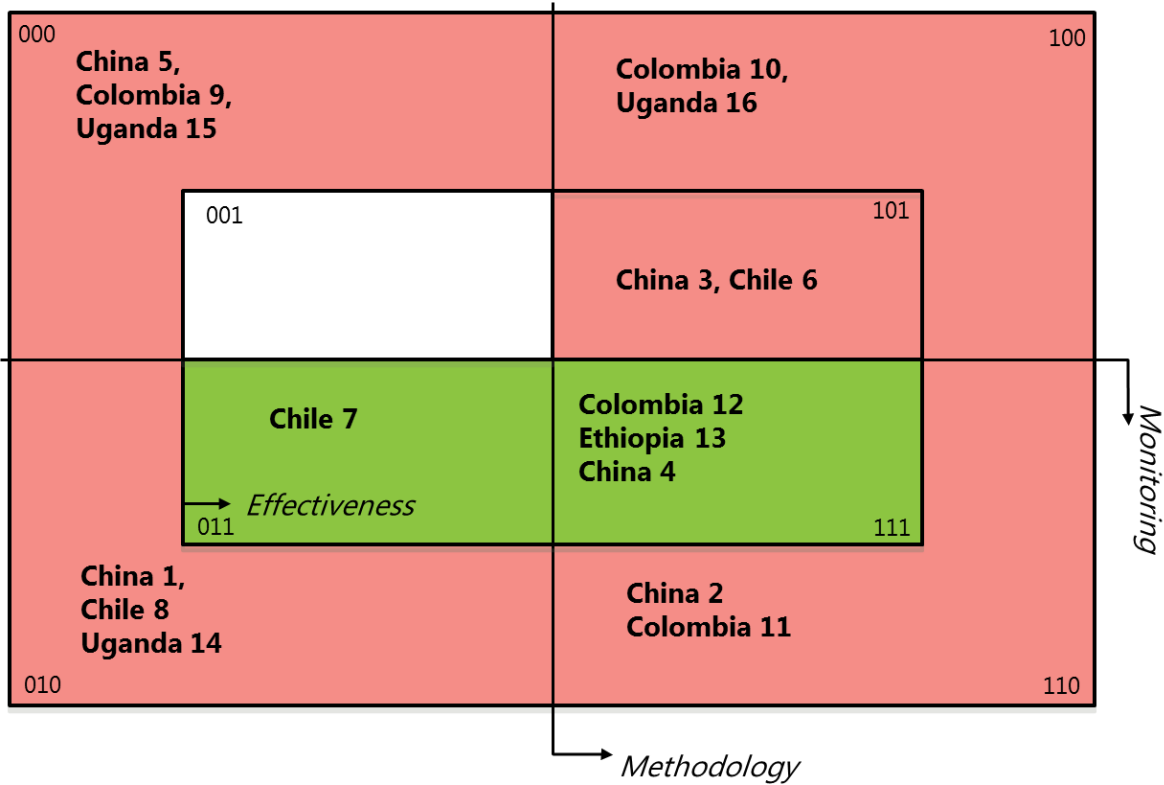
Faulty assumptions in the project model led to overestimation in the projects ER generation potential in three cases (1, 14, 15).

Issue with monitoring/verification or misunderstandings over CDM rules contributed to the shortfall in 3 cases (3, 5, 15). For example, the China Xiaogushan hydropower project achieved five successful verification rounds, exceeding the projects targets and the average performance of other hydropower plants of its size in China,³ but the fifth was invalidated by the CDM board over what was eventually found to be a misunderstanding on the part of the CDM board but the system lacked an appeal process to allow the decision to be reversed. Despite the rejection of the fifth verification the World Bank purchased the emission reductions generated.

In ten cases, the ERPA was amended with a revised target that better reflected the reality of the projects CER potential. In three cases, the revised target was met or exceeded (Chile Chacabuquito, hydropower project), or is ongoing and on track for meeting the revised target (China Huitengxile, wind project, and Ethiopia Humbo, A/R project). Six cases failed to meet the revised target or are ongoing but not expected to meet the revised target (cases 1, 2, 8, 11, 14, 16).

Resorting to QCA helps identify how these potential causes combine to lead to the target shortfall in reducing emissions. The two main causal paths that emerge as having the most explanatory power are: **the lack of effectiveness of operations OR faulty monitoring despite robust methodologies**. The results of QCA are presented in the figure C.2.

Figure C.2. Qualitative Comparative Analysis Results for Outcome 1: Reaching Certified Emission Reduction Targets



Note: The Venn Diagram represents all possible combinations of “absence” or “presence” of three conditions: Methodology, Monitoring and Effectiveness.
All cases on the left of the **central vertical axis** are cases where the “good methodology” was absent, and all cases on the right of the central vertical axis are cases where it was present.
Similarly, all cases at the top of the **central horizontal axes**, are cases where “good monitoring” was absent, whereas those at the bottom of the central axis are cases where it was present.
The **central rectangle** represents the third condition, “effective projects”. The cases where the project was effective fall inside the central rectangle, whereas the cases where effectiveness was absent fall outside the rectangle. The conditions intersecting divides the space into eight special areas which each represents a different combination of conditions.
Red special area represents negative outcomes; whereas **green** special area represents positive outcomes; when the area is striped, it means that they include both cases with positive and negative outcomes, they are contradictory cases.

Outcome 2: Generating Cobenefits

There has been significant discussion in the literature about the degree to which CDM projects fulfilled their second mission of fostering local community cobenefits as part of broader sustainable development outcomes. The patterns emerging from the cross-case evidence echo the findings of the structured literature review in finding that CDM A/R projects are those that have the most potential to generate significant local cobenefits. Direct cobenefits to local communities were generated in the A/R projects across all countries, projects carried out in Colombia across all technologies, and the China hydro projects (2, 3, 8, 9, 10, 11, 12, 13, 16). In most of the other cases, community cobenefits were limited or nonexistent.

All the A/R projects across countries generated direct cobenefits to communities. These cases were developed under the BioCF which is one of three World Bank carbon funds that have an explicit objective of generating cobenefits for communities. However, it is also the case that the A/R cases have inherent characteristics that require providing incentives to the local communities more so than other technologies such as renewable energy. In some cases, this is because the project entity needed to enter into lease agreements with the landholder to carry out the project, in other cases the project entity was a rural development agency and the project was part of a larger rural development program which had dual goals of improving and or diversifying community livelihoods and enhancing environmental conditions via better land management practices, sustainable forest management.

Almost none of the hydro projects (run of river) generated direct cobenefits to communities. The exception being the hydro project in China. That project was carried out in an area with ethnic minorities, triggering the World Bank Group E&S safeguards. CER revenues were used to finance the Ethnic and Minority plan that was prepared to comply with the safeguards policies. The plan included a range of activities including a local health clinic, temple, road maintenance and village education.

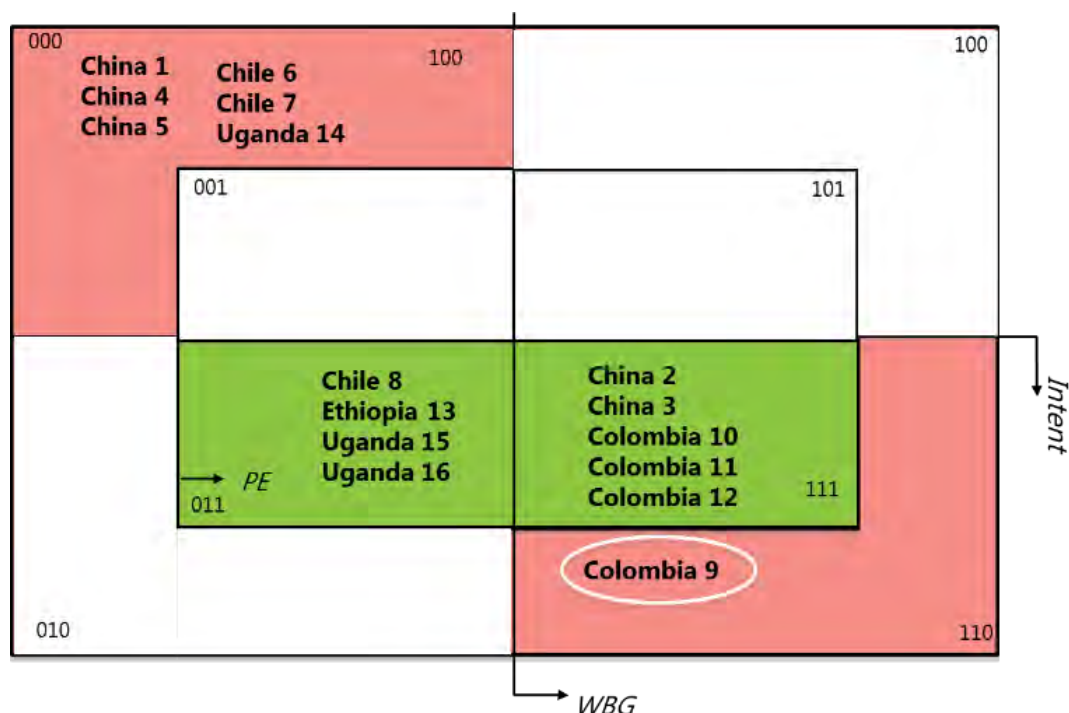
All four of the cases in Colombia were designed to provide direct cobenefits to communities, regardless of technology. In all the Colombia cases the World Bank's E&S policies enhanced the direct socioeconomic benefits to communities. In the Colombia *Jepiroche* Wind project, which was implemented in Indigenous Peoples Territory, the World Bank role was extremely prominent, not only did it play a role, but the World Bank also incentivized implementation of the E&S plan by offering a premium price in the ERPA contingent on high-quality implementation of the E&S program. The Bank E&S policies also contributed to the cobenefits in the China hydro project, which came out of the Ethnic and Minority plan that was prepared to comply with World Bank Group safeguards. It is not clear why E&S safeguards did not have a greater impact on enhancing community cobenefits in other cases.

The DNA, which has the potential to raise the ambition of the cobenefits pursued by CDM projects, did not play a role in the generation of benefits in any of the cases reviewed.

In addition to the pattern by technology and country, QCA reveals two main causal paths, one leading to positive outcome and one leading to negative outcomes (figure C3). When there was a **strong "intent" to achieve cobenefits at the project design combined with a demonstrated commitment of the PE throughout the project, local cobenefits were more likely to be achieved.** In some cases, the World Bank was instrumental in ensuring that there was an explicit and deliberate intent to generate cobenefits at project design, including through its safeguards policies, specifically regarding indigenous peoples.

Conversely, when there was limited intent and the PE did not feel compelled nor committed to serve the community and when the World Bank Group had limited say in the project beyond ensuring compliance with safeguards, cobenefits were unlikely to be generated.

Figure C.3. Qualitative Comparative Analysis Results for the for Outcome 2: Generating Cobenefits

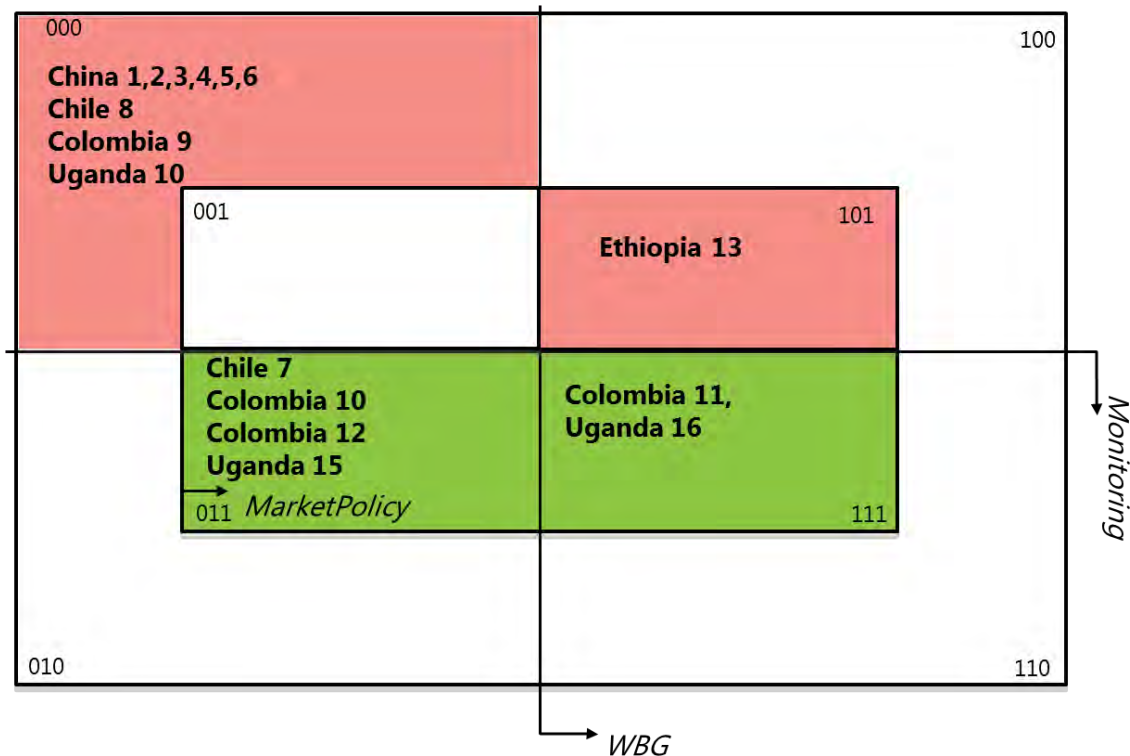


Note: Colombia 9 is an outlier case where the chain broke early on (explaining the absence of cobenefits despite Intent and the World Bank's support).

Outcome 3: Potential for Commercializing CERs beyond ERPAs

To date none of the projects reviewed have commercialized additional CERs beyond ERPA signed with the World Bank Group. Some cases however, have a greater likelihood of doing so in the future than others. A “winning configuration” seems to require an interested and able PE combined with an external incentive to pursue emissions reductions, find a buyer and go through the verification process. These incentives take tend to include: the prospect of a carbon policy or the emergence of a voluntary market. This “winning configuration” also depends on market conditions, the cost of verification, the PE's mandate. The comparative case analysis, formalized with QCA reveals three overarching patterns illustrated (figure C4).

Figure C.4. Qualitative Comparative Analysis Results for the Outcome 3: Commercialization of CER beyond ERPA



Note: CER = Certified Emission Reduction; ERPA = Emission Reduction Purchase Agreement; WBG = World Bank Group.

Projects that have a negative outcome, they are unlikely to commercialize CERs in the near term, exhibit two patterns. One pattern are projects that never got far enough through the CDM process to generate any emission reductions, so there is nothing to commercialize (case 9). The second pattern (cases 1, 2, 3, 4, 5, 6, 8, 13, 14, 16) involves projects that continue to operate and generate emission reductions but the PE has not capacity to identify potential buyers and negotiate a new ERPA or the PE has no interest in pursuing future commercialization because of the “cost” of the verification process is too high and the current carbon prices are too low to make it worth their while. The PE of the Uganda West Nile Hydro project, for example, noted that they are only interested in exploring commercialization of additional CERs if they can find a buyer with a reasonable price that will cover the cost of monitoring and verification. In contrast, the Uganda solid waste composting project has received offers for the purchase of additional CERs. Despite the low price of carbon currently, the PE has received support from another donor that is covering monitoring and verification costs of its second verification.

A/R projects face a peculiar burden in participating in the current voluntary markets because the temporary credits issued for this technology are a deterrent to potential buyers.

Projects that have a positive outcome are those that have not yet made a tangible effort to commercialize additional CERs but the PE has expressed its intention to do so and has access to potential buyer or there is tangible evidence of a potential market is under development, and the knowledge of commercialization (cases, 7, 10, 11, 12, 15). For example, in Colombia a recent carbon tax is stimulating the development of a national carbon market. A domestic market is also under development in China but is not yet stimulating demand to the extent we see in Colombia and none of the case in China reported any potential buyers.

Because of the potential demand for CERs generated by the carbon tax even the PEs of A/R projects anticipate commercializing future CERs, even though globally there has been little demand for A/R projects in voluntary markets because of the temporary nature of the credits issued. One example is the Colombia San Nicolas project, the ERPA for that project was terminated by the World Bank before CERs were verified, because verification costs were higher

than the returns of tCERs from this A/R CDM activity. However, the project continues to generate emission reductions and the PE is a government agency that is part of a larger “ecosystem” of entities with the capacity to take advantage of new carbon schemes that are under development, including a Reducing Emissions from Deforestation and Forest Degradation in Developing Countries scheme that the PE developed.

Even though this was an “unsuccessful” World Bank ERPA project, this case has a higher likelihood of commercializing future CERs than some of the other cases that may have been more successful as a World Bank ERPA project but where there is no real prospect of potential buyers. Another case is the Colombia Jepirachi Wind project, which continues to generate emission reductions and is in the process of finalizing a formal technical assistance with the World Bank Group to develop the capacity to commercialize CERs in the national market. There are also cases in which the PE has the capacity (know-how) to access voluntary markets and had the potential economy of scale to reduce the cost of monitoring and verification. This was the case with the Chile Chacabuquito Hydro Chile Chacabuquito Hydro Project, the PE had developed three CDM projects and commercialized its CERs through World Bank ERPAs and each of which continues to generate emission reductions. They are considering pursuing a future CER offering that bundles CERs from three of its hydro plants.

Outcome 4: Demonstration Effects to Further Catalyze CF

There is significant evidence across all countries that World Bank Group ERPA projects generated a demonstration effect that catalyzed the development of other CF projects (case 1, 2, 3, 4, 5, 7, 10, 13, 14, 15). The pioneering role of the World Bank Group in CF and the demonstration effects that unfolded were evidence across the cases included in the sample.

Many of the cases exhibiting a demonstration effect on other CDM projects were early CDM projects, the first to be registered in their country of the first of a specific technology to be registered. As such they played a significant role in providing proof of concept and demonstrating to others that there was real money on the table and carbon offset revenue was not a “pie in the sky” concept. Some of the awareness of these case was raised by media coverage they received by being the “first of a kind.” But the World Bank also played a key role in publicizing these cases in trainings and conferences domestically as well as globally in Carbon Expos and through regional knowledge exchange events.

In some cases, the PE built on the experience gained through the World Bank-supported ERPA to develop subsequent CDM projects. This was the case in the Chile Chacabuquito Hydro Chile Chacabuquito Hydro Project, the PE prepared two additional CDM projects that were commercialized through World Bank ERPAs. Some staff that worked on this project during its preparation left the PE to establish their own consulting firm where they developed and successfully registered CDM projects for other entities.

