How to Keep Momentum up in Carbon Markets?

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A background paper for the Synthesis Report "Mobilizing Climate Finance", prepared by Philippe Ambrosi (World Bank), with inputs by Klaus Opperman, Philippe Benoit, Chandra Shekhar Sinha (World Bank), Lasse Ringius (International Finance Corporation), Maria Netto (Inter-American Development Bank), Lu Xuedu (Asian Development Bank), Jan Corfee-Morlot, Robertus Dellink, Andrew Prag (OECD Secretariat).

This note examines how to maximize the benefits from the use of market instruments in support of developing countries' low-emission development priorities. First, it briefly surveys the current state and trends of the carbon market, highlighting the main achievements of carbon finance over its decade-long history. Second, it reviews updated scenarios of the scale of future carbon markets and associated financial flows, in light of developments in climate negotiations and domestic markets. Finally, it identifies the necessary steps to scale up carbon market flows in future, on both the demand and supply sides, including the reform of existing mechanisms, and innovation to broaden the scope, scale and reach of carbon markets.

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Executive Summary

The experience of the past decade shows that carbon offset markets can play an important role in catalyzing low-carbon investment in developing countries, complementing and leveraging other financial resources. In principle carbon offset revenues provide an additional revenue stream that enhances the overall financial viability of low-emission projects. More particularly, they can help incentivize the often large up-front capital investments needed for low carbon projects, as well as providing incentives to overcome social inertia, lack of awareness and various transaction costs that tend to hinder climate-friendly investment. The "pay-upon-performance" nature of the asset also creates positive incentives for good management and operational practices to sustain emission reductions over time.

The value of transactions in the primary CDM market – the largest offset market by far – totaled around $27 billion in 2002-10, which is estimated to have been associated with around $125 billion in low-emission investment. Since the bulk of transactions are forward purchase agreements with payment on delivery, actual financial flows through the CDM have actually been lower, about $5.4 billion through 2010. A 2 percent levy on issuance of CDM credits has also mobilized $150 million for the Adaptation Fund. All in, this makes of the CDM an important conduit for international climate action resources to developing countries. By contrast with other major international resource flows dedicated to mitigation, the CDM channels primarily private resources (as more than 80 percent of CDM credits are purchased by the private sector). Finally, the CDM provides opportunities to support basic development needs (e.g., access to sustainable energy services and waste management solutions, etc.) and contributes to technology transfer and diffusion.

That said, carbon offset markets – and carbon markets as a whole – now face major challenges. The value of transactions in the primary CDM market declined sharply in 2009 and further in 2010, amid chronic uncertainties about future mitigation targets and market mechanisms after 2012. A number of other factors are further constraining the potential of carbon finance, including market fragmentation in the absence of a global agreement, transaction costs associated with complex mechanisms, low capacity in many countries, lack of upfront finance, weaknesses in the current 'project by project' approach and non-inclusion of some sectors with significant abatement potential (e.g., agriculture).

Despite the recent slowdown in market activity, a number of recent developments do show continued interest in advancing carbon market solutions in both developed and developing countries. The 2010 United Nations Climate Change Conference in Cancun adopted important improvements and reforms to enhance the efficiency of the CDM and agreed to consider the establishment of one or more market-based mechanisms to enhance the cost-effectiveness of mitigation actions by Parties. The Conference formally recognized developing countries' Nationally Appropriate Mitigation Actions (NAMAs), some of which plan the use of market mechanisms. It also recognized the contribution of forest-related activities in efforts to tackle climate change, making not only projects but also developing countries and sub-national regions within them eligible for incentives, subject to verification that such REDD+ activities have reduced emissions against a reference level.