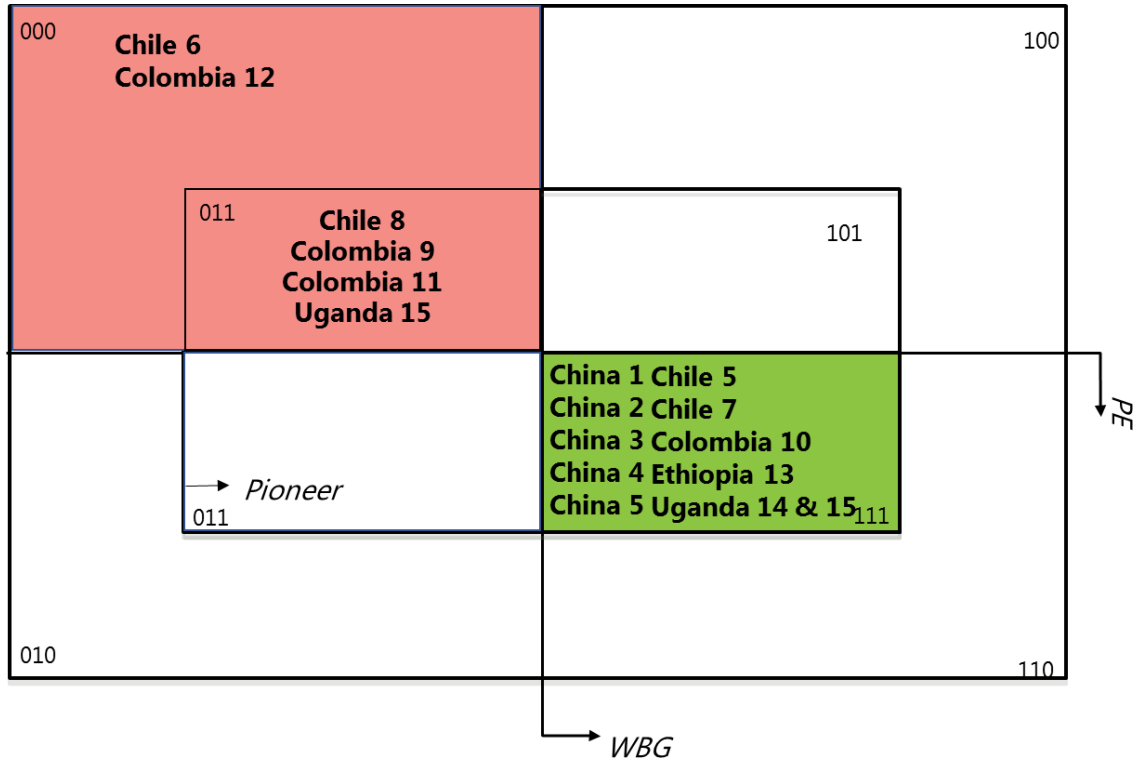
From a technology standpoint, few of the A/R projects had a demonstration effect on additional A/R CDM projects. The lack of demonstration effect for A/R projects is attributed to the rigid CDM rules which issues only temporary credits of five years and hampers demand. However, the Ethiopia Humbo A/R project catalyzed additional CDM projects in Ethiopia using other technologies (renewable off-grid), because this was the first CDM project of any type.

From a timing stand point, most of the cases that did not spur a demonstration of other CDM project, other than A/R projects, were carried out at a time when the market was in a downturn, was highly volatile, or closed at the time of market collapse (case 6, 15).

The QCA results provide further clarity on the combined contributory factors that ought to be in place for demonstration effects to materialize, and the factors that explain why sometimes there was no observable demonstration effects (figure C5). The “winning configuration” that emerges are cases where the project was a pioneer CDM project either in the country or for this specific technology in the country, and where both the World Bank Group and the PE made a substantive effort to disseminate and advertise the experience.

Conversely, in the cases, where neither the World Bank, nor the PE were invested in disseminating lessons, independent of whether the ERPA was a pioneer CDM, demonstration effects could not be observed.

Figure C.5. Qualitative Comparative Analysis Results for the Outcome 4: Demonstration Effects of Carbon Finance



Note: WBG = World Bank Group.

Outcome 5: Demonstration Effects to Further Develop Technologies

A demonstration effect in technology diffusion or replication occurred in half of the cases. The World Bank Group's contribution to the demonstration effect of technologies is less prominent than it was in catalyzing additional CF projects.

While, technology transfer as used by UNFCCC involves transfer of new technology from one country and demonstration of its use in another country. CDM has been claiming such transfer of climate mitigation technologies from advanced economies to developing countries. However, in this study we broadened the definition of demonstration effects, to also include the diffusion of the technology within the same country, or the replication or scale-up of the technology by the same project entity in another project.

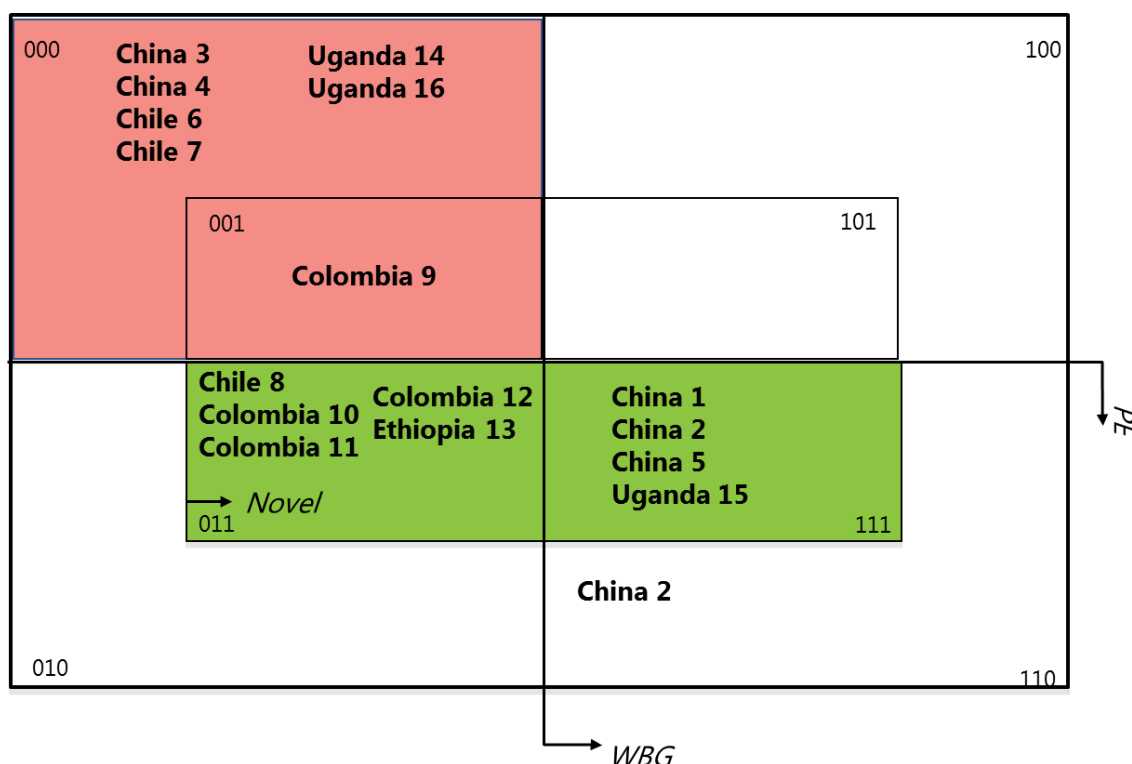
Typically, the technologies that have been diffused or replicated have been new innovations that were piloted by the CDM project or the first time that an established technology was applied at such a large scale, such as the China landfill gas and biogas projects (case 1, 5).

The benefit sharing arrangements/land use contracts and restoration / planting techniques developed under several of the A/R projects have been replicated elsewhere but it is unclear to what extent the ERPA project per se played a role, as these were projects that were developed as part of a larger rural development or sustainable land use program and the PE's mandate is to contribute to dual goals of environmental sustainability and social/economic development of the local population. In most cases the PE or a third party rather than the World Bank Group was responsible for the technology replication.

As demonstrated in the QCA results below, the projects that did not catalyze the replication of technology (3, 4, 6, 7, 9, 14, 16) were those that used technologies that were already well-established in the country, which was the case for all the hydro projects. Or cases in which a policy barrier is preventing further replication. For example, the Wind project in Colombia has not yet been replicated because past energy sector policies have discriminated against wind power. Recently these policy bottlenecks have been removed and the lessons developed through the CDM project are expected to be replicated.

On the other hand, when there was novelty in technology and the PE contributed to either replicate or disseminate the technological innovation, positive demonstration effects on future adoption within the country were more likely to occur (figure C.6).

Figure C.6. Qualitative Comparative Analysis Results for the Outcome 5: Demonstration Effect for Technology



Note: WBG = World Bank Group.

4. Conclusions

The World Bank Group played a significant role in motivating project entities across all countries and technologies to resort to CF. The World Bank Group made a critical contribution in introducing various project entities across countries to the concept of CF. By signing ERPAs, at time of market and regulatory uncertainties, the World Bank Group provided a key assurance to capital investors, representing a guaranteed buyer for potential CERs and spreading out the investment risk in a commodity that hardly existed at the time.

There was a significant amount of capacity building and technical skills transfer embedded in ERPA preparation, development and implementation. The World Bank Group played a key role in helping PEs navigate the CDM process through each step of the project preparation, registration and monitoring and validation phases of the causal chain. In each of these phases, there is clear evidence of the World Bank's contribution to addressing bottlenecks, obtaining clearance faster than would otherwise have been the case. During this part of the causal chain, the World

Bank made a particularly critical contribution to the development of GHG reduction accounting methodologies which are technically demanding to develop.

The evidence on the performance of ERPA projects in reducing GHG emission, shows that ERPA projects usually succeeded in issuing CERs but at a lower volume than what was expected. Shortfalls in CER volumes were due to a combination of project operational inefficiencies, problems with specific methodologies used to calculate emission reductions or monitoring issues. The most prevalent factor contributing to CER shortfalls were project operational or technical failures, aspects of the project with which the World Bank Group typically had limited involvement.

There is a mixed picture with respect to the effectiveness of ERPA cases in generating cobenefits for local communities. Cobenefits to local communities were limited except for projects that were prepared under the BioCF, which requires projects to explicitly include direct cobenefits to communities, or those that were carried out in indigenous people's territory or ethnic lands and cobenefits were explicitly developed to comply with the World Bank's E&S safeguards.

By motivating the PEs to pursue CF and supporting them through the CDM process, the World Bank has also played a critical role in the development of carbon markets by catalyzing the development of other CF projects. The ERPA projects sped up the learning curve for other actors in the carbon market "ecosystem" in many countries and demonstrated that CF is not a pie in the sky but a tangible concept with real money on the table. There is also substantive evidence that when these pioneering CF projects also piloted a new technology in a given country, and the regulatory environment allowed it, the diffusion, scale-up or replication of technologies took place. In this sense this study generates important lessons in demonstrating the World Bank's role and added value in "creating markets" for innovative commodities, such as emission reduction in the mid-2000s.

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Annex C.1. Causal Chain and Contributions of Key Players in ERPA Projects

Phases of the Theory of Change	Describe the Level of Achievement or Failure at Each Stage of the Causal Chain	Contributions of Key Players IN the Project Cycle			Other explanatory factors (policy, markets, regulation systems, etc.)
		Project Entity or Entities (Implementing Agency or Project Owners)	Institution	External players (Government Entity, Third Parties, Trader Associations, etc.)	
Motivating the start of the project					
Motivating the choice of carbon finance for this project					
Preparation, review and due diligence of the initial CDM project concept					
Designing the CDM project including project design document, methodology, baseline study and monitoring plan					
Obtaining national approval for the project including letter from the Designated National Authority					
Preparing the validation protocol and obtaining validation by the designated operating entity					
Registering the project with UNFCCC					
Financing the project					
Developing and negotiating the ERPA					
Implementing the monitoring and verification processes					
Generating Emission Reductions and CER issuance					
Facilitating payments for CERs as per ERPA (active project)					
Designing cobenefits plan and generating cobenefits					
Commercializing CERs after the end of the crediting period (for closed projects)					
Sustaining technology and ensuring environmental integrity of additional ERs (for closed projects)					

Note: ER = emission reduction.

¹ This appendix was prepared by April Connelly and Estelle Raimondo.

² Boolean minimization consists of the reduction of a long complex expression into a more parsimonious expression. It can be summed up as follows: "If two Boolean expressions (combining multiple factors) differ in only one causal condition yet produce the same outcome, then the causal condition that distinguishes the two expressions can be considered irrelevant and can be removed to create a simple, combined expressions (Ragin 1987, 83).

¹ A designated operational entity is an independent auditor accredited by the CDM Executive Board (CDM EB) to validate project proposals or verify whether implemented projects have achieved planned greenhouse gas emission reductions" Source: <https://cdm.unfccc.int/DOE/index.html>.

² The PE changed during the preparation stage of the TOC and the new project entity was not interested in carrying out the work required to go through the CDM process.

³ The CDM Executive Board rejected the 5th verification on the basis that the project had performed above the project design document volumes for four consecutive years due to an increase in the plant load factor, which in turn was due to increased water flow to the project. The increase in water flow is considered a "permanent change" the documentation to amend this information was rejected by the CDM Executive Board on October 15, 2013 on the basis that the Project Entity not only modified key parameters affected by the change to the Project activity, but also modified the electricity tariff which was not affected by the proposed change (increase of water flow). The Bank submitted a letter to the CDM Executive Board on October 23, 2013 stating that the electricity tariffs were modified to correct a mistake in the registered project design document, but there is no appeal process to take this information into account.

Appendix D. Econometric Analysis of Global Clean Development Mechanism Data

This section attempts to assess the relative effectiveness of the World Bank Group in reducing greenhouse gas emissions through its support to the Clean Development Mechanism (CDM) interventions. It undertakes quantitative analysis of Certified Emission Reduction (CER) issuances of the global CDM projects. The analysis investigates whether World Bank Group-supported projects performed differently from other projects regarding emission reductions. The analysis is based on the global CDM pipeline database of the United Nation Environment Program—Technical University of Denmark (UNEP DTU).

The UNEP DTU's CDM pipeline database includes projects from the validation stage through registration and eventual issuance of CERs. The empirical exercise in this appendix will focus primarily on registered projects in the CDM pipeline which are eligible to generate CERs. The first CER issuances in the database occurred in 2005. Since the first commitment period of the Kyoto Protocol ended in 2012, CER issuances can be divided in two periods: period 1 (CP1) covering issuances between 2005 and 2012, and period 2 (CP2) for issuances starting 2013 and onwards. Depending on the project, the crediting may start at any point during these two periods.

World Bank Group Projects: A Quick Comparison

Projects in the CDM database were classified as World Bank Group supported by identifying who was the consultant/agency responsible for the project design and the development of project baselines.¹ Overall, there are 7,784 registered projects in the database of which 98 have been identified as World Bank Group projects (table D1). Total issuance in the database amounted to 1,852 million tons of carbon dioxide equivalent (tCO₂e) with World Bank Group-supported projects issuing 182.8 million tCO₂e. For projects with positive issuances, World Bank Group projects on average issued almost 4 times more than non-World Bank Group projects.

Table D.1. CDM Projects and CER Issuances

	Projects (no.)	Projects with CER Issuance (no.)	CER Issuances (tCO ₂ e, millions)	Average CER Issuance per Project with Issuance (tCO ₂ e, millions)
World Bank Group Projects	98	80	182.8	2.3
Rest of the CDM Portfolio	7,686	3,004	1,669.9	0.6

Source: Independent Evaluation Group analysis based on United Nation Environment Program—Technical University of Denmark CDM database (December 2017).

Note: CDM = Clean Development Mechanism; CER = Certified Emission Reduction; tCO₂e = tons of carbon dioxide equivalent.

The distribution of the World Bank Group projects tends to be more evenly distributed across all regions than the rest of the global CDM portfolio (table D.2)—60 percent of the World Bank Group-supported projects can be found in the East Asia and Pacific and Latin America and Caribbean Regions, whereas almost the same share of projects can be found in just East Asia and Pacific for the rest of the portfolio. With regards to CER issuances, both the World Bank Group and the rest of the CDM portfolio show a concentration of issuances in East Asia and Pacific, driven mostly by projects in China.²

Table D.2. Regional Distribution of Projects and CER Issuances (percent)

Region	Projects		Issuances	
	World Bank Group (n = 98)	Rest of the CDM Portfolio (n = 7,686)	World Bank Group (n = 183; million tCO ₂ e)	Rest of the CDM Portfolio (n = 1,670; million tCO ₂ e)
East Asia and Pacific	26	61	84	69
Europe and Central Asia	6	1	1	1
Latin America and the Caribbean	34	13	11	13
Middle East and North Africa	5	2	0	2
South Asia	15	22	2	14
Sub-Saharan Africa	14	2	1	1
Total	100	100	100	100

Note: CDM = Clean Development Mechanism; CER = Certified Emission Reduction; tCO₂e = tons of carbon dioxide equivalent.
Source: Independent Evaluation Group analysis based on United Nation Environment Program—Technical University of Denmark CDM database (December 2017).

Table D.3. Distribution by Technology of Projects and CER Issuances (percent)

Technology	Projects		Issuances	
	World Bank Group (n = 98)	Rest of the CDM Portfolio (n = 7,686)	World Bank Group (n = 183 million tCO ₂ e)	Rest of the CDM Portfolio (n = 1,670; million tCO ₂ e)
Agriculture	0	0.01	0	0
Afforestation-reforestation	19	1	4	0.3
Energy efficiency	11	8	1	6
Fugitive emission	1	1	0	2
Fossil fuel switch	0	1	0	4
Cement	1	0.3	5	0.2
Industrial gases	2	2	63	45
Renewable energy	40	73	11	33
Transport	0	0.4	0	0.1
Waste management	26	14	17	9
Total	100	100	100	100

Source: Independent Evaluation Group analysis based on United Nation Environment Program—Technical University of Denmark CDM database (December 2017). *Note:* Includes only registered projects. *Note:* CDM = Clean Development Mechanism; CER = Certified Emission Reduction; tCO₂e = tons of carbon dioxide equivalent.

Like the regional distribution, World Bank Group projects tend to be more evenly distributed with regards to the technologies used to reduce emissions as compared with the rest of the CDM portfolio (table D3). The World Bank Group projects covered several technologies: renewable energy (43 percent), waste management (26 percent), and afforestation/reforestation (19 percent). In contrast, about 73 percent of the rest of the global CDM portfolio utilized renewable energy technologies such as hydroelectric, geothermal, wind, solar, and biomass/biogas. The distribution of CER issuances by technology however, did not follow a similar pattern to the regional distribution. For both groups,

World Bank Group and the rest of the CDM portfolio, most of the issuances came from industrial gases related projects.

Empirical Model

For the econometric analysis of the CER issuances, the equation of interest is the following:

$$y_i = \alpha + \beta w b_i + \gamma X_i + \rho Z_i + \epsilon_i \quad (1)$$

where y_i is the dependent variable; $w b_i$ is a binary variable with a value of 1 if the project is World Bank Group supported; X_i is a vector of project-level control variables; Z_i is a vector of country-level control variables.

The dependent variable in the analysis is the CER issuance⁴ and is scaled by the actual or effective crediting period over which the issuances have occurred. This will facilitate the comparison between projects that have been crediting CERs for different lengths of time. An additional way to enable a reasonable comparison between projects is to use the ratio of actual issuance levels relative to the expected issuance at the start of the project's life. This method of scaling can be interpreted as the "issuance success rate" of the project. Both the issuance per effective crediting years and the issuance success rates were converted into log forms⁵.

One key issue when using CER issuances as dependent variable is that most of the registered projects (60 percent) have not yet or did not choose to issue any CERs. This leads to a censoring problem (Green 2002). For censored dependent variables, the use of the standard linear estimators like Ordinary Least Squares (OLS) will result in inconsistent estimates even with large sample sizes—like having an omitted-variable bias (Cameron and Trivedi 2010). One solution is to simply focus the analysis on the non-censored observations, but this may throw away valuable information.

Given the censored nature of the dependent variables, we adopt the Tobit approach as pioneered by Tobin (1958):

$$y_i^* = \beta x_i + u_i \sim N(0, \sigma^2) \quad (2)$$

$$y_i = \begin{cases} y_i^*, & \text{if } y_i^* > 0 \\ 0, & \text{if } y_i^* \leq 0 \end{cases} \quad (3)$$

What we are interested in estimating equation (2) where y_i^* is either CER issuances per crediting year or issuance success rates. However, y_i^* is unobserved or latent whereas what we observe in the CDM database are only positive issuances where 0 is the lower censoring point (3). That is, for $y_i^* \leq 0$ we simply observed these projects as having 0 issuances.

Unlike OLS, the Tobit model conditions the expected value of the dependent variable on the probability of the observations being censored, exploiting information from both censored and non-censored observations of the dependent variable. Tobit maximum likelihood estimators are consistent under the assumptions that the errors are normally distributed and homoskedastic. This can be done by maximizing the log-likelihood of the density (Cameron and Trivedi 2010):

$$f(y_i) = \left[\frac{1}{\sqrt{2\pi}\sigma^2} \exp \left\{ -\frac{1}{2\sigma^2} (y_i - x_i' \beta) \right\} \right]^{d_i} [\Phi\{\gamma - x_i' \beta\} / \sigma]^{1-d_i} \quad (4)$$

where d_i is equal to 1 if the observation is above the censoring point, and 0 otherwise, $\Phi(\cdot)$ is standard normal cumulative distribution function.

However, while Tobit is a commonly used model for quantitative analysis of censored data, it also has its disadvantages. First, it relies heavily on the two stated assumptions, the violation of which will result in biased estimates. Second, the Tobit model assumes that the same mechanism affects the probability of nonzero observations and the magnitude of the observation itself (Jones 2000). That is, the Tobit model forces a variable to have one coefficient to explain both how it affects the probability of having positive observations and the level of that

observation. In some cases, it is highly likely that these two mechanisms might be independent of each other and their coefficients may have different signs or magnitudes.

To assess the robustness of the Tobit results, we use a 2-part model (2PM) approach (Jones 2000) which relaxes some of the restrictive Tobit assumptions. The first part of the 2PM is a Probit model in which the dependent variable is binary with a value of 1 if CER issuance is positive and 0 otherwise. This model captures the mechanism that affects the probability of issuance. The second part is an OLS model restricting the sample to positive issuance only—this captures the mechanism that affects the level of the issuance conditional on having issued CERs. Notice that since these regressions are estimated separately, the coefficient of the regressors are not forced to be the same for both mechanisms.

Compared with the other estimators, the 2PM has several advantages. First, the 2PM assumes that the mechanism that affects the decision to issue CERs and the size of the issuance itself are independent from each other. This gives us the flexibility of assuming different or even contradicting effects of regressors on the probability of issuing CERs and the volume of issued CERs.⁶ Second, neither the normality or homoskedasticity assumptions are necessary to maintain consistency of OLS (Cameron and Trivedi 2010), although the first part, Probit, might still suffer bias from heteroskedasticity. Third, the 2PM is also appropriate as compared with other estimators such as the Hurdle model or the Generalized Tobit because observations with observed zero issuance are uninformative in determining the amount of issuance conditional on positive issuance since the decision to issue CERs and the amount of the issuance is not done simultaneously (Jones 2000). A project decides first whether it should go through the verification process and issue CERs given the emission reductions it has accumulated. However, the amount of the issuance (as CER) depends on the emission reductions verified by an accredited third-party Designated Operational Entity (DOE).⁷ As a result, the observation of zero issuance for a project does not contain information that will help in estimating the relationship between the level of issuance and the control variables.

As a further test of robustness for the Tobit results, the model was re-estimated by reducing the sample to the top 10 entities (“project design document consultants”) in the CDM database. The interest is to check how the World Bank Group projects would compare against the narrower set of the top 10 experienced carbon market participants supporting the design of these projects. This sampling restriction, which will result in an overall sample of 1,400 projects, will provide a more comparable group of project design document consultants to the World Bank Group.

The following explanatory variables, mainly from the CDM database, are included to control for project characteristics that may affect CER issuances:

- Expected years of credit based on the original design document.
- Binary variables for the phase in which the crediting period started. CP1 is divided into two phases to capture the sharp increase in CDM activity late in the 2000s: the first period is between 2000–05, the second is between 2006–12. CP2 is for projects that started their crediting period from 2013 onwards.
- Binary variables for the different technologies used: Renewable Energy (hydropower, wind, solar, geothermal, biomass/biogas), Energy Efficiency, Waste Management and Methane Capture, and Others.⁸
- Binary variables for regional location of the project.
- Project size in terms of investments (\$ millions).
- Expected internal rate of return (excluding revenues from CER issuances).

The country-level control variables are calculated to be the average preexisting values from 2000–05, right before the first issuances in the CDM. These variables control for initial conditions in the country before the CDM mechanism was established:

Average carbon dioxide emissions (metric tons per capita) from World Bank Development Indicators.

- Average share of electricity production from fossil fuels (oil, gas and coal) from World Bank Development Indicators.
- Average real gross domestic product per capita (in logs) from the International Monetary Fund World Economic Outlook.

The models were estimated for three different periods:

- CP1 for all projects that started their crediting period before 2013; and
- CP1+CP2 covering CER issuances during the two periods (that is, the full sample from the CDM database).

Results

The results for total issuance of CERs per effective crediting year for the entire period are presented in table D4. Some caveats in interpreting the regression results: first, caution must be taken when interpreting results from a Tobit regression as the coefficients are not directly interpreted the same way as one would interpret them in an OLS—the marginal effects are for the latent variable (equation 2) and not for what we observe (equation 3); second, given the small number of project-level variables available for the estimation, one has to be mindful in assigning causal relationships to the regression results. With those caveats, the parameter estimates point to an inference regarding the variables that affect CER issuance and the relative performance of World Bank Group–supported projects: controlling for the observable variables included, the World Bank Group projects tend to be different from the rest of the global CDM portfolio with regards to the size of the issuances. The World Bank Group projects indicator variable had a positive and significant estimated parameter across the three estimated models, indicating that the World Bank Group projects tend to be more successful in generating more CERs per year, compared with the rest of the CDM pipeline or the top 10 market participants. Table D.4 also shows that World Bank Group support also had a varying positive effect on the probability of issuing CERs (column 3a) and the size of the issuance (column 3b).

Table D.4. Certified Emission Reduction Issuance per Effective Crediting Year (in logs) During CP1+CP2

	Tobit		Two-Part Model: Full Sample	
	(1) Full sample	(2) Sample: Top 10 Agencies	(3a) Probit	(3b) OLS
World Bank projects	2.994*** (0.54)	3.184*** (0.58)	1.405** (0.44)	0.470* (0.18)
Marginal effects of World Bank Group projects at the mean (percent)				
Probability of having positive issuance	121.3 (0.00)	31.6 (0.00)	49.6 (0.00)	
Expected value of issuance given positive issuance	35.4 (0.00)	185 (0.00)		60 (0.18)

Source: United Nation Environment Program—Technical University of Denmark Clean Development Mechanism database, International Monetary Fund World Economic Outlook, World Development Indicators, Independent Evaluation Group staff analysis.

Note: * p<0.10, ** p<0.05, *** p<0.01. Regression results reflect the full model with all controls. Standard errors in parenthesis are clustered at the country.

Table D.4 also presents the marginal effects, calculated using average values of the regressors. The marginal effects show that World Bank Group projects tend to have 35 percent higher probability of issuing CERs (column 1). Moreover, conditional on having issued CERs, World Bank Group projects tend to have 121 percent higher levels of issuance compared with non-World Bank Group projects (column 1). The large magnitude of the effects on both the probability of issuance and the level of issuance is not surprising. As table D.1 shows, 80 out of 90 World Bank Group projects were able to issue CERs indicating a higher probability of issuance. Moreover, the World Bank Group projects tend to issue more compared with the rest of the CDM portfolio—the average issuance for non-World Bank Group-supported projects are 0.56 million tCO₂e compared with World Bank Group-supported projects of 2.3 million tCO₂e.

Given that the marginal effects are calculated by assigning certain values for the control variables, it might be of interest to see if there are differences in results when evaluating the marginal effects for different regions. For example, while there seems to be no sizeable differences on the marginal effect on the probability of issuance between regions on being World Bank Group projects for the Tobit model,⁹ holding the values of the other regressors at their means, there are stark differences the effects of World Bank Group support on the level of issuances per effective crediting year, conditional on having issued CERs. In Sub-Saharan Africa, World Bank Group projects tend to have 86 percent higher issuances holding the values of the other regressors at their means, whereas World Bank Group projects in East Asia have 125 percent higher issuances compared with non-World Bank Group projects. Projects in Latin America and the Caribbean and Mexico are in between the two regions with World Bank Group projects tending to have 98 percent higher issuances. These results suggest substantial variation in performance for World Bank Group projects across regions regarding the levels of issuance.

The regressions for the top 10 market participants show similar results with the coefficient for the World Bank Group variable having an analogous magnitude and sign (table D.4, column 2). Moreover, the size of the marginal effects is comparable—World Bank Group projects have a 31 percent higher probability of issuance and have 185 percent higher issuance conditional on having issued CERs. The results of the 2PM10 show that being a World Bank Group project is associated with both a higher probability of issuance (table D.4, column 3a) and a higher amount of issuance but at the 10 percent significance level only (table D.4, column 3b). The marginal effect for the OLS part of the 2PM is a little more straight forward to interpret: conditional on positive issuance, World Bank Group projects are likely to have issuances that are 60 percent higher than other projects. The smaller magnitude compared with the Tobit results is due to a couple of factors. First, the World Bank Group project variable is an indicator variable which implies that we are doing a discrete change from 0 to 1. Second, since we are using the means of the variables to calculate the marginal effect, the cumulative density function for the probability of positive issuance for Tobit type transformations has a high slope around the mean of the distribution. The two factors combined tend to result in larger magnitudes for the marginal effects. The full details of the estimated relationships are in annex D, table AD.1.

Table D5. Certified Emission Reduction Issuance Success Rates During CP1+CP2

	Tobit		Two-Part Model: Full Sample	
	(1) Full sample	(2) Sample: Top 10 Agencies	(3a) Probit	(3b) OLS
World Bank projects	58.362*** (14.98)	63.221*** (11.86)	1.403** (0.45)	-10.126 (7.58)
Marginal effects of World Bank Group projects at the mean (percent)				
Probability of having positive issuance	24.7 (0.00)	28.8 (0.00)	49.9 (0.00)	
Expected value of issuance given positive issuance	21 (0.00)	34.2 (0.00)		-10.1 (0.19)

Source: United Nation Environment Program—Technical University of Denmark Clean Development Mechanism database, International Monetary Fund World Economic Outlook, World Development Indicators, Independent Evaluation Group staff calculations.

Note: * p<0.10, ** p<0.05, *** p<0.01. Regression results reflect the full model with all controls. Standard errors in parenthesis are clustered at the country.

Table D.5 presents the findings for the issuance success rate, which measure the extent to which the projects were able to reach their expected issuance target. The Tobit results (column 1) show a generally positive and statistically significant relationship between the issuance success rates and World Bank Group support. In addition, the marginal effects at the mean values show a 25 percent higher probability of positive issuance and a 21 percent higher issuance success rate, conditional on having a positive issuance. And unlike the results for the level of the issuance (discussed above), there are no large discernable differences for the effect of World Bank Group support on the level of success rates across regions or technologies with the effects ranging from 16–24 percentage points higher success rates compared with non-World Bank Group projects.

The robustness of the results for issuance success rates are not as strong as the results for the total issuance per effective crediting year in table D.4. The results for the top 10 market participants show estimates with similar signs and magnitude with the Tobit. The marginal effects also are reasonably comparable (table D.5, column 2)—World Bank Group projects have a 29 percent higher probability of a positive success rate and a 34 percent higher success rate than non-World Bank Group projects. However, the 2PM results show that World Bank Group projects only have a significant effect on the probability of success (columns 3a), but not on the level of issuance success (column 3b). Indeed, World Bank Group projects have a 50 percent higher probability of positive success rates compared with non-World Bank Group projects (column 3a).

The OLS results in the 2PM model show that the level of the success rate for the World Bank Group projects is not different from the other CDM projects (negative but insignificant relationship). These results, together with the results in table D.4, column 3b indicate that the strongest impact that World Bank Group has on CDM projects is mostly on the probability of positive issuance—but not on the extent to which the projects meet their expected issuance (success rate). There is also a moderate evidence on the level of the total issuance, conditional on positive issuance. The full details of the estimated relationships for the issuance success rate are in annex D, table AD.2.

Conclusion

The World Bank Group has been an active participant in carbon markets. It has been providing technical and financial support to CDM projects that mitigate climate change and contribute to sustainable development. It is one of the top 10 consultants for projects that participated in the CDM with over 98 supported projects since 2000. The analysis in

this section was undertaken to assess the extent to which the World Bank Group–supported projects performed relative to other CDM projects for two key parameters (total CER issuance per effective crediting year and issuance success rate). The quantitative evidence from the regression estimates suggests that World Bank Group projects tend to be more likely to have positive issuances (in terms of total CERs per year) and have a positive success rate (relative to the expected issuances). The strong positive effect on the probability of positive issuance becomes moderate when one looks at the level of the total CER issuance—World Bank Group projects tend to have higher levels of issuances relative to other projects (at 10 percent level). Moreover, this positive relationship fades when looking at the levels of the success rate—the World Bank Group projects are not different from other projects in terms of meeting their targets (the expected issuance). These results in total suggest that projects receiving World Bank Group support are most likely to issue CERs and will be better able to reduce emissions.

Given the nature of the data available in the CDM database, the econometric analysis cannot fully explain why the World Bank Group projects may perform differently from other CDM projects. However, the results suggest that the World Bank Group is more able to put projects on the path to have CER issuances, which could be related to the technical and financial support provided in terms of baseline and monitoring methodologies, among others. In addition, the World Bank Group can influence decisions at the early stages of project design and development which improves the quality at the project entry. Moreover, projects supported by the World Bank Group have access to technical assistance programs that are sometimes attached to the CDM projects.¹¹ Of the 98 World Bank Group–supported projects in the database, 29 received technical assistance from the World Bank Group. These findings are consistent with the causal analysis of selected CDM projects undertaken by the Independent Evaluation Group (appendix C) which provides strong evidence of the World Bank Group motivating carbon finance and supporting projects through the design, validation and verification process. Appendix C provides additional details on how the World Bank Group impacts each stage of the project from the design stage to the issuance of CERs.

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Annex D.1. Detailed Regression Results

Table AD.1. CER Issuance per Effective Crediting Year (in logs) During CP1+CP2

	Tobit		Two-Part Model: Full Sample	
	(1) Full sample	(2) Sample: Top 10 agencies	(3) Probit	(4) OLS
World Bank projects	2.994*** (0.54)	3.184*** (0.58)	1.404** (0.44)	0.470* (0.18)
Years of crediting period	-0.103 (0.06)	-0.350*** (0.06)	-0.018 (0.03)	-0.068 (0.04)
Average CO ₂ emissions (metric ton per capita)	0.031 (0.07)	0.104* (0.05)	0.001 (0.02)	0.028 (0.01)
Average electricity production from oil gas and coal sources (% of total)	-0.004 (0.01)	-0.020 (0.02)	-0.003 (0.00)	0.003 (0.00)
Log average real GDP per capita (00–05)	-0.022 (0.41)	0.172 (0.84)	0.184 (0.14)	-0.470** (0.15)
Renewable: Hyrdo-electric	-0.244 (0.25)	-0.764** (0.26)	0.043 (0.10)	-0.496** (0.15)
Renewable: Wind	-0.957*** (0.29)	-1.408*** (0.19)	-0.127 (0.11)	-1.042*** (0.10)
Renewable: Solar	-2.808** (1.05)		-0.722* (0.31)	-1.201*** (0.14)
Renewable: Other	-1.129*** (0.26)		-0.341*** (0.09)	-0.317* (0.15)
Waste Management- Methane Capture	0.557 (0.35)		0.084 (0.10)	0.779*** (0.18)
Fugitive emissions	1.561*** (0.23)		0.329*** (0.10)	1.063*** (0.14)
Other technologies	0.414 (0.53)		0.169 (0.22)	-0.443 (0.26)
Credit start during 2006–12	-2.506*** (0.47)	-3.377* (1.59)	-1.016** (0.36)	-0.805*** (0.05)

	Tobit		Two-Part Model: Full Sample	
	(1) Full sample	(2) Sample: Top 10 agencies	(3) Probit	(4) OLS
Credit start during 2013 onwards	-6.443*** (0.43)	-5.928*** (1.60)	-2.264*** (0.36)	-0.504*** (0.10)
Europe and Central Asia	1.444 (1.76)		0.165 (0.49)	0.608 (0.94)
East Asia	1.968** (0.62)	2.561** (0.80)	0.509** (0.17)	0.803 (0.44)
South East Asia (incl. Fiji)	1.123 (0.62)		0.271 (0.17)	0.355 (0.46)
Southern Asia	2.146** (0.67)		0.671*** (0.20)	0.508 (0.45)
North Africa and Middle East	0.904 (1.39)		0.053 (0.45)	1.016 (0.53)
Latin America and Mexico	0.054 (0.89)		-0.133 (0.28)	0.487 (0.48)
IRR excluding CER revenue	0.028 (0.02)	0.036 (0.06)	0.012 (0.01)	-0.000 (0.01)
Project size	0.690*** (0.06)	0.480*** (0.09)	0.089*** (0.02)	0.812*** (0.03)
Constant	0.085 (3.12)	3.400 (7.37)	-0.995 (1.14)	5.081** (1.50)
Observations	5,140	1,041	5,140	1,976
Pseudo Log-likelihood	-6,685.371	-1,749.226	-2,970.113	-2,612.549

Sources: United Nation Environment Program – Technical University of Denmark Clean Development Mechanism database, International Monetary Fund World Economic Outlook, World Development Indicators, Independent Evaluation Group staff calculations.