New market initiatives are also underway in both developed and developing countries, despite the uncertainties about the international regulatory environment. For developed economies, these include an upcoming cap-and-trade scheme in California and several other regional initiatives in North America,

city-wide emissions trading systems in Japan, and proposed carbon trading legislation in Australia (which could become, after EU and New Zealand, the third regulation establishing a country-wide or supra-national emissions trading system in developed countries). Building on the experience and achievements of the CDM, a number of other countries are also experimenting on a voluntary basis with market approaches to cost-effectively reduce emissions, mobilize domestic and international resources for low-emission development and potentially deliver additional benefits such as increased technology transfer, energy security or competitiveness. In the developing world, a broad range of instruments are being considered in countries such as Brazil, China, Chile, Colombia, Costa Rica, Indonesia, Korea, Mexico, Turkey and Ukraine.

Depending on the level of ambition with which countries implement national mitigation targets under the Copenhagen Accord and Cancun Agreement, offset market flows could range from $5 - 40 billion per year in 2020. A scenario targeting a two degree pathway, which would require a much higher level of ambition, could stimulate offset flows in excess of $100 billion. The health of the carbon market will ultimately depend upon three factors. First, there are *demand factors*, in particular the ambition of mitigation targets and the scope for market mechanisms (which drive the size of demand), as well as eligibility criteria (which influence the type of carbon assets included in the market). Second, *supply* which is notably affected by the lead time and capacity required to develop eligible projects and deliver scaled-up abatement in a broader range of opportunities. Lastly there are *market rules and institutions*, which influence transactions costs, the level of efficiency of the market and the level of capacity needed for market functioning.

The most important determinant of carbon offset market flows to developing countries is clearly *the level of international mitigation targets*: the more ambitious the targets the greater the scope for such flows. Developed countries can also encourage flows by *increasing supplementarity limits*, which are the proportion of mitigation targets that can be met by purchases from developing countries. Greater use of market mechanisms, taking advantage of the diversity in costs of abatement across sectors and regions, could encourage countries to scale up their mitigation efforts while lowering the cost of doing so.

Improving long term policy clarity about future frameworks is an urgent priority. Currently market activity (and associated low-emission investment) is seriously hampered by multiple uncertainties about future demand, the eligibility of various market mechanisms, project types, technology and country of origin, among others. Given the heavy toll of a potential market disruption in terms of both capacity and confidence, governments could work towards sustaining momentum in the market while new initiatives are being developed. They could, for example, dedicate a fraction of their international climate finance pledges to support testing and showcasing new approaches, such as concepts for country or sector programs, new methodologies, CDM reforms and new mechanisms. This would be a cost-efficient use of climate finance as it would target least cost-options and would be performance-based. It would also help build up a supply pipeline for a future scaled-up market, preventing supply shortages and price pressures.

As regards supply, innovative steps to broaden the scope, scale and reach of carbon markets can be considered in several directions. First, steps could be taken to include sectors bypassed under existing regimes, notably the large mitigation opportunities from REDD+ activities and agricultural soil carbon. The sequestration of carbon in soils is currently a neglected part of the climate solution, yet the carbon market could provide incentives for sustainable land management programs that deliver a triple win for

society: improved yields, enhanced resilience to climate change, and global mitigation. Second, steps could be taken to scale-up the impact of carbon finance through programmatic approaches that help overcome the high costs and constraints inherent in the current project-by-project approach. This could include building on the existing CDM Programme of Activities (PoA), which has proved successful in promoting small-scale, dispersed activities such as distribution of cookstoves, efficient light-bulbs, biogas digesters and solar water heaters. It could also explore new approaches such as a city-wide approach to carbon finance, incorporating GHG mitigation concerns into urban planning, landscape approaches or policy crediting. Finally, steps could be taken to increase the participation of the poorest countries in the carbon market, in particular by simplifying and adapting carbon finance procedures to the realities of these countries (e.g., finding solutions for the treatment of suppressed demand or of non-renewable biomass which currently hinders clean energy uptake in these regions).