Note: Regression results reflect the full model with all controls. Standard errors in parenthesis clustered at the country. Comparison group for technologies is energy efficiency type projects; comparison group for credit start is pre-2006 projects. The comparison group for technologies and regions was consolidated for the top 10 subsamples due to the lower number of observations per technology. Comparison group for Regions is Sub-Saharan Africa. CER = Certified Emission Reduction; CO₂ = carbon dioxide; GDP = gross domestic product; IRR = internal rate of return.

*p < 0.10.

**p < 0.05.

***p < 0.01.

Table AD.2. Certified Emission Reduction Issuance Success Rate During CP1+CP2

	Tobit		Two-Part Model: Full Sample	
	(1) Full sample	(2) Sample: Top 10 agencies	(3) Probit	(4) OLS
World Bank projects	58.362*** (14.98)	63.221*** (11.86)	1.403** (0.45)	-10.126 (7.58)
Years of crediting period	-1.496 (1.34)	-7.024*** (1.76)	-0.025 (0.03)	-0.174 (2.05)
Average CO ₂ emissions (metric ton per capita)	-0.038 (1.67)	1.792 (1.43)	0.001 (0.02)	0.189 (0.56)
Average electricity production from oil gas and coal sources (% of total)	-0.329 (0.23)	-0.882 (0.63)	-0.002 (0.00)	-0.428** (0.13)
Log average real GDP per capita (00–05)	11.518 (12.49)	11.827 (23.44)	0.135 (0.14)	1.448 (5.08)
Renewable: Hydroelectric	3.756 (6.75)	-5.473 (7.33)	0.005 (0.11)	4.478 (2.95)
Renewable: Wind	-9.195 (5.59)	-7.334* (3.43)	-0.166 (0.11)	4.234 (3.37)
Renewable: Solar	-60.311*** (14.70)		-0.802*** (0.24)	17.284*** (3.17)
Renewable: Other	-27.957* (12.51)		-0.367*** (0.09)	-2.187 (8.25)
Waste Management-Methane Capture	7.501 (8.25)		0.067 (0.10)	2.878 (4.71)
Fugitive emissions	8.360 (8.38)		0.290** (0.11)	-18.387*** (2.86)
Other technologies	3.167 (8.00)		0.158 (0.22)	-10.746 (15.19)
Credit start during 2006–12	-58.426*** (16.05)	-65.485 (42.17)	-1.020** (0.36)	0.856 (2.54)
Credit start during 2013 onwards	-176.408*** (25.27)	-141.780*** (42.34)	-2.354*** (0.36)	5.033 (6.89)
Europe and Central Asia	16.243		0.223	-31.026

	Tobit		Two-Part Model: Full Sample	
	(1) Full sample	(2) Sample: Top 10 agencies	(3) Probit	(4) OLS
	(42.47)		(0.51)	(18.36)
East Asia	40.934*	71.667**	0.440**	11.480
	(15.92)	(23.01)	(0.16)	(13.09)
South East Asia (incl. Fiji)	22.853		0.229	8.110
	(15.88)		(0.17)	(13.39)
Southern Asia	57.543**		0.583**	23.657
	(18.25)		(0.19)	(14.65)
North Africa and Middle East	10.838		0.051	7.507
	(34.99)		(0.45)	(18.68)
Latin America and Mexico	12.496		-0.056	21.055
	(24.30)		(0.28)	(13.83)
IRR excluding CER revenue	0.947*	1.758	0.012	-0.089
	(0.45)	(1.21)	(0.01)	(0.62)
Project size	7.823*	-1.523	0.088***	1.979**
	(3.11)	(3.42)	(0.03)	(0.66)
Constant	-66.218	38.389	-0.532	81.910
	(99.52)	(200.01)	(1.14)	(45.95)
Observations	5,140	1,041	5,140	1,943
Pseudo Log-likelihood	-1,3170.205	-3,501.375	-2,922.036	-9,891.394

Source: United Nations Environment Program—Technical University of Denmark Clean Development Mechanism database, International Monetary Fund World Economic Outlook, World Development Indicators, Independent Evaluation Group staff analysis.

Note: * p<0.10, ** p<0.05, *** p<0.01. Regression results reflect the full model with all controls. Standard errors in parenthesis clustered at the country. Comparison group for technologies is energy efficiency type projects; comparison group for credit start is pre-2006 projects. The comparison group for technologies and regions was consolidated for the top 10 subsamples due to the lower number of observations per technology. Comparison group for Regions is Sub-Saharan Africa.

*p < 0.10.

**p < 0.05.

***p < 0.01.

¹ The World Bank Group portfolio in the CDM pipeline does not include all the World Bank Group ERPA projects. The distribution by region, income group and technology provided here therefore only includes the registered CDM projects and will be different from the similar distribution comparing the full World Bank Group portfolio with the rest of the rest of the CDM portfolio.

² Projects in China account for 56 percent of all issuances in the whole database, including World Bank Group projects.

³ All regressions will be estimated with clustered standard errors on the country level.

⁴ The analysis also looked at issuance delay which measures the number of months between first issuance and a projects registration. The relationship of World Bank Group support and issuance delay is only marginally significant but suggest at least 9 months less delay for World Bank Group projects. See the tables at the end of this appendix for the results.

⁵ Given that MLE relies heavily on the normality assumption, a log transformation was done on the dependent variables.

⁶ A classic example is the case of fire damage (Lin and Schmidt 1984) as mentioned by Greene (2002): older buildings might be more prone to fires due to materials used or construction methods available at the time, however, because newer buildings have higher values in general, fire damage to these buildings might be higher.

⁷ See Fenhann and Hinostroza (2011) for full details of a CDM's project life cycle.

⁸ These include afforestation and reforestation, agriculture, cement, fossil fuel switch, industrial gases, and transportation. These technologies were categorized as "Others" as they have relatively fewer observations in the database. By combining them into one category, we can ensure a more precise and parsimonious specification.

⁹ The same disaggregation for technologies shows similar results.

¹⁰ Additionally, the 2PM repeated for the reduced sample yielded similar results: World Bank Group projects tend to perform better than non-World Bank Group projects.

¹¹ We have attempted to explore the technical assistance mechanism. However, given the small sample observation of projects that received technical assistance, the regression results may be misleading and not robust.

Appendix E. Evolution of Markets and Regulatory Systems

As a background paper for this evaluation, the Independent Evaluation Group carried out a structured literature review (SLR) which provides a comprehensive synthesis of the existing literature on changes in international market mechanisms for greenhouse gas (GHG) reductions and related regulatory systems. The assessment period 1997 to 2016 starts with the signing of the Kyoto Protocol and ends with the entry into force of the Paris Agreement. A key aspect of the review is how the World Bank Group responded to these changes. This appendix presents a summary of the main findings from the SLR.

Methodology

To ensure high quality of the results, the SLR followed approaches normally used by the IPCC. Peer-reviewed literature was the backbone while non-peer-reviewed sources (“gray” literature) were only used if they were published by an institution that has credible internal quality control process. Academic literature search was conducted for publications over 1997–2018 using the HEC Paris Library search engine that covers an array of databases, including among others Academic OneFile, Academic Search Index, BASE, GreenFILE, and ScienceDirect.¹

The initial screening yielded 5,353 results. After removing duplicates and publications that were deemed irrelevant to the topic of the review, the number of peer-reviewed papers was filtered to 792. Since gray literature was excluded from the initial search, additional 19 key seminal papers and review articles were identified by recognized experts in the field after the general literature search. This was particularly important for literature on market mechanisms under the Paris Agreement due to the relatively recent emergence of the topic and lack of relevant academic literature that has passed the lengthy peer review process. Since the initial screening also revealed a lack of articles related to the World Bank’s activities, it was therefore decided to add an additional search term: (“World Bank”) AND (“carbon”). This additional search yielded 320 peer-reviewed articles, of which 157 articles were retained after excluding duplicates and irrelevant articles. The total number of publications included in the review is thus 968. Finally, using expert review of the abstracts, a total of about 300 peer-reviewed articles were retained in addition to about 40 papers from “gray literature.”

Summary of Main Findings

Key changes in markets and regulatory frameworks as well as the responses of the World Bank Group can be grouped into four main periods as following:

i. Emergence of Carbon Markets until 2005

This period is characterized by the introduction of market mechanisms as a climate change mitigation tool. Parties to the UNFCCC negotiated the definition of the flexible mechanisms that were included in the Kyoto Protocol (1997) and their operational rules and procedures that were included in the Marrakech Accords (2001). The operationalization of the CDM required the establishment of officially approved baseline and monitoring methodologies and piloting activities in different sectors. The nascent carbon market was characterized by the lack of demand from the private sector making the initial participation of the public sector crucial.

The World Bank Group responded to these challenges by defining a new environmental strategy in the 1990s that takes into account the establishment of UNFCCC and the need for mitigation activities. As the market instruments emerged, the World Bank Group responded by establishing the Prototype Carbon Fund, followed by other carbon funds (for example, Community Development Carbon Fund (CDCF), CF-Assist, BioCarbon Fund [BioCF]) that were seen as groundbreaking models for accessing low-cost GHG emission reduction credits and aggregating demand. The World Bank Group also supported the emergence of carbon markets through the development of CDM methodologies and capacity building for developing countries.

ii. “Gold Rush” Period from 2006 - 2011

After the initial testing period, the carbon markets entered a phase of great expansion. This period is characterized by significant changes in markets and regulatory frameworks as the European Union Emission Trading Scheme (EU ETS) became operational and was linked to the CDM creating a large source of demand for carbon credits from the private sector adding to the demand from governments, for example, in Japan. Large developing countries, such as China, India, Brazil, Mexico, and the Republic of Korea became the largest suppliers of carbon credits. This raised concerns about the uneven distribution and limited participation of low-income countries (LICs). The introduction of the Program of Activities concept was aimed at addressing this issue. In terms of the sectoral breakdown, the supply of carbon credits was initially dominated by industrial gas projects that provided a cheap GHG abatement opportunity but raised criticism for creating perverse incentives and not contributing to sustainable development. In the second part of this period, following suspensions of accreditations by the regulators due to low quality work, regulation regarding assessment of CDM project additionality and verification was strengthened significantly, with validators and verifiers becoming more careful.

The World Bank Group continued its involvement in carbon markets through various funds, facilities and instruments (for example, World Bank-UCF, IFC-P12CF, IFC-CDG) contributing to increasing demand for carbon credits, mitigating project risks and providing capacity building in developing countries to strengthen the carbon market. However, criticisms were raised at the World Bank Group’s CF operations regarding its role in the carbon market, not prioritizing poverty alleviation and acting as a commercial intermediary, for example, by engaging in HFC-23 reduction projects. The World Bank Group partially responded to these criticisms, by switching focus to specific sectors that, especially in the early period, have only marginally benefited from the carbon markets. This refers for instance to the CDCF focusing on LICs and low-income communities, and the BioCF targeting biodiversity protection.

iii. Fragmentation and Decline of Carbon Markets in 2012–16

This period is characterized by a sudden decline in carbon prices between 2011 and 2013 and the resulting decline in the development of new carbon projects. This is related to both domestic and international regulatory regimes. At the domestic level, the issuance of carbon credits started reaching the quantitative limits on the use of offsets in the EU ETS effectively eliminating the largest source of demand. At the international level, the uncertainty surrounding the second Kyoto Commitment Period resulted in decreased demand from governments.

The World Bank Group responded to these changes in markets by continuing its efforts to support projects in LICs through Ci-Dev focusing on underrepresented sectors, as well as innovative and transformational projects, including rural electrification, improved energy efficiency, and waste management. The World Bank Group thus provided a lifeline to activities that otherwise would have been stalled given the market conditions. The Pilot Auction Facility targeted the non-bank-supported CDM methane projects which were at the risk of discontinuation. In addition, the World Bank Group responded to the decline in international carbon markets by focusing on domestic carbon pricing initiatives through the Partnership for Market Readiness (PMR). Besides providing financial support to projects in the times of crisis, the World Bank Group actively engaged in the policy dialogue to support regulatory reforms, notably the CDM Policy Dialogue.

iv. Post-Paris “relaunch” of market mechanisms

The post-Paris period is characterized by significant changes in the international climate regime that will affect the development of carbon markets in the future. Unlike the Kyoto Protocol that only covered developed countries, the Paris Agreement adopted in 2015 involves global participation, which comes, however, at the cost of increasing complexity. Instead of a uniform formula of “carbon budgets,” the Paris Agreement allows parties to voluntarily define their Nationally Determined Contribution indicating the mitigation and adaptation targets for each party. Although the Paris Agreement includes provisions for market mechanisms through Articles 6.2 and 6.4, their modalities and procedures continue to be discussed and the practical implementation remains uncertain. Principally, their scope could be upscaled to cover policy instruments or even entire sectors. While the international carbon market remains

uncertain, an increasing number of domestic carbon pricing initiatives have been launched around the world in the past several years.

The World Bank Group responded to these changes in the international regulatory framework by launching new initiatives to identify pilot activities for upscaled crediting in the context of the Paris Agreement, for example, TCAF, and to support the design and development of domestic carbon pricing initiatives, for example, the Carbon Pricing Leadership Coalition, NCM and PMR.

Concluding Remarks

Overall, this SLR demonstrates that the World Bank Group has contributed to the establishment and development of the carbon market since the 1990s. It remained a key player for capacity building and for supporting mitigation activities that are at risk of being discontinued and is likely to play an important role in the operationalization of market mechanisms under the Paris Agreement at both domestic and international levels. The SLR found that several positive impacts have been generated by World Bank Group activities:

- Establishment of carbon funds that were seen as groundbreaking models for accessing low-cost GHG emission reduction credits, aggregating demand and through the World Bank Group ability to manage them.
- Focus on specific sectors that, especially in the early periods, have been marginally benefited from the carbon markets. This refers for instance to the CDCF, focusing on LICs and low-income communities and the BioCF, targeting biodiversity protection.
- The World Bank Group was able to successfully deliver capacity building support to developing countries and to the market as a whole. It focused on mitigation project design, implementation and monitoring, including support for CDM methodology development and review.
- When the crisis of the carbon market erupted, World Bank Group continued to support mitigation activities through the Ci-Dev initiative and the Pilot Auction Facility. Also, capacity building remained one of the main pillars of the World Bank Group's strategy through substantial efforts in supporting the development of new market mechanism approaches on the national level through the PMR and the CPCL.

However, criticisms have been raised regarding the World Bank Group strategy and operations in the carbon markets. Although the World Bank Group's initial participation in the markets was seen as positive, questions have been raised on the World Bank Group acting like a commercial intermediary, rather than supporting market development and capacity building. Concerns have been raised also regarding the actual contribution to poverty eradication, which is one of the key goals of the World Bank Group. In other cases, some researchers highlight the potential risk of World Bank Group-supported projects in the forestry sector regarding environmental integrity, permanence of the carbon sinks, adverse impacts for indigenous people, and leakage issues.

The key features of each period, challenges and the World Bank Group responses are summarized in table E.1.

¹ <http://www.hec.edu/Library/>

Period	Main Features of the Period	Key Challenges	World Bank Group Responses
Until 2005: Initial negotiations on flexible mechanisms and enter into force of the Kyoto Protocol	<p>Parties negotiate for the definition of the flexible mechanisms and for the definition of their operational rules and procedures.</p> <p>After initial testing through Activities Implemented Jointly, the market mechanisms of the Kyoto Protocol (CDM, JI and IET) are agreed.</p> <p>Initial piloting and implementation of activities in different sectors.</p> <p>Carbon markets created and catalyzed to demonstrate the potential for low-cost emission reduction and compliance with Kyoto targets.</p> <p>Environmental integrity and economic efficiency of the mechanisms are studied in detail.</p>	<p>Evaluation of the cost effectiveness and associated risks for investors.</p> <p>Initial testing of different design models.</p> <p>Environmental integrity and contribution to SD.</p> <p>Baseline setting and additionality concerns.</p> <p>Provision of incentives for technology transfer and innovation.</p> <p>Definition of eligible activities and associated issues for the forestry sector.</p> <p>Forestry projects are criticized for the negative impacts on SD at local level and for indigenous people.</p>	<p>Definition of a new environment strategy in the 1990s taking into account the establishment of UNFCCC and the need for mitigation activities.</p> <p>Launch of the PCF and other carbon funds as innovative models for catalyzing carbon markets, pilot Kyoto mechanisms and public-private partnerships for project-based emission reduction.</p> <p>World Bank Group funds to reduce project risks and access cheap emission reductions. They also deliver significant capacity building activities for developing countries.</p> <p>CDCF supports LICs and low-income communities within developing countries.</p> <p>BioCarbon Fund links climate change activities with SD benefits and biodiversity protection.</p> <p>Support to new methodologies development including capacity building.</p> <p>Multiple national carbon funds supported by European countries initiated to support Kyoto compliance.</p>
From 2006 until 2011: "Gold rush" of the carbon markets, with increasing numbers of mitigation projects implemented and credit prices rising	<p>After the initial testing period the carbon markets commences a phase of great expansion. EU is the main source of demand for CDM credits while China and India dominate their supply.</p> <p>Improvements of the rules of the CDM, with operationalization of the PoA concept.</p> <p>Governance and institutional set up, including capacity building needs, emerge as a key element for the carbon market functioning.</p>	<p>Additionality and baseline setting face significant issues affecting the environmental integrity of the CDM.</p> <p>Questionable contribution to SD and technology transfer.</p> <p>"Low hanging fruits" and uneven geographical distribution, penalizing Africa.</p> <p>Forest sector under close scrutiny also during this period, to avoid adverse impacts and ensure delivery of local SD benefits.</p> <p>Projects risks are assessed in more details, through analysis of several years of operations.</p> <p>PoAs are seen as a positive development for reducing transaction costs of small-scale projects and contribute to a more balanced distribution.</p>	<p>Carbon Funds are seen as a positive element that can reduce project risks and support investment mobilization.</p> <p>The World Bank through its Funds (for example, UCF) and IFC through CDG contribute to increasing demand for carbon credits and mitigating project risks in developing countries to strengthen the carbon market.</p> <p>CDCF is in a good position for contributing to addressing the issues related to forestry projects.</p> <p>FCPF launched to support target countries in the REDD+ readiness and large-scale crediting in the forest sector.</p> <p>Establishment of new initiatives to support high-quality activities (for example, Ci-Dev) and promote large-scale projects under PoA approach (for example, CPF).</p> <p>IFC launches the P12CF to help buyers and sellers mitigate carbon market risks in 2013-20.</p> <p>World Bank launches the UCF—T2 boost the post-2012 demand for credits and support carbon markets.</p>

<p>From 2012 until 2016: Fragmentation and decline of carbon markets due to carbon price collapse</p>	<p>Uncertainties on the future climate regime and lack of mitigation ambition from Annex I countries affects negatively the carbon markets. After failure of the Doha Amendment in December 2012 on ratification of the second commitment period of Kyoto, prices drop quickly reaching all-time low. Investors have less confidence on market mechanisms. Regarding the JI and CDM, only PoAs still show signs of life, with submission for registrations and issuances, although with limited numbers.</p>	<p>Carbon credit supply hits the demand ceiling. Supply-demand disequilibrium leads to carbon price collapse. Carbon prices are too low to sustain projects. Risk of project discontinuation and capacity loss. CDM reforms.</p>	<p>Questions are raised on World Bank Group carbon finance operations regarding its role in the carbon market, not prioritizing poverty alleviation and acting as a commercial intermediary. CDG and P12CF terminated and IFC closes its carbon business. Pilot Auction Facility establishes a floor price for carbon. UCF—T2, Ci-Dev, CPF sign ERPAs from selected projects to bridge demand gaps. PAF continues its pilots for providing price insurance using online auctions for targeted projects GHGs and projects under threat of decommissioning. PMR supports capacity building for domestic market readiness and the development of carbon pricing schemes in targeted high emission countries. FCPF strengthens capacity building in REDD+ readiness. BioCF ISFL to provide support for enabling environment, investments, private sector engagement, and upscaled crediting for landscapes in selected countries. Engage in the policy dialogue to support regulatory reforms.</p>
<p>Post-Paris of “relaunch” of market mechanisms</p>	<p>Prices in the carbon markets are still very low. Limited activities in the international carbon markets. The Paris Agreement brings positive developments regarding market instruments through Article 6. Detailed modalities and procedures for the new mechanisms are still to be defined. An increasing number of developed and developing countries implements (or plans to do so) domestic carbon pricing initiatives, some of which allow use of credits.</p>	<p>Need to increase mitigation ambition at global level. Transition of the CDM to the PA. Issues with baselines and additionality, and on MRV systems continue to be discussed. Stronger emphasis on the importance of SD benefits and need to avoid negative impacts of market mechanisms. New “sectors” emerge: cities and urban development, “blue” carbon, continued discussion on Carbon Capture and Storage (CCS).</p>	<p>Launch of new initiatives or activities with different specific focus: TCAF—to identify pilot activities for upscaled crediting in the context of the PA CPLC, NCM and the PMR—to support the design and development of carbon pricing initiatives at domestic level IFC Forests Bonds—to support REDD projects and pay the coupon in carbon credits CCS TF—for continued capacity building on CCS in developing countries</p>

Note: CDCF = Community Development Carbon Fund; CDG = Carbon Delivery Guarantee; Ci-Dev = Carbon Initiative for Development; FCPF = Forest Carbon Partnership Facility; GHG = greenhouse gas; IFC = International Finance Corporation; ISFL = Initiative for Sustainable Forest Landscapes; NCM = Networked Carbon Markets; PAF = Pilot Auction Facility; PCF = Prototype Carbon Fund; PMR = Partnership for Market Readiness; PoA = Program of Activities.

Appendix F. Additionality in Clean Development Mechanics and Joint Implementation

The Clean Development Mechanism (CDM) and Joint Implementation (JI) are the major international offset mechanisms within the broader world of carbon finance (CF). The instruments expected to lead to significant reductions of greenhouse gas (GHG) emissions at the project level, to provide emission reduction credits to purchasers in developed countries who could then use these credits as a substitute for reducing their own GHG emissions. The aggregate effect then would be to lower the cost of emission reduction efforts, by achieving those efforts in developing or transition countries rather than in developed countries with commitments to reduce emissions. However, for this to work, it must be that emission reductions in the projects were “additional,” that is that they would not have occurred in the absence of the CDM or JI mechanisms. In other words, the emission reductions should be additional to what would have occurred without the CF support (baseline). If the same emission reductions can be achieved without CF (under the baseline), it implies that CF by itself did not reduce emissions and the resulting credits cannot have any value as carbon offsets. If the emission reductions from the CDM/JI projects are not additional, it will not be possible to compensate for the GHG emissions by purchasers in the Annex I countries when such credits are used as low-cost offsets—and so in effect overall global GHG emissions would increase. There has been significant academic and policy discussion about whether these “additionality” requirements were met in practice at the project level.

As a background paper for this evaluation, the Independent Evaluation Group carried out a structured literature review (SLR) on the additionality of the CDM and JI. The objective of the review was to identify what the existing literature says about the extent to which CF projects under the CDM and JI were able to meet environmental integrity and additionality requirements in practice in reducing GHG emissions, and to note what contributed to those outcomes. The SLR also sought to identify how conceptual approaches to additionality were defined and operationalized, and to describe the policy conclusions drawn by authors on how additionality concepts should be used in the future. This Appendix presents a summary of the main findings from the SLR.

Methodology

The SLR was carried out for papers published over 2007–17 using a search protocol developed for the exercise. The SLR used search terms to identify a universe of formal literature papers from four of the main academic and scientific databases, combined then with backward citation tracking to expand the population. Gray literature was included based on backward citation tracking, combined with searches for publications by specific key institutions, and manual addition of some known key papers. This population was then filtered through inclusion (including survey papers and papers addressing CDM/JI projects) and exclusion criteria (papers with low numbers of citations were excluded). This left 81 papers to be covered in the review.

Summary of Main Findings

The results of the literature review are mixed. Studies published throughout the period on specific project technologies consistently find risks to additionality stemming from (i) specific technologies, and (ii) the nature of project-based mechanisms. However, the policy-oriented literature identifies changes in the regulation and operation of the CDM over the period and shows that significant efforts have been made in procedures to improve additionality outcomes. Most sources argue that assessing additionality, even with more recent procedural improvements, is challenging and that it is difficult to prove that many projects provide strict environmental additionality.

While the level of additionality depends on the specific project technology, financing environment, and government policies, there were some broad patterns in additionality:

- *Large hydropower* projects were unlikely to be additional, as they were already common practice, as nonfinancial factors unrelated to CDM revenue had the main influence on decisions to develop these projects, and as hydro projects in most countries were profitable even without the CDM.
- The additionality of *small hydropower* projects varied, depending on country-specific factors.
- The additionality of *solar power* projects depends greatly on the time period because of the rapidly declining costs of solar photovoltaic technology. Early in the period, solar projects were unlikely to be financially viable even with CF. Late in the period, some solar projects were easily viable even without CF (and so were nonadditional).
- *Bagasse* projects were found to be unlikely to be additional, as returns were attractive enough to justify investment without CF.
- Additionality was mixed for *other biomass* projects, with roughly half having questionable additionality.
- *Energy efficiency* additionality was mixed. Lighting projects were likely to be additional as they faced high transaction costs and other barriers. Large industrial energy efficiency was likely not to be additional except for the cement sector.
- *Landfill gas* projects were highly likely to be additional, as revenues from emission reductions were the primary driver for investment decisions.
- *Industrial gas* projects were highly likely to be additional, though some papers noted the possibility for perverse incentives and potential over-crediting at some stage of CDM development.
- *Afforestation/reforestation* projects were potentially additional as they were not viewed as economically attractive without CF.

Three main characteristics of the CDM process were identified as posing serious challenges to the ability to devote CF only to genuinely additional projects:

- *Asymmetric information embedded in the project-based mechanisms.* Project developers have a strong incentive to claim that projects are additional to maximize payments, and these claims are difficult for regulators to verify.
- *Flaws in the Additionality Tool and Assessment Processes.* The literature critiqued bottom-up approaches to baseline setting as creating risks of inflated baselines, subjective features in barrier analysis assessments, weaknesses in investment analysis assessment including lack of consistency in IRR calculations, and a common practice assessment that was not strict enough.
- *Large fixed costs of additionality assessment and evaluation.* The process of additionality assessment featured high transaction costs, lengthy processing times, and extensive requirements, which acted as a barrier to projects. Program of Activity approaches may have partially mitigated this.

Appendix G. Local Cobenefits in Clean Development Mechanisms

The Clean Development Mechanism (CDM) is the major international offset mechanism within the broader world of carbon finance (CF), and was designed to lead to significant emission reductions that will help reduce the cost of climate mitigation in countries with commitments as well as contribute to sustainable development in the host countries. However, there has been significant discussion about the degree to which these projects fulfilled their dual mission of emission reductions and sustainable development, particularly with respect to fostering local community cobenefits as a part of broader sustainable development outcomes.

As a background paper for this evaluation, the Independent Evaluation Group carried out a structured literature review (SLR) on the generation of local community cobenefits of CDM projects. The objective of the review was to identify what the existing literature says about the extent to which CF projects under the CDM led to significant development cobenefits for local communities and what contributed to these outcomes. Local community cobenefits are a subset of all economic, social, and environmental sustainable development benefits, and the review focused on local infrastructure, access to energy, income and employment, access to electricity or lighting, and improved natural resource or environmental services. This Appendix presents a summary of the main findings from the SLR.

Methodology

The review was carried out for all papers published until 2017 using a search protocol developed for the exercise. The review used search terms to identify a universe of formal literature papers from four of the main academic and scientific databases (that is, Academic Search Complete, Web of Science, Scopus, and GreenFILE (EBSCO)), while Google Scholar and Google were used to capture additional possible papers, combined then with backward citation tracking to expand the population. Gray literature was included based on backward citation tracking, combined with searches for publications by specific key institutions, and manual addition of some known key papers. This population was then filtered through inclusion (including academic peer review, survey papers, and papers addressing CDM projects) and exclusion criteria (publications before 2007 with less than 100 citations, publications from year 2007 to 2015 with fewer than 10 citations, and pure policy discussion papers with fewer than 50 citations were excluded). This left 82 papers to be covered in the review, of which 11 pure policy, 31 survey and project analysis, 18 CDM AR, and 22 gray literature.

Summary of Main Findings

Studies on the types of benefits had a range of research methods, some of which looked at actual ex post evidence, but others that relied on an assessment of the type of benefits intended to be achieved based on ex-ante project documents. The SLR finds that local employment and economic impact are frequently mentioned as potential benefits, especially for afforestation/reforestation projects. Improved environmental services are commonly mentioned, especially for improved local air quality, and improved ecosystem services for afforestation/reforestation projects. Local infrastructure is rarely studied, but those papers that exist find low performance of projects in providing this benefit. There is moderate evidence for improvements in cleaner and affordable energy for heating and cooking, and improved access to electricity and lighting in regular CDM projects, but stronger evidence for these benefits in projects with third-party labelling or under specific World Bank facilities that focused on local development benefits (for example, the Community Development Carbon Fund, BioCarbon Fund and Ci-Dev).

While there is variation in the literature, most sources argue that, even with procedural improvements, the CDM has not consistently delivered significant cobenefits to local communities. Noting that the results depend on project and country context, some broad patterns emerged across different types of project technologies:

- *Industrial gas* projects provided few tangible development or cobenefits for local communities and did not have significant employment effects.

- *Landfill gas* projects may have contributed to improved sanitation and water quality, but also often generated opposition from local communities related to pollution concerns.
- *Large hydropower* projects are criticized in the literature for bringing negative social and environmental effects to local communities due to displacement effects. Some large hydro projects were not developed under international best practices for social and environmental safeguards, and some of the literature may have been influenced by these projects.
- *Small and medium hydropower* projects had high possibilities of delivering energy access and improved air quality, while having lower environmental and social damage.
- *Wind power and solar power* projects were widely argued ex-ante to be more likely to deliver local cobenefits. Some field studies found that actual cobenefits were limited, while others found that there were significant benefits for lighting and electricity when projects were well designed and had strong involvement of local stakeholders.
- *Energy efficiency* projects such as improved cookstoves and efficient lighting were seen as delivering local benefits but facing high transaction costs.
- *Biomass energy* projects had moderate performance on local air quality and good performance on local employment generation.
- Studies expected that *afforestation/reforestation* projects would have significant local cobenefits, but there has been little assessment of actual results.
- Projects with *third-party quality labelling* were more likely to deliver cobenefits, but this is driven largely by the selection of project types by those standard setters.
- Specific *World Bank facilities that emphasized local cobenefits* (for example, the Community Development Carbon Fund, BioCarbon Fund, Ci-Dev) appear to have been able to deliver tangible cobenefits to local communities.

There is variation across countries depending on the approach of national governments in setting their sustainable development co-benefit requirements for CDM projects. Broadly speaking, those countries whose designated national authorities were focused on cobenefits were able to generate more of those benefits for a given project. Least development countries were seen as overall benefiting little from cobenefits, because of the very low share of CDM projects registered in those countries, driven by small-scale projects, high transaction costs, and lack of capacity to manage complicated CDM procedures. Adoption of Program of Activities approaches appears to have improved participation in these countries.

Two issues were identified in the literature as posing challenges for delivering cobenefits:

- There can be trade-offs between achieving greenhouse gas emission reductions at least cost with maximizing local sustainable development benefits. By design, the CDM favors projects that can achieve emission reductions at least cost, which can favor projects such as industrial gas or methane elimination projects that may have few development cobenefits.
- A lack of clear criteria for assessing development cobenefits has led to inconsistent and often weak application of the goal of achieving sustainable development in the CDM project assessment.

Appendix H. Methodologies Developed by the World Bank

#	Mechanism	Sector Scope UNFCCC/VCS	Sector Scope by Number	Methodology ID # (UNFCCC)	Methodology Scale by Size of Projects ^a	Projects (Oct 2016)	PoAs (Oct 2016)	Combined	Date ^b
1	CDM	Waste handling and disposal	13	AM0003 (consolidated into ACM0001)	Large	219	6	225	1/12/2004
2	CDM	Waste handling and disposal	13	AM0010 (consolidated into ACM0001)	Large	2	0	2	6/13/2004
3	CDM	Energy industries (renewable—/ nonrenewable sources)	1	AM0005 (consolidated into ACM2)	Large	4	0	4	4/14/2004
4	CDM	Energy industries (renewable—/ nonrenewable sources)	1, 4	AM0007	Large	0	0	0	6/14/2004
5	CDM	Waste handling and disposal	13	AM0012 (then AM0025, now consolidated under ACM0022)	Large	71	1	72	8/11/2004
6	CDM	Energy demand	3	AM0020	Large	0	0	0	2/25/2005
7	CDM	Energy industries (renewable—/ nonrenewable sources)	1	AM0026	Large	6	0	6	11/28/2005
8	CDM	Manufacturing industries	4	AM0041 (now consolidated under ACM0021)	Large	3	0	3	11/2/2006
9	CDM	Fugitive emissions from production and consumption of halocarbons and sulphur hexafluoride	1, 11	AM0035	Large	2	0	2	9/29/2006
10	CDM	Energy industries (renewable—/ nonrenewable sources)	1	AM0048	Large	4	0	4	5/4/2007

#	Mechanism	Sector Scope UNFCCC/VCS	Sector Scope by Number	Methodology ID # (UNFCCC)	Methodology Scale by Size of Projects ^a	Projects (Oct 2016)	PoAs (Oct 2016)	Combined	Date ^b
11	CDM	Energy industries (renewable—/ nonrenewable sources)	1	AM0052	Large	0	0	0	5/4/2007
12	CDM	Energy demand	3	AM0060	Large	0	0	0	5/30/2007
13	CDM	Metal production	9	AM0082	Large	1	0	1	7/17/2009
14	CDM	Afforestation and reforestation	14	ARAM 0002 (Consolidated into AR- ACM0003)	Large	2	0	2	5/19/2006
15	CDM	Afforestation and reforestation	14	ARAM0001 (Consolidated into AR- ACM0003)	Large	3	0	3	11/28/2005
16	CDM	Afforestation and reforestation	14	ARAM0005 (Consolidated into AR- ACM0003)	Large	5	0	5	12/22/2006
17	CDM	Afforestation and reforestation	14	ARAM0004 (Consolidated into AR- ACM0003)	Large	8	0	8	9/29/2006
18	CDM	Afforestation and reforestation	14	ARAM0009 (Consolidated into AR- ACM0003)	Large	2	0	2	10/19/2007
19	CDM	Afforestation and reforestation	14	ARAM0010 (Consolidated into AR- ACM0003)	Large	1	0	1	10/18/2007
20	CDM	Afforestation and reforestation	14	ARAM0013 (Consolidated into AR- ACM0003)	Large	6	0	6	4/15/2011
21	CDM	Energy demand	3	AMS II J	Small	36	6	42	8/2/2008
22	CDM	Manufacturing industries	4	AMS II I	Small	0	0	0	ND