Encouraging innovation to turn future carbon offset flows into finance is another option. Difficulties in securing sufficient up-front long term financing have proven a major constraint in advancing most carbon finance projects. So far, there have been few attempts by financial institutions to monetize forward carbon revenue streams as a way of providing upfront investment capital for such projects, because of factors such as underlying project risk, low familiarity with carbon finance and post-2012 uncertainty. Several institutions including MDBs are developing a range of solutions such as frontloading mechanisms that turn anticipated carbon revenues into upfront finance, risk mitigation tools that enhance the confidence of financiers in the value and predictability of future carbon credits, revolving funds where accruing revenues can support a next tranche of investments, and structured finance with innovative use and combination of instruments, each addressing specific barriers and needs.

Given the possibility that the carbon market will develop in a fragmented way, through numerous regional and national initiatives, there would be a significant payoff from *greater harmonization of rules across regimes to ensure minimum fungibility of carbon assets*. This would control transaction costs and keep capacity needs manageable, which would otherwise multiply with the diverse specific requirements of each new carbon regime in a fragmented carbon world, with real risks of restricting access to the carbon market and increasing the maturity time of supply. Harmonization would also maintain liquidity and efficiency, as the gains from indirect linking through well-functioning crediting mechanisms appears to be very large, reflecting the vast low-cost abatement potential in developing countries. To ensure market integrity, greater clarity and harmonization are also needed on the framework for monitoring and accounting. A number of options are available for international GHG accounting including some that combine elements of a top-down approach based on the Kyoto Protocol and more decentralized country-led approaches.

Finally, there remains a considerable need for *innovation, awareness-raising and capacity building in public and private institutions in developing countries*, to increase their participation in the carbon market and build and enabling environment for low-emission development.

1 A Brief Overview of the Carbon Market

1.1 Scope, economic principle and structure of the carbon market

Wherever they take place, activities that mitigate greenhouse gas (GHG) emissions contribute equally to the fight against climate change. This equivalence, together with the wide diversity in cost of abatement across sectors and regions, is the basic principle for a carbon market, as a cost-effective solution to collectively reduce global GHG emissions. An entity (a government, a private company or an individual) seeking to reduce its carbon footprint can thus combine the following three options, with some flexibility depending on their relative costs: reduce its own emissions, acquire allowances (emission rights) through the carbon market (to cover excess emissions), or acquire emission reductions from projects (or offsets) through the carbon market (to compensate for, or offset, excess emissions) — see Box 1). Provided it sends an adequate, predictable and long-term price signal for GHG emissions, the carbon market can effectively encourage less carbon-intensive lifestyles, technology choices, and investment decisions.

Box 1: Allowances and emission reductions: risk profiles and standardization

Allowances grant the entities regulated under a cap and trade scheme the right to emit a given quantity of GHG. The total number of allowances issued corresponds to the cap set on the aggregate emissions from these entities. To be in compliance, each mandated entity must periodically surrender as many allowances as its individual GHG emissions; if allowed, it can also surrender offsets. To lower compliance costs, allowances are tradable: as long as the price of an allowance (or of an offset) is below an entity's marginal abatement cost, it is cheaper for it to buy an allowance (or an offset) rather than reduce its own GHG emissions. The European Union Emissions Trading System (EU ETS), which regulates domestic emission sources in the EU (mostly utilities), is the paramount example.

Because emissions trading is a quantitative instrument, there is a high certainty that emissions will remain below the cap (if effective enforcement mechanisms are in place). Conversely, the level and the stability of the price of an allowance are less predictable since the amount of allowances cannot self-adjust to sudden shifts in demand, induced for example by large fluctuations in economic activity. Three simple quantitative mechanisms can help dampen price volatility: banking (saving allowances for a future use), borrowing (the opposite of banking) and the use of emission reductions (which are generated outside the perimeter of the ETS). Other interventions can be considered (like a price floor or a price cap) but remain more delicate to implement.[1]

Emission reductions (ERs) are generated by certified activities that can verifiably demonstrate real and measurable GHG emission reductions additional to any that would occur in the absence of these activities.[2] Such activities constitute a voluntary participation in the carbon market, motivated by the

[1] The relative merits of emissions trading and other carbon-linked instruments are examined in depth in de Mooij and Parry (2011), a background paper also prepared in support of the G-20 request on mobilizing climate finance. Hood (2010) prepared a thorough review of emissions trading systems.