Appendix H
Methodologies Developed by The World Bank

#	Mechanism	Sector Scope UNFCCC/VCS	Sector Scope by Number	Methodology ID # (UNFCCC)	Methodology Scale by Size of Projects ^a	Projects (Oct 2016)	PoAs (Oct 2016)	Combined	Date ^b
23	CDM	Agriculture	15	AMS III R	Small	34	7	41	10/19/2007
24	CDM	Energy industries (renewable—/ nonrenewable sources)	1	AMS I D	Small	2022	43	2,065	11/1/2002
25	CDM	Energy industries (renewable—/ nonrenewable sources)	1	AMS I C	Small	308	20	328	11/1/2002
26	CDM	Energy demand	3	AMS II E	Small	17	1	18	11/1/2002
27	CDM	Energy industries (renewable—/ nonrenewable sources)	1	AMS III B	Small	21	2	23	11/1/2002
28	CDM	Waste handling and disposal	13	AMS III E	Small	5	0	5	11/1/2002
29	CDM	Energy industries (renewable—/ nonrenewable sources)	1	ACM0002	Large	3,129	45	3,174	9/3/2004
30	CDM	Manufacturing industries	4	ACM0005	Large	17	0	17	9/30/2005
31	CDM	Manufacturing industries	4	ACM0003	Large	32	0	32	5/13/2005
32	CDM	Energy industries (renewable—/ nonrenewable sources)	1	ACM0007	Large	16	0	16	11/28/2005
33	CDM	Mining/mineral production	8, 10	ACM0008	Large	72	2	74	11/28/2005
34	CDM	Afforestation and reforestation	14	Consolidated into AR-ACM0001 (before ARAM0003, now Consolidated into AR-ACM0003)	Large	7	0	7	9/17/2010

#	Mechanism	Sector Scope UNFCCC/VCS	Sector Scope by Number	Methodology ID # (UNFCCC)	Methodology Scale by Size of Projects ^a	Projects (Oct 2016)	PoAs (Oct 2016)	Combined	Date ^b
35	CDM	Afforestation and reforestation	14	AR-ACM0002 (Consolidated into AR-ACM0003)	Large	0	0	0	3/25/2009
36	CDM	Transport	7	ACM0016	Large	9	0	9	10/16/2009
37	CDM	Waste handling and disposal	13	AMS III AJ	Small	0	0	0	3/26/2010
38	CDM	Energy: Electrification of rural communities using renewable energy	1	AMS I.L	Small	0	2	2	3/2/2012
39	CDM	Energy: Electrification of communities through grid extension or construction of new mini-grids	2	AMS III.BB	Small	0	1	1	5/11/2012
40	VCS	Agriculture, Forestry, Land Use	14	VM0015		3	0	3	7/12/2011
41	VCS	Agriculture, Forestry, Land Use	14	VM0017		0	0	0	12/21/2011
42	CDM	Integrated methodology for electrification of communities	1, 2	AMS III.BL	Small	0	0	0	7/24/2015

Source: Data compiled by Independent Evaluation Group based on World Bank and United Nations Framework Convention on Climate Change database

Note: CDM = Clean Development Mechanism; PoA = Program of Activities; UNFCCC = United Nations Framework Convention on Climate Change; VCS = Verified Carbon Standard.

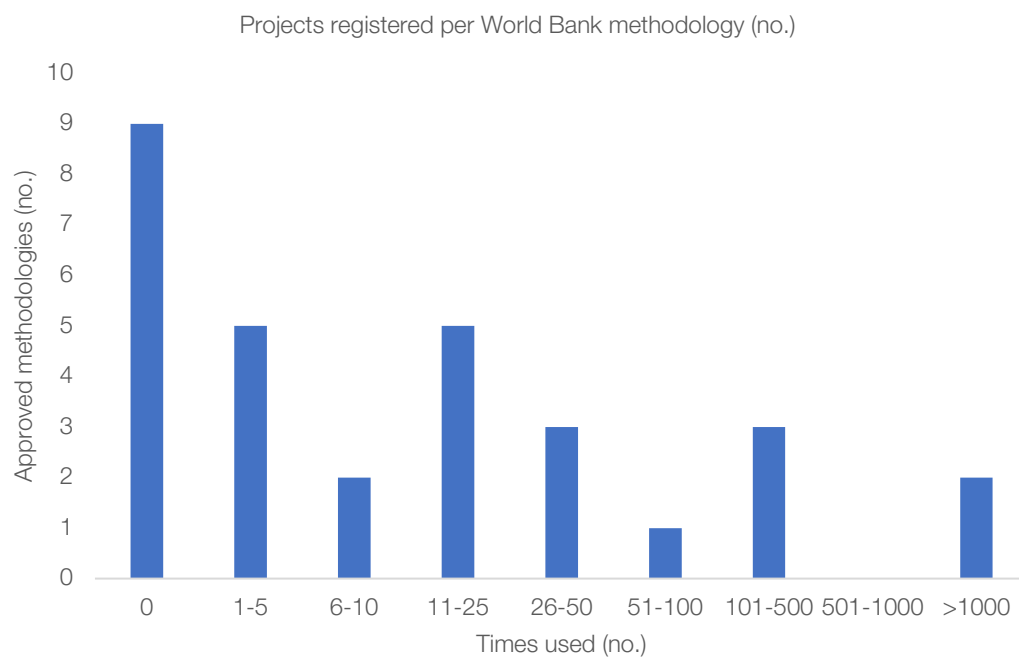
a. The "scale" refers to the size of a project or activity covered by the methodology. Initially, the thresholds for small scale were 15 MW for renewable energy projects (type I), 15-gigawatt annual savings for energy efficiency projects (type II) and direct emissions of 15,000 tons of carbon dioxide equivalent for other project types (type III). The Conference of Parties 11 increased the threshold for type II projects to 60 gigawatt hours per year and applied interpretation a) to type III projects whose threshold was increased to 60,000 tons of carbon dioxide per year.

b. First approved methodology in the United Nations Framework Convention on Climate Change site.

For large scale, <https://cdm.unfccc.int/methodologies/PAmethodologies/approved>.

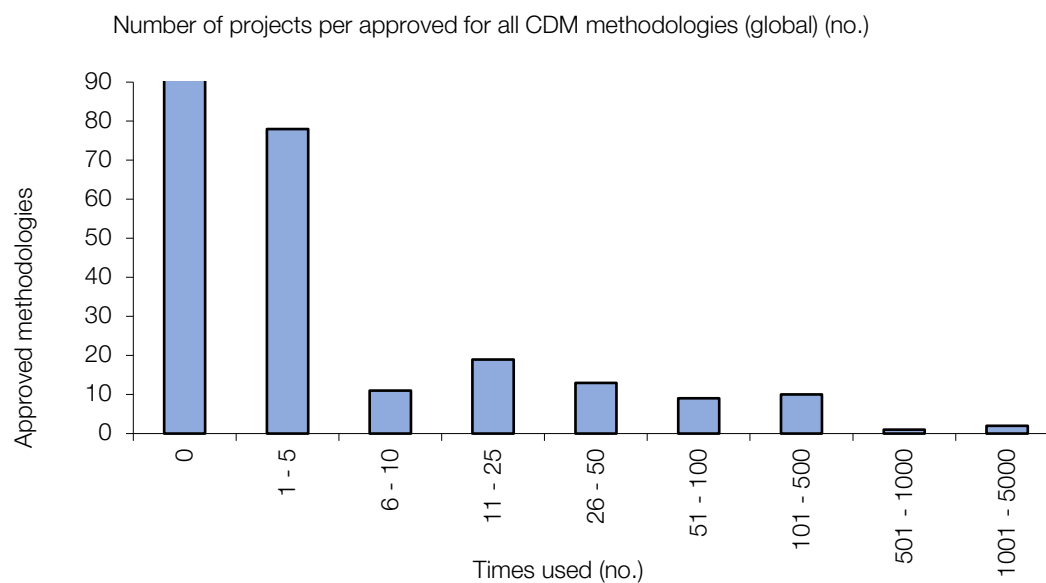
For small scale, <https://cdm.unfccc.int/methodologies/SSCmethodologies/approved>.

Figure H.1. How Often Are World Bank–Approved Methodologies Used?



Source: Independent Evaluation Group analysis based on World Bank and United Nations Framework Convention on Climate Change database.

Figure H.2. How Often Are All Approved Clean Development Mechanism Methodologies Used?



Source: United Nation Environment Program—Technical University of Denmark CDM database, December 2017.
Note: CDM = Clean Development Mechanism.

Table H.1. Approved Clean Development Mechanism Methodologies (Global) (number)

Approved	Approved CDM methodologies
94	Large-scale Methodologies (AM)
25	Large-scale Consolidated Methodologies (ACM)
94	Small-scale Methodologies (AMS)
1	Large-scale Afforestation/Reforestation Methodologies (AR-AM)
1	Large-scale Consolidated Afforestation/Reforestation Methodologies (AR-AM)
2	Small-scale Afforestation/Reforestation Methodologies (AR-AMS)
36	Approved Standardized Baselines
253	Total number of Approved Methodologies

Source: United Nation Environment Program—Technical University of Denmark CDM database, December 2017.

Appendix I. Project Performance Assessment Cases in Brazil and Bulgaria

The World Bank–Financed District Heating Project in Bulgaria

A blended district heating (DH) and carbon finance (CF) project was approved in 2003 to modernize the DH networks in the capital city of Sofia, which account for about 65 percent of the national heat supply, and an adjacent town of Pernik in Bulgaria.¹ The overall investment program of \$132.7 million was committed to be financed by loans from the World Bank and the European Bank for Reconstruction and Development (EBRD), grants from the EBRD-administered Kozloduy International Decommissioning Support Fund (EBRD-KIDSF) and the EU pre-accession program, and DH companies' own funds. A CF operation was designed to purchase emission reductions (emission reductions) resulting from the project-supported activities through the World Bank's Prototype Carbon Fund (PCF). The project aimed to improve the quality of DH services, enhance financial viability of District Heating Company (DHC), and increase environmentally friendly operations in Sofia and Pernik, through energy conservation and pollution reduction mechanisms. The improvement in DH services was expected to reverse the trend of customer disconnection, and along with the implementation of the financial recovery plans, place the DH system on a more financially sustainable path.

The project investments in modernization and replacement of pipelines and substations in the DH system were expected to lead to energy savings and reduction in fuel consumption, thus resulting in carbon dioxide (CO₂) emissions reduction. The project supported energy-saving technology options that included replacement of old foam concrete DH channels with pre-insulated pipes and thermal insulation of above-ground pipelines. Old district heating pipes were based on foam concrete technology that was used in 1960s and 1970s and had substantial leakages and breakdowns. Investments in modernizing DH substations were therefore designed to facilitate control of heat supply at the building level that could be adjusted by households based on consumer needs. These investments included the installation of flow control devices such as control valves, and installation of variable speed pumping systems at the main heat sources. Combined with project support for public awareness campaigns to promote energy efficiency measures, this was expected to facilitate energy conservation and reduce heat consumption at the household level by allowing households to directly control their own heat consumption.

Two subprojects in Sofia DHC and Pernik DHC were registered as separate Joint Implementation (JI) projects meeting the additionality requirement for registration under the Kyoto Protocol. The Sofia and Pernik district heating projects were the first projects registered under the Kyoto Protocol in the country since its ratification in 2002. During 2004–08, both subproject generated more emission reductions than expected—1,203,933 tons of carbon dioxide equivalent (tCO₂e) from Sofia DHC, and 382,514 tCO₂e from Pernik DHC. During the same period, both DHCs sold the emission reductions to the PCF, as per the contracted volume of 1,084,000 emission reductions from Sofia DHC and 157,000 emission reductions from Pernik DHC. The DHCs received additional funds for their operations from the purchase of emission reductions resulting from investments into modernization of their DH systems.

As the first CF operation in Bulgaria, it helped launch CF, by demonstrating the feasibility of the instruments, by building capacity in the Bulgarian government for managing CF and building capacity of DHCs to measure and monitor CO₂ emissions from heat generation, transmission, and distribution. The project also helped the two DHCs better prepare for introduction into the EU ETS of the Bulgarian DH sector in 2007 and reporting on the EU requirements. The Bulgarian government allocated 158,538 emission reduction units to the Sofia DHC in the final National Allocation Plan for 2008–12 within the framework of the EU ETS.

The project introduced an innovative instrument raising awareness in government agencies and companies that CO₂ emission reductions could bring financial benefits. Overall, the World Bank, through the PCF, was a pioneer in CF in Bulgaria through these two DH subprojects and a third one, the Sviloza biomass project. The Bulgarian Ministry of Environment and Water acknowledged that these projects constituted an important step toward the country's active participation in the UNFCCC. They gave Bulgaria the experience in conducting JI projects under Article 6 of the Kyoto

Protocol to the UNFCCC and steered the subsequent approval of 28 such projects. However, despite its value for piloting and testing of the new concept in JI, the additionality of the emission reductions in this early project is questionable, mainly because the emission reductions could have happened without the CF component.

The World Bank–Financed Integrated Solid Waste and CF Project in Brazil

A blended solid waste and CF project for a total cost of \$160 million was approved in 2010 to improve the treatment and disposal of municipal solid waste in Brazil.² It was the first fully blended operation in the Latin America and the Caribbean Region that combined a financial intermediary loan, a CF component, and a technical assistance package. The project supported the closing of open dumps and the implementation of modern and environmentally-safe landfills or alternatives to waste disposal, improving municipal solid waste management practices, reducing poverty among waste-pickers, increasing private sector participation in solid waste service provision, and strengthening the implementing agency Caixa Econômica Federal's capacity to manage CF projects.

A CF operation, Caixa Solid Waste Management (2012–19) was linked to the project, under which an ERPA was signed between IBRD and Caixa on December 5, 2011. The CF operation is scheduled to close in December 2019. Caixa's main needs and interests were to strengthen the capacity for implementing CF and environmental and social safeguards. The initial thinking about this project began as early as 2005, soon after the Kyoto Protocol came into force. In the absence of dedicated funding for developing expertise in CF as well as related environmental and social safeguards, Caixa approached the World Bank for assistance. Caixa also applied to the Ministry of Cities to make the CDM applicable to federal Fundo de Garantia de Tempo de Serviço funds that are a major source of finance for solid waste management (SWM) and received approval in 2008. Caixa signed a Seller Partnership Agreement in 2009 with the World Bank–administered Carbon Partnership Facility.

With the implementation of the Santa Rosa subproject in the metropolitan region of Rio de Janeiro, Caixa registered Brazil's first programmatic SWM program under the CDM. Caixa became the only bank in Brazil to offer loans that accepted future carbon revenues as partial guarantees, through the introduction of an innovative mechanism for financing of landfills, by linking the interest rate of loans offered by Caixa to the performance of the landfill project. Caixa's SWM program of activities and its ability to access CF was showcased as a corporate asset and disseminated publicly. A total of 1,244, 251 CERs were issued as of August 2017 under a Santa Rosa subproject (UNFCCC). Ciclus Ambiental, which runs the Santa Rosa facility, receives carbon credits that are generated every month from flaring landfill gas and they have also contracted to sell landfill gas to a company, Gas Verde. A new subproject, the landfill São Gonçalo in Rio de Janeiro, was added to the Program of Activities (PoA) on March 31, 2016.

In terms of environmental integrity, the greenhouse gas emission reductions were additional under this project, and achieved through capturing and flaring the landfill gas, which is a mix of methane and CO₂. Without the revenue stream from CF, a landfill project would have little economic incentive to capture the waste gas, and hence the emission reductions would not have occurred in the absence of CF. In respect of safeguards, an Environmental and Social Management Framework that was developed during preparation was later applied to Caixa's entire SWM portfolio. The resulting framework Plano de Gestão Socio Ambiental, was adopted by Caixa for its entire SWM portfolio. The framework is publicly available through the Caixa website and has become one of the technical assistance tools that Caixa can make available to municipalities. Following the project, Caixa has adopted the Equator Principles for risk management.

The World Bank assisted Caixa in developing capacity to manage the CDM project cycle, from project identification and evaluation, to registration by the UNFCCC Executive Board, and monitoring. The World Bank was also effective in building Caixa's capacity for managing environmental and social safeguards for the solid waste sector. However, although a task force within Caixa was established for the management of carbon initiatives, a dedicated CF unit at Caixa was not created as planned. The knowledge and capacity to develop CF subprojects under the PoA was confined to a small team in Brasília that identified and implemented a small number of CF operations. The scope and

size of the PoA could have been expanded but Caixa did not approach other buyers outside the World Bank to exploit a pool of possible projects. About 10 additional landfills were registered in Brazil under the CDM after the registration of the PoA. Further, the slowdown in the carbon market reduced interest among potential providers of CF.

¹ IEG (2018): Bulgaria-District Heating Project. Project Performance Assessment Report. Independent Evaluation Group, Washington, DC: World Bank.

² IEG (2018): Brazil-Integrated Solid Waste Management and Carbon Finance Project. Project Performance Assessment Report. Independent Evaluation Group, Washington, DC: World Bank.

Appendix J. Governance Arrangements and Monitoring and Evaluation in Carbon Funds and Facilities

This section presents the existing evidence on the governance structure and monitoring and evaluation (M&E) systems in the World Bank Group's carbon funds and initiatives. The findings from Independent Evaluation Group (IEG) desk review, portfolio review and analysis, and World Bank Group staff interviews indicate that the governance mechanisms and M&E frameworks vary significantly across the CF vehicles in the World Bank Group.¹ Table J.1 shows the variations in governance principles, M&E frameworks, external evaluations, and the role that participants (donors) and host countries (World Bank Group country clients) play in the decision-making process.

Table J.1. Governance and Monitoring and Evaluation in Carbon Finance Initiatives

CF Fund or Facility	Year	Carbon market role	M&E framework	External evaluations	Governance Principles	Role of Client Countries in Governance ^a
PCF	2000	Yes	No	No	PC model: Participants' Committee (Buyers) approve projects and ERPA Conditions. <i>Carbon Fund</i> : just donors have decision-making power	No
NCDMF	2002	Yes	No	No	PC model	No
CDCF	2003	Yes	No	No	PC model	No
BioCF	2004	Yes	No	No	PC model	No
ICF	2003	Yes	No	No	PC model	No
DCF	2005	Yes	No	No	PC model	No
SCF	2004	Yes	No	No	PC model	No
CFE	2005	Yes	No	No	PC model	No
UCF	2006	Yes	No	No	Participants are informed about the projects before joining the facility. World Bank has control on the project approval process.	No
CF-Assist	2003	No	No	Yes	Donors approve budget and annual program.	No
FCPF	2008	Yes	Yes	Yes	Partnership model <i>Readiness Fund</i> : all donors and host countries representatives have the same decision-making power. <i>Carbon Fund</i> : just donors have decision-making power	Yes
CPF	2009	Yes	No	No	Partnership model: Host country representatives (sellers of carbon assets) and donors (buyers of carbon assets) are equally represented in the partnership committee, the governance body of the CPF, and have joint decision-making power.	Yes

Appendix J
Governance Arrangements and Monitoring and Evaluation
in Carbon Funds and Facilities

					<i>Carbon Fund: Decisions on inclusion of programs to the portfolio and ERPA are made by donors (buyers of carbon assets)</i>	
Ci-Dev	2012	Yes	Yes	Yes	PC Model	No
PMR	2010	No	Yes	Yes	Partnership model: All decisions are taken by the Participant Assembly with balanced representation from donors and implementing countries	Yes
PAF	2014	Yes	Yes	Yes	PC Model: Comprised of representatives from Donors, the PC oversee and approve on the operations, advise on knowledge dissemination, and be informed of other elements of operational design as well as financial information.	Advisory role
NCM	2016	No	No	Yes	Technical assistance facility managed by the World Bank	Advisory role
TCAF	2016	Yes	Yes	Yes	Donor governed facility	No
CPLC	2016	No	No but in workplan for 2018–19	Yes	Coalition model: Decision-making power resides in the assembly with representation from government, private sector and civil society of each country. World Bank acts as secretariat.	Advisory role

Source: Independent Evaluation Group desk review.

Note: BioCF = BioCarbon Fund; CDCF = Community Development Carbon Fund; CDM = Clean Development Mechanism; Ci-Dev = Carbon Initiative for Development; FCPF = Forest Carbon Partnership Facility; M&E = monitoring and evaluation; NCM = Networked Carbon Markets; PAF = Pilot Auction Facility; PC = participants' committee; PCF = Prototype Carbon Fund; PMR = Partnership for Market Readiness; NCDMF = Netherlands Clean Development Mechanism Facility; SCF = Spanish Carbon Fund.

a. Role of client countries in governance: Advisory role: Decision-making power is with the participants and/or the World Bank, but host country committees play an advisory role; No: Host countries have no role in the governance of the carbon funds, but host countries authorize the CDM projects through their CDM Designated National Authorities; Yes: Decision-making power is shared between Participants and representatives of the host countries.

As can be seen from table J.1, many of the older Kyoto carbon market funds and initiatives lacked clear governance arrangements, results frameworks and M&E arrangements to ensure accountability and support learning. Overtime, the newer initiatives (for example, CPF, Forest Carbon Partnership Facility [FCPF], Partnership for Market Readiness [PMR]) developed more inclusive, balanced and transparent arrangements and allowed clients and funders to engage actively in decision-making processes. The evaluation by the Independent Evaluation Group (IEG) on Climate Change and the World Bank Group observed that in contrast to earlier CF funds which were governed by a participants' Committee (PC) although in consultation with host countries, the new CF facilities feature equal representation of donor and host countries in fund governance (IEG 2010).

Most notably, FCPF and CPF have started to explore an inclusive and partnership-based governance structure that includes both participants and host countries in the decision-making process (IEG 2010; 2017). However, both funds leave the decision to include a project or activity or approve an ERPA with the participants (donors). In those facilities that do not cover commercial transactions (for example, PMR and CPLC) the decision-making process is more balanced—involving both donors and client countries. The new initiatives have more transparent results frameworks and M&E arrangements to generate necessary data and evidence to support accountability and learning. Closer collaboration and partnership between all parties involved broaden the opportunity to exchange views and discuss issues to improve the performance of CF as a tool in climate change mitigation and development.

Since CF activities in World Bank Group have been largely dependent on external trust funding, governance and oversight is provided through external entities rather than the World Bank Group Board of Directors. To date, only three of the carbon initiatives have completed external evaluations. These include: PMR which had one external evaluations completed in 2015 (PMR 2015) and an inception report for the second evaluation (PMR 2017) in addition to annual reviews (2012–16); FCPF which had two external evaluations (2011, 2016) as well as an IEG Global Program Review (2012); and the CF-Assist mid-term evaluation (ICF 2009). An IEG Global Program evaluation looked at the Prototype Carbon Fund's performance at its initial stages (World Bank 2004). The PAF is currently undergoing an external evaluation of the formative stages of the program, and Ci-Dev is expecting an external evaluation at a later stage (IEG 2011a).

IEG also found a broader issue of inconsistent practices and records across partnership programs and trust funds. In its evaluation of the World Bank's Involvement in Global and Regional Partnership Programs, IEG found that only a few programs generated systematic evidence about achievements of their objectives at the outcome level. Most partnership programs generally lacked robust M&E frameworks with indicators for measuring outcomes (IEG 2011a). In the evaluation of the World Bank's Trust Fund Support for Development, IEG highlighted the difficulty in measuring and attributing results of trust-funded programs and activities, and determining their impact, because of the frequent lack of a results framework with clear outcome objectives and indicators for monitoring progress. There were some exceptions, such as trust-funded activities that were paired with World Bank operations. The evaluation reviewed 36 randomly selected trust fund programs and found that only a few had defined their desired *outcomes*; whereas the majority had defined their objectives simply in terms of *inputs or outputs*, and most of these lacked monitorable indicators (IEG 2011b).

The recent IEG's 2015 report on "Opportunities and Challenges from Working in Partnership: Findings from IEG's Work on Partnership Programs and Trust Funds" further highlighted common challenges in oversight and result frameworks. The evaluations found weaknesses in governance and transparency in many partnership programs and trust funds, as well as frictions and conflicts of interest from the multiplicity of roles that the World Bank typically performs in partnerships and trust funds. Yet the World Bank had no routine oversight and tracking of partnerships and of how it engaged in them. The report noted that although there had been progress, many partnerships and trust funds lacked clear goals and indicators, it was therefore often difficult to attribute results to specific partnerships let alone assess results across the portfolio.

Overall, according to the World Bank Group management action record monitored by IEG in response to its recommendations, the World Bank Group is improving its processes toward establishing well-articulated monitoring and evaluation frameworks and appropriate governance arrangements at the outset in partnerships. IEG noted that World Bank Group ensures that all major Financial Intermediary Funds (FIFs) have articulated governance arrangements and the Trust Fund Handbook requires teams to prepare a strong results-oriented design at the Trust Fund Proposal (TFP) stage.²

In terms of the governance transparency, PMR and FCPF are the only two CF funds to provide a clear structure of governance (which is also made available on their websites). PMR and FCPF are also demonstrating commitment to enhance their M&E frameworks.

In the case of the PMR, the Participant Assembly is the formal decision-making body. The Participant Assembly consists of contributing participants, who provide financial support to the PMR Trust Fund and share their carbon pricing experience, and 19 Implementing Country participants, who receive funding and technical support. The Paris Agreement also includes nonvoting technical partners, observers, technical experts, and the World Bank as the delivery partner.³ The World Bank also serves as the trustee and secretariat. The PMR established a results framework at the Partnership Assembly Meeting (PA7) in Marrakesh in 2013, under which an Operations Monitoring System was launched in 2015. The system included program indicators, frequency of data collection, data sources and collection methods, and assigned responsibilities.

However, the recent external review in 2015 reported concerns among some stakeholders about insufficient transparency in reporting on implementation grant and budget allocation decisions and consultant selection to the Participant Assembly. With respect to results framework, the evaluation team recommended that a full M&E system to be established. The evaluation also suggested a continuous process of M&E activities as opposed to the focus of one-off external performance assessments, such as this evaluation exercise itself, every three to five years. In this regard, it proposed the Monitoring and Evaluation Working Group to be fully integrated into the PMR functional structure to develop, help guide and oversee the design, establishment and operation of the PMR's M&E system. In addition, the ongoing second external evaluation indicated that the secretariat is developing an annual PMR Results Monitoring Report which will be presented annually at a Participant Assembly meeting starting in FY2018 (PMR 2017). This report will reflect overall status of implementation of the PMR toward its expected results, based on the PMR logframe, while the Results Monitoring Report will serve as a link between the PMR Performance Evaluation System and the PMR Operations Monitoring System.

In the case of FCPF, the decision-making bodies with voting powers are the participants Committee (for the Readiness Fund) which meets twice a year and composed of 14 REDD+ countries and 14 financial contributors, and the Carbon Fund Committee (for Carbon Fund) meeting twice a year and composed of 11 Carbon Fund financial contributors. The World Bank serves as trustee and secretariat for both funds as well as one of the three Delivery Partners for the Readiness Fund (others are United Nations Development Fund and IDB) and the sole Delivery Partner for the Carbon Fund. According to the second external evaluation (FCPF 2016), FCPF has strengthened stakeholder engagement in several ways, such as by increasing the number of observer seats in the FCPF governance structure, by organizing global dialogue events, and by the provision of funding to indigenous peoples and civil society organizations through the Capacity Building Program. However, the lack of comprehensive gender-mainstreaming strategy and private sector engagement at the country level constitute a weakness in the FCPF's results framework.

On the M&E side, FCPF has developed the country reporting framework template "REDD+ Annual Country Progress Reporting (with Semi-Annual update)" following the structure of the FCPF M&E Framework, its logical framework and the Performance Measurement Framework in 2013. The evaluation found this template to be well-structured. Its traffic light systems made reporting simple, although information and data provided were of variable quality. However, the FCPF's reporting system did not function to its full potential as not all data necessary for monitoring, reporting and decision making were provided across the portfolio and the M&E Framework was not providing a useful tool for monitoring and evaluating the success of FCPF's knowledge sharing and communication activities. The review concluded that FCPF has reached a stage where the existing monitoring and evaluation system does not fully correspond to the current situation in program implementation and the global context, suggesting the need to further enhance it.

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¹ In this review, the monitoring and evaluation framework refers to whether the CF initiative has a relevant results-oriented design with monitoring benchmarks and evaluations to assess the overall performance of the initiative. The presence of an M&E framework generally implies that the CF initiative has developed and implemented the following aspects: (i) theory of change defining the overall conceptual approach on how the inputs or activities would combine to produce outputs, outcomes and impacts; (ii) clearly defined objectives; (iii) measurable indicators for monitoring the desired outputs and results; (iv) periodic monitoring of the indicators against benchmarks; (v) periodic evaluation of performance against stated objectives or targets (internal or external); and (vi) adaptive learning and change based on the evaluation—which will help the initiative produce relevant lessons and enhance its performance.

² <http://ieg.worldbankgroup.org/mar/independent-assessment-world-banks-involvement-global-and-regional-partnership-programs-1>.

³ The observers include the UNFCCC, multilateral agencies such as the Asian, Inter-American, Latin American, and European Development Banks (ADB, IDB, CAF, and EBRD, respectively), the United Nations Development Program, the International Carbon Action Partnership, the Organisation for Economic Co-operation and Development, the International Energy Agency, and the International Monetary Fund.

Appendix K. Engagement in Carbon Finance by Other Multilateral Development Banks

This section presents the “big picture” findings from the Independent Evaluation Group desk study and Stakeholder Mapping Exercise regarding the areas of engagement in carbon finance (CF) across the main multilateral development banks (MDBs). This review does not claim to be a comprehensive analysis of CF at these MDBs and is not intended to make any evaluative assessment on the activities of these MDBs.

MDBs are public finance institutions that channel financial resources and often provide capacity building as well as technical and policy support to foster the achievement of international and national development mandates and objectives, such as, poverty alleviation. Over the past several years, climate change has become one of the central topics in the work of MDBs. Collectively, the Asian Development Bank, the African Development Bank, the European Bank for Reconstruction and Development, the European Investment Bank (EIB), the Inter-American Development Bank (IDB), and the World Bank Group (World Bank Group) committed \$158 billion in climate finance (2011–16) for developing countries (EBRD 2016) (see figure K1). This includes both upfront financing and ex post payments, for example, through the purchasing of carbon credits.

MDBs employ an array of financial instruments to provide climate finance including equity, grants, loans, guarantees and other instruments such as carbon finance, that is, purchasing carbon credits. Almost three-quarters of total climate finance in 2016 was committed through investment loans, while other instruments such as carbon credit purchasing agreements represented only 6 percent (EBRD 2016). CF per se therefore represents a small share of the total climate finance committed by MDBs and is usually focused on specific objectives. For example, early initiatives such as the World Bank Group’s Prototype Carbon Fund and the Netherlands European Bank for Reconstruction and Development (EBRD) Carbon Fund aimed at pioneering carbon markets by creating the initial demand for carbon credits. Several initiatives had a specific geographical focus depending on MDBs’ regions of operation. For example, the ADB’s Asia Pacific Carbon Fund on the Asia-Pacific Region, the EIB/EBRD Multilateral Carbon Credit Fund focused on Central Europe and Central Asia, the IDB’s Micro Carbon Development Fund on CDM PoAs in Latin America and the Caribbean.

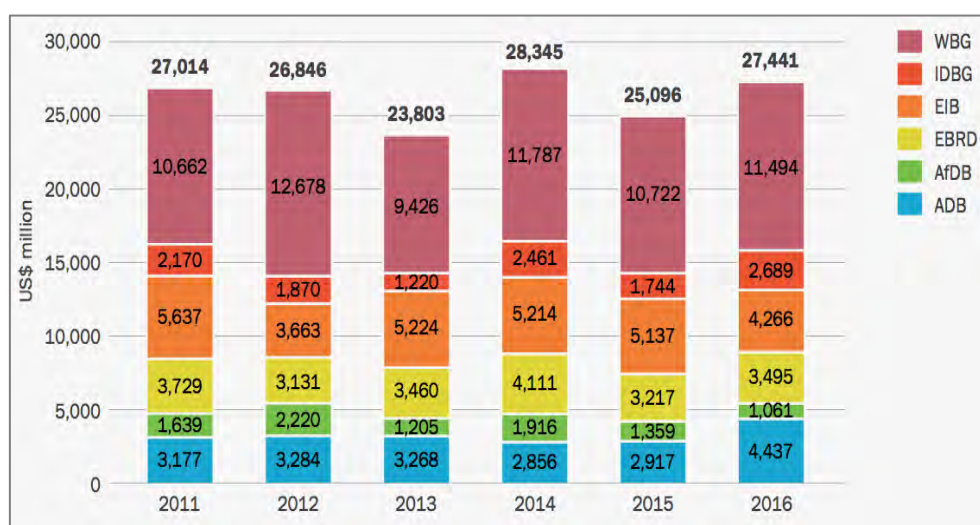
Another important aspect of MDBs’ work is the provision of policy advice, technical support and capacity building. Several MDBs including the ADB, the EBRD, the IDB, and the World Bank Group provide capacity building and technical support for carbon markets and carbon finance. For example, the ADB’s Carbon Market Program provides financial and technical support for CDM projects in the Asia-Pacific Region. The EBRD’s Sustainable Energy Financing Facilities support the development of carbon projects in Central Europe, Central Asia and Northern Africa by providing technical assistance and supporting the development of local carbon markets, for example, in Turkey. The IDB’s Sustainable Energy and Climate Change Initiative aims at strengthening the capacity of countries in the Latin America and the Caribbean Region to improve their access to carbon finance.

Table K.1 presents MDB’s activities related to CF. In summary, regional MDBs have participated and contributed importantly in CF, providing multiple services:

- The African Development Bank’s African Carbon Support Program launched in 2010 assists its regional member countries to access CF. Its activities include assistance in developing project documents, support the development of regional grid emission factors, and support project owners in commercializing their projects’ carbon potential.
- The Asian Development Bank launched the Carbon Market Initiative in 2006, which was succeeded by the Carbon Market Program, as part of the ADB’s climate change program. Its Carbon Market Program includes upfront carbon financing through the Asia Pacific Carbon Fund and the Future Carbon Fund (FCF); technical CDM support through the Technical Support Facility; and marketing support for carbon credits through the Credit Marketing Facility.

- The European Bank for Reconstruction and Development was one of the early movers in CF, starting in 2003 by managing a \$35 million Netherlands-financed carbon fund. In 2006 EBRD, jointly with the EIB, launched the Multilateral Carbon Credit Fund, to purchase emission reduction credits from Joint Implementation (JI) activities. Also, in 2006, the EBRD launched the Sustainable Energy Initiative (SEI) focusing on energy efficiency and sustainable energy investments. Its program “Carbon Crediting Approach in Southern and Eastern Mediterranean Countries (SEMED)” comprises market-based programs to reduce carbon emissions.
- In 2007, the IDB supported methodology development and capacity building and launched the Sustainable Energy and Climate Change Initiative (SECCI) to support activities in key sectors such as energy, transportation, water and environmental protection, and climate resilience.

Figure K.1. Reported MDB Climate Finance Commitments, 2011–16
(\$, millions)



Source: EBRD 2016.

On climate finance, an important resource that the Bank Group can access as part of the climate finance approach is the Green Climate Fund (GCF) which currently is distinct from carbon finance. Established by the UNFCCC in 2010, the Fund aims to help developing countries mitigate their emissions and adapt to a changing climate with financing from advanced economies. Since 2015, the Fund supports the Paris Agreement by providing grants, loans, equity, or guarantees to catalyze climate finance, and using public investment to stimulate private finance. The Bank Group and the GCF signed an Accreditation Master Agreement in November 2017 to coordinate efforts to reduce emissions and prepare for the impact of climate change. Linking the Clean Development Mechanism (CDM) to the GCF has been proposed and discussed. The GCF’s Private Sector Facility’s Business Model Framework recognizes that the CDM has created a “credible and transparent framework for results-based (pay-for-performance) financing of low cost mitigation activities” (GCF 2013) and lists Certified Emission Reduction (CER) price guarantees for certain types of CDM activities (such as energy access) as one way in which the Fund could encourage private sector investors to support mitigation action at scale. To date, only one activity that is also a registered CDM project has been awarded GCF funding, a solar PV project in Chile. However, approval was awarded on the condition that it did not seek to sell CERs. A similar situation exists regarding the project “Sustainable Landscapes in Eastern Madagascar” approved by the GCF in 2016, where emissions credits from forest protection (REDD+) are to be retired. As such there is not yet any formal link between the GCF and CDM (Climate Focus, Perspectives, and Aera Group 2017).

Like other major MDBs, the World Bank Group performs multiple functions in CF. The World Bank Group along with major MDBs including the ADB, the AfDB, the EBRD, and the IDB, has engaged in financing carbon projects to implement its multiple roles. However, unlike other MDBs that have a clear geographical focus on their regions of

operation, the World Bank Group's activities are global. Moreover, while there is no publicly available exhaustive data on the size of CF support of different MDBs, the EBRD's 2016 Joint Report on Multilateral Development Banks' Climate Finance demonstrates that the overall size and number of carbon funds involving the World Bank Group is larger than that of other MDBs (EBRD 2016). The World Bank Group also differentiates itself by its deep expertise, long institutional memory, innovating carbon finance instruments, for example, the Pilot Auction Facility or the International Finance Corporation's Carbon Delivery Guarantee and Forests Bond. Second, the World Bank Group along with other major MDBs has played an important role in capacity building for the private and public sector, for example, supporting DNAs in host countries, as well as technical assistance to project developers, but has recently expanded its support to market readiness (including forests and landscapes) and domestic carbon pricing. Third, all major MDBs engage in regulatory support, for example, through the development of methodologies and grid emission factors. The World Bank Group distinguishes itself by being a pioneer in the development of early methodologies and engaging in broader CDM reforms at a later stage. Finally, the World Bank Group appears to play a unique role of a global convener through initiatives such as the Partnership for Market Readiness, CPLC and Networked Carbon Markets.

Table K.1. MDB Activities Related to Carbon Finance

MDB/CF Element	Initiatives Related to Carbon finance	Mitigation Activities Implementation	Capacity Building	Technology Transfer	Regulatory Functions	Main Focus	Comparison with World Bank Group's Operation
AfDB	African Carbon Support Program	Screening of 55 project in the Bank's portfolio and support development and validation of 4 selected projects Support provided through the Green Bond Program to several CDM projects. However, the program is not targeting specifically CDM activities, but mitigation activities in general	Mostly to public officers from DNAs and AfDB staff Support in event organization (African Carbon Forum, Conference of Parties 22)	Not specifically targeted	Support development of one methodology relevant for African countries Support development of Standardized Baselines for regional grid emission factors	No specific focus identified	Lack of specific carbon fund Support to specific CDM activities (4 projects) Strong focus on training for DNA and internal staff No specific focus on technologies and sector: support was targeting lighthouse activities in different sectors or countries
ADB	Carbon Market Program FCF APCF JFJCM	Carbon funds management and credit procurement Technical support to project owners Support exploration of opportunities under the JCM	Provided to both private and public stakeholders Support in regional events organization Capacity building on new mechanisms	Low-Carbon Technology Marketplace Asia Climate Change & Clean Energy Venture Capital Initiative	Support in the calculation of grid emission factors	EE, transport, renewables	Support in the marketing phase of CERs Open to explore new bilateral mechanism and linking of domestic activities Upfront finance provided through the carbon funds (that is, up to 75% of expected CERs volume)
EBRD	SEI and GET focus, among other things, on carbon markets SEMED	Carbon funds management and credit procurement Technical support for project identification and development Support meeting offer and demand for carbon credits	Provided to both private and public stakeholders	Recently added as a specific focus under the GTE (not specifically related only to carbon finance)	Policy dialogue support under the Bank's environmental initiatives and programs Support development of new instruments (for example, upscaled crediting)	Energy efficiency and renewable energies JI transactions From central Europe to Central Asia	Similar in terms of areas covered (that is, funds management and procurement of credits, capacity building, regulatory functions) Provision of an upfront finance component Strong involvement of local financial institutions

Appendix K
Engagement in Carbon Finance by Other Multilateral Development Banks

MDB/CF Element	Initiatives Related to Carbon finance	Mitigation Activities Implementation	Capacity Building	Technology Transfer	Regulatory Functions	Main Focus	Comparison with World Bank Group's Operation
							Initial focus on JI only due to EBRD's geographic focus (that is, Central and Eastern Europe, Central Asia)
IDB	SECCI (not only focused on carbon finance) Micro Carbon Development Fund Policy-based loans	Support in project development and validation Support development of PoAs	Activities (for example, workshops) at regional level	Not specifically targeted	Policy-based loans (more broadly focusing on climate change) Training to DNAs Development of methodologies in the transport sector	EE and renewables Transport (Brazil) and landfill gas (Colombia) REDD+ (Multiple countries)	Focus on EE and RE, SECCI are not focused only on carbon finance elements Activities are mostly focused on creating the enabling environment, capacity building Small-scale activities and PoA development

Note: ADB = Asian Development Bank; AfDB = African Development Bank; CER = Certified Emission Reduction; DNA = Designated National Authority; EBRD = European Bank for Reconstruction and Development; EE= energy efficiency; FCF = Future Carbon Fund; IDB = Inter-American Development Bank; JI = Joint Implementation; REDD+ = Reducing Emissions from Deforestation and Forest Degradation; SECCI = Sustainable Energy and Climate Change Initiative; SEI = Sustainable Energy Initiative; SEMED = Carbon Crediting Approach in Southern and Eastern Mediterranean Countries.

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Appendix L. World Bank Group Carbon Finance Vehicles

Table L.1. World Bank Group Carbon Finance Vehicles

Fund or Facility	Launch Year	Main Objectives/Activities	Special Features
Prototype Carbon Fund (PCF)	2000	<ul style="list-style-type: none"> Pioneer carbon markets and Kyoto mechanisms; define project cycle and MRV processes Demonstrate efficiency of project-based emission reduction transactions and contributions to sustainable development Public-Private Partnerships Knowledge dissemination 	<ul style="list-style-type: none"> Carbon markets innovation Public and private sector participation Fellowship program for Host Country representatives and participants PCF Plus as a technical assistance vehicle
IFC-Netherlands Clean Development Mechanism Facility (INCaF)	2002	<ul style="list-style-type: none"> Assist Netherlands' Ministry of Infrastructure and the Environment to purchase approximately €100 million worth of emission reductions from eligible private sector projects in Non-Annex I Countries on or before December 31, 2006 	<ul style="list-style-type: none"> First carbon finance facility managed by IFC Plan to purchase a target of 16 million CERs Played a role for IFC to establish its own CFU
Netherlands Clean Development Mechanism Fund (NCDMF)	2002	<ul style="list-style-type: none"> Assist Netherlands to meet its obligations toward Kyoto Complement the PCF in responding to the demand for CF projects from host countries 	<ul style="list-style-type: none"> The Netherlands government negotiated a "first right of refusal" clause, that gave the fund project selection priority over all funds launched after the NCDMF
Italian Carbon Fund (ICF)	2003	<ul style="list-style-type: none"> Assist Italy to meet its obligations toward Kyoto Access to additional resources to attend the demand from host countries 	<ul style="list-style-type: none"> Helped to respond to the demand from World Bank country clients to develop projects under the CDM or JI rules
Community Development Carbon Fund (CDCF)	2003	<ul style="list-style-type: none"> Develop small-scale CDM projects in poor developing countries that would reduce emissions and poverty and improve local communities Help build a market for emission reductions and expand the reach of carbon finance and the benefits to 	<ul style="list-style-type: none"> Launched to meet a specific niche of the market not covered by PCF and the other funds Strong co-benefit or community development component CER price may have reflected cobenefits—fair

Fund or Facility	Launch Year	Main Objectives/Activities	Special Features
		<ul style="list-style-type: none"> developing countries that may otherwise be excluded • Leverage private capital flows for sustainable development • Offer relevant information to UNFCCC and other interested parties for further development of the CDM 	and competitive prices for small-scale projects relative to large projects in other countries
Carbon Finance Assist (CF-Assist)	2003	<ul style="list-style-type: none"> • Enable all eligible countries to participate in carbon markets by building the necessary institutional and human capacity • Disseminate knowledge on carbon markets • Maximize the sustainable development benefits • Reduce the transaction costs for participating in the carbon market 	<ul style="list-style-type: none"> • Important component of the CFU outreaching and advocacy strategy • Carbon Expo and State and Trends of the Carbon Markets are co-financed by CF-Assist
IFC & IBRD-Netherlands European Carbon Facility (NECaF)	2004	<ul style="list-style-type: none"> • Assist Netherlands' Ministry of Economic Affairs in acquiring a target of 10 million tons of ERs by 2012. The Government of Netherlands committed a total of €47.72 million 	<ul style="list-style-type: none"> • First carbon finance facility managed by both IFC and IBRD. • Helped to foster and build the JI market, particularly in the Eastern Europe
BioCarbon Fund (BioCF)	2004	<ul style="list-style-type: none"> • Demonstrate that land-based activities can generate high-quality ERs with strong cobenefits for local communities • Develop and pilot rules for afforestation and reforestation 	<ul style="list-style-type: none"> • First fund launched by the CFU to attend forest related projects. • Deal with "temporary" credits and offer replacement credits to participants
Spanish Carbon Fund (SCF)	2004	<ul style="list-style-type: none"> • Assist Spain to meet its obligations. • Access to additional resources to attend the demand from host countries toward Kyoto 	<ul style="list-style-type: none"> • Helped to respond to the demand from World Bank country clients to develop projects under the CDM or JI rules
Danish Carbon Fund (DCF)	2005	<ul style="list-style-type: none"> • Assist Denmark to meet its obligations toward Kyoto 	<ul style="list-style-type: none"> • Helped to respond to the demand from World Bank country clients to develop projects under the CDM or JI rules
Carbon Fund for Europe (CFE)	2005	<ul style="list-style-type: none"> • Assist several European countries to meet their obligations toward Kyoto 	<ul style="list-style-type: none"> • Helped to respond to the demand from World Bank country clients to develop

Fund or Facility	Launch Year	Main Objectives/Activities	Special Features
Umbrella Carbon Facility (UCF) — Tranche 1	2006	<ul style="list-style-type: none"> Manage the purchase of very large volumes of emission reductions (over 10 million tons CO₂e) for varying groups of participants in multiple tranches Provide CDM revenue to China CDM Fund which is intended to support improvements of the legal and institutional framework for operations in carbon markets in China; provide financial support for the design and implementation of projects and activities in the areas of climate change mitigation and adaptation, with priority focus on energy efficiency and renewable energy; Support institutional strengthening and capacity building; and promote public awareness on climate-related issues, and on mitigation and adaptation options 	<p>projects under the CDM or JI rules</p> <ul style="list-style-type: none"> Participants are governments from several EU countries and the European Investment Bank Pilot projects for industrial gases (HFC-23) The UCF was created at a time when there was high demand from buyers and aimed to inject large volumes of ERs to the market Concentrate many buyers (Private and public) to purchase emission from two projects—HFC-23 (Trifluoromethane) incineration projects located at two HCFC-22 (Chlorodifluoromethane) manufacturing facilities (Jiangsu Meilan Chemical Co. Ltd., and Changshu 3F Zhonghao New Chemicals Material Co. Ltd) in Jiangsu Province, China
Umbrella Carbon Facility (UCF) — Tranche 2	2010	<ul style="list-style-type: none"> Intended to provide participants with a facility to obtain post-2102 CERs Help to maintain demand for post-2012 carbon credits during a period of regulatory uncertainty 	<ul style="list-style-type: none"> Future of the CDM remains in balance following UN climate talks in Mexico, which failed to end uncertainty as to whether Kyoto projects can earn credits after 2012 Enable CDM project developers to continue selling their carbon credits well beyond 2012 Current participants to the UCFT-2 are Statkraft Markets GmbH, GDF Suez (now ENGIE), Swedish

Fund or Facility	Launch Year	Main Objectives/Activities	Special Features
IFC Carbon Delivery Guarantee (IFC-CDG)	2007	<ul style="list-style-type: none"> • Help developing country projects maximize the value of their future carbon credits by providing transparent access to traded emission markets • Provide appreciable impact on the value of the credits by providing projects with an AAA-rated counterparty 	<p>Energy Agency and ENEL Trade S.p.A.</p> <ul style="list-style-type: none"> • New financial instrument to provide a delivery guarantee to buyers who are unwilling to take emerging market projects and credit risks • IFC would take the project and credit risk on its AAA-rated balance sheet • IFC to buy CERs from developing countries offering them prices based on market conditions • Buyers willing to pay premium prices for CERs, which in turn enable IFC to offer better prices to project owners in developing countries
Forest Carbon Partnership Facility (FCPF)	2008	<ul style="list-style-type: none"> • Assist countries in their efforts to achieve ERs from deforestation and/or forest degradation by providing financial and technical assistance • Pilot performance-based payments for ERs generated from REDD+ activities for • Promoting future large-scale positive incentives for REDD+ • Test ways to sustain or enhance the livelihoods of local communities and to conserve biodiversity • Disseminate broadly the knowledge gained 	<ul style="list-style-type: none"> • First facility dedicated to pilot activities in the REDD field • Changed the governance pattern in the CFU funds of facilities, incorporating host countries to the governance of the facility
Carbon Partnership Facility (CPF)	2009	<ul style="list-style-type: none"> • The CPF was launched with the ambition to scale up the size of the projects or activities. CPF aimed to develop large-scale projects and activities using Kyoto Protocol rules, including Program of Activities approach. 	<ul style="list-style-type: none"> • The CPF promoted the development of activities under the PoA approach. • Incorporate host countries to the governance of the facility

Fund or Facility	Launch Year	Main Objectives/Activities	Special Features
		<ul style="list-style-type: none"> It targets areas that were not reached effectively by the CDM 	
Partnership for Market Readiness (PMR)	2010	<ul style="list-style-type: none"> Build capacity to develop and implement carbon pricing instruments needed for GHG mitigation and NDC implementation Create a knowledge base on carbon pricing instruments and facilitate information exchange Assist countries to identify and implement best practice approaches and support compatibility in design of carbon markets Inform the national and international policy discussions on mitigation by sharing lessons learned and providing a platform for collective innovation on carbon pricing instruments 	<ul style="list-style-type: none"> Provides support to countries to develop carbon pricing policy choices and their future implementation
Carbon Initiative for Development (Ci-Dev)	2011	<ul style="list-style-type: none"> Implement performance-based payments for ERs in low-income countries. Influence on the penetration of carbon markets as a tool to expand energy access in poor countries. Uses performance payments to support projects that use clean and efficient technologies in low-income countries to reduce GHG emissions 	<ul style="list-style-type: none"> Develop standardized baselines and support accounting standards in key energy related areas. Focused on energy. Consideration of additional cobenefits in agreeing terms of carbon purchase Payment for additional cobenefits
Post-2012 Carbon Facility (P12CF)	2011	<ul style="list-style-type: none"> Foster continued investments in climate-friendly projects and address the carbon market concerns related to uncertain regulatory regimes after 2012 Provided minimum price guarantees on CERs to sellers by indexing the price of CERs 	<ul style="list-style-type: none"> First facility on carbon finance that was established by an MDB. Create a new pathway to markets by indexing to spot market (market price available at the time of CER delivery) subject to

Fund or Facility	Launch Year	Main Objectives/Activities	Special Features
		<ul style="list-style-type: none"> to a future market price with floor and cap Forward purchase CERs produced by IFC client companies until 2020 	<ul style="list-style-type: none"> floor (a predetermined lowest price) and a cap (a predetermined highest price). Mobilized funds from utilities and other energy companies. Aimed at helping to: (i) reduce GHG emissions; (ii) extend carbon markets; and (iii) increase access to finance
BioCarbon Fund Initiative for Sustainable Forest Landscapes (BioCF ISFL)	2013	<ul style="list-style-type: none"> Strengthen the capacity of government institutions engaged with developing and implementing land use activities Improve the understanding of how financial incentives for reducing GHG emissions from landscapes can help tropical forest countries seeking to promote rapid, large-scale investments to achieve economic development 	<ul style="list-style-type: none"> Jurisdictional 'landscape' level at scale programs Blended climate and development impacts Aligning public and private sector interests
Pilot Auction Facility (PAF)	2014	<ul style="list-style-type: none"> Pay-for-performance mechanism which uses auctions to allocate funds to projects that generate emission credits from methane, using the existing CDM infrastructure. Pilot a global pay-for-performance approach to stimulate the implementation of shovel-ready projects that reduce methane emissions 	<ul style="list-style-type: none"> Provides carbon price guarantees through a put option to project developers. ERs will be retired by participants
Networked Carbon Markets (NCM)	2015	<ul style="list-style-type: none"> Pilot and test a post 2020 scenario when multiple markets will co-exist. Linking different jurisdictions allowing the communications and potential transactions among them 	<ul style="list-style-type: none"> The NCM analyzes the multimarket global environment and help countries to understand how to position themselves and define their own strategies. The NCM is a CB and technical assistance instrument.

Fund or Facility	Launch Year	Main Objectives/Activities	Special Features
Carbon Pricing Leadership Coalition (CPLC)	2015	<ul style="list-style-type: none"> • A convening instrument to advance the knowledge and experience on effective carbon pricing systems. 	<ul style="list-style-type: none"> • Participation of government and private sector entities from both developed and developing countries. • It is a coalition and the bank acts as a secretariat.
Forests Bond	2016	<ul style="list-style-type: none"> • Leverage IFC's decade long experience in the CF business to test and develop a new business line using capital markets in REDD+ • Leverage private sector resources to reduce emissions and prevent deforestation in developing countries 	<ul style="list-style-type: none"> • Designed as a CSR activity for a private company underwriting implicit put option (buy any credits tendered) • Treasury product with proceeds applied to general IFC portfolio • PV of coupon used to structure an ERPA for an independent forestry (REDD+) project in Kenya • Gives investors the option of getting paid in either carbon credits or cash.
Transformative Carbon Facility (TCAF)	2016	<ul style="list-style-type: none"> • Support activities for purchase carbon credits from transformative mitigation programs in countries (for example, through scaling up existing experiences going beyond the traditional project-based CDM approach). 	<ul style="list-style-type: none"> • The TCAF is assisting countries to develop mitigation activities that will generate CERs at a much larger scale (Beyond PoAs), • Includes a new approach on policy crediting.

Note: CDM =Clean Development Mechanism; CF = carbon finance; CFU = Carbon Finance Unit; Ci-Dev = Carbon Initiative for Development; CO₂ = carbon dioxide; ER = emission reduction; ERPA = Emission Reduction Purchase Agreement; EU = European Union; GHG = greenhouse gas; IBRD = International Bank for Reconstruction and Development; IFC = International Finance Corporation; JI = Joint Implementation; NCDMF = Netherlands Clean Development Mechanism Facility; NCM = Networked Carbon Markets; PCF = Prototype Carbon Fund; UCF = Umbrella Carbon Facility.



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The World Bank
1818 H Street NW
Washington, DC 20433