[2] For instance investing in wind power or other renewable energy sources instead of coal-fired power generation or improving energy efficiency at a large industrial facility to reduce energy demand and hence, GHG emissions from power generation.

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expected revenues from the sale of the emission reductions. To ensure the environmental integrity of the carbon market, it is essential to demonstrate the additionality of the emission reductions (i.e., they would not have occurred without the incentive provided by participation in the offset market) and to estimate their volume by a periodic monitoring. To do so, a number of carbon market standards (chief among them, the Kyoto Protocol's Clean Development Mechanism or CDM) codify the definition of the baseline scenario, the demonstration of additionality, methodologies for accounting and monitoring, together with the modalities of supervision (including third party validation and verification, review and public consultation process).

Unlike allowances, ERs need to be generated through a process that has certain inherent risks (eligibility under a given standard, project development and performance, for instance) and often involves significant transaction costs (for example for validation and verification). In addition, since they are generated by projects located in different countries, implementing various technologies, involving diversely skilled sponsors, yet-to-be issued ERs show extremely different risk profiles to a potential buyer. Such risks are addressed through contractual provisions that define how they are allocated between parties, and, along with other factors, are reflected in the value of the transaction. Together with other factors (confidentiality and fragmentation in over-the-counter transactions), this heterogeneity contributes to explain why attempts to achieve price discovery and transparency for project-based ERs have been only partially successful so far.

By contrast, allowances are extremely homogeneous commodities, a characteristic that lends itself well to the definition of standard financial products, thereby facilitating transactions and price discovery through exchanges. To bridge the gap between a heterogeneous primary market for projects-based ERs and a standardized allowances market, the financial sector has been instrumental in developing a secondary market for ERs, bringing standardized assets to buyers and coming with guaranteed firm volume deliveries and achieving full price discovery.

1.2 A compliance-driven market, in need of post-2012 political and regulatory visibility

The Kyoto Protocol laid the foundation of a global carbon market that offers a cost-effective way to manage the GHG emissions from industrialized countries (see Box 2). Together with tributary regimes (like the European Union Emissions Trading System, see Box 3), it accounts virtually for the entire activity in the carbon market (which also includes some local initiatives, particularly in North America, as well as a voluntary segment, that caters for the demand of individuals, companies and public entities that wish to reduce their carbon footprint in the absence of a regulatory constraint or as an early measure in anticipation of future mandatory regulation).

With both the entry into force of the Kyoto Protocol and the official start of operations of the EU ETS in 2005, the global carbon market experienced a vibrant growth, reaching in 2009 an estimated US$144 billion in value (13 times its 2005 value, see Figure 1). This growth stalled however in 2010, suffering from insufficient visibility beyond 2012 (when the First Commitment Period of the Kyoto Protocol comes to an end).

Box 2: The international framework for carbon markets

United Nations Framework Convention on Climate Change (1992): overall framework for governments' efforts towards climate change mitigation, following "common but differentiated responsibilities" based on "respective capabilities."

Kyoto Protocol to the UNFCCC (1997, entry into force February 2005): commits industrialized country signatories to reduce their GHG emissions collectively by at least 5.2% below 1990 levels on average over 2008-12 while developing countries can take no-regrets actions and participate voluntarily in the carbon market. To comply with their Kyoto targets, industrialized countries can:

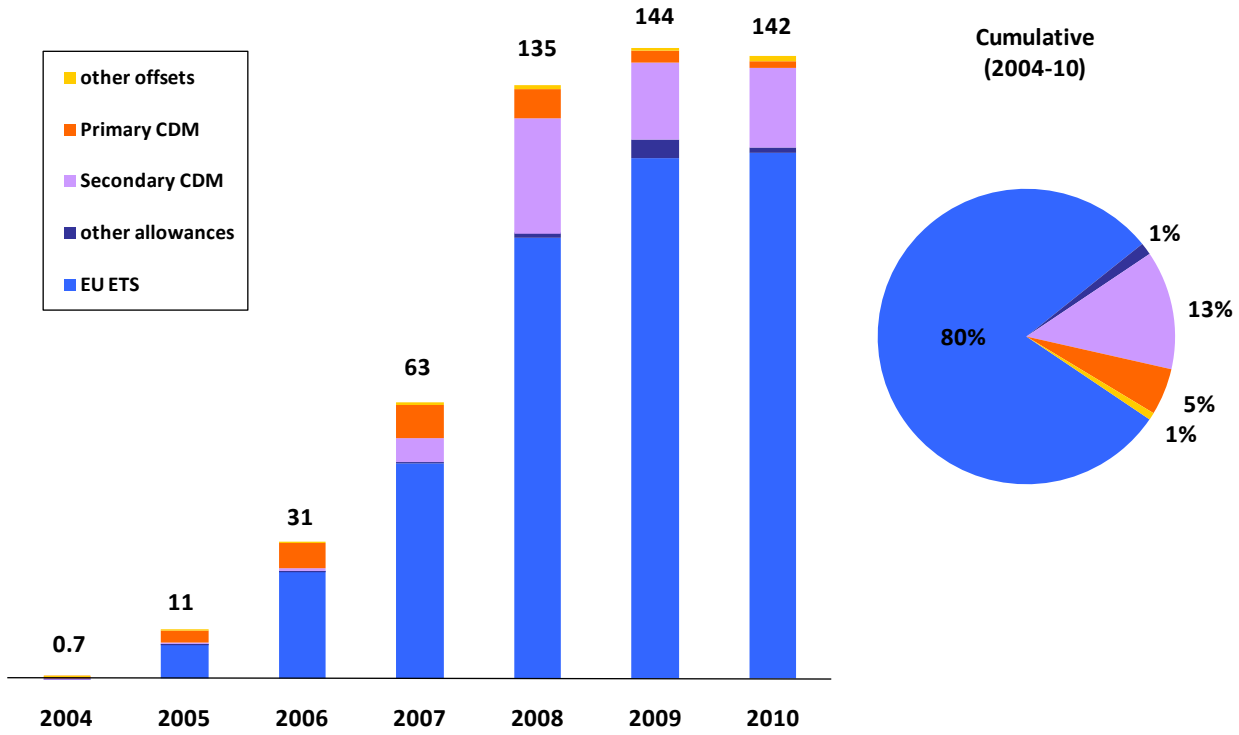
- take domestic actions (e.g., carbon tax, carbon trading, standards, subsidies, investment in cleaner technologies);
- trade allowances (Assigned Amount Units, AAUs), among governments; or
- purchase ERs from projects in developing countries (Clean Development Mechanism or CDM, generating Certified Emission Reductions or CERs) or in industrialized country signatories (Joint Implementation or JI, generating Emission Reduction Units or ERUs).

Accounting for more than 70% of global transactions every year and the main source of demand for ERs, the EU ETS remains the engine of the carbon market. Since its inception, the EU ETS has produced a transparent price signal for GHG emissions that adequately reflects market fundamentals. It has also triggered domestic abatement and influenced investment decisions of power companies and encouraged low-carbon investment in developing countries and economies in transition. The EU ETS continues to evolve, strengthening for instance its price signal through a significant increase in auctioning of allowances. This evolution also builds upon learning and experience, as evidenced by actions taken against several market irregularities (such as VAT carousel fraud, or theft of allowances) in support of a more robust and transparent regulation.

Box 3: The European Union Emissions Trading System (EU ETS)

Through the EU ETS, EU Member States (as well as Iceland, Liechtenstein, and Norway) allocate part of their efforts toward achieving their Kyoto targets to domestic emission sources (mostly utilities). It started in 2005 with a three-year pilot phase, which was in particular critical to gain accurate data on emissions from covered entities. Over 2008–12, emissions from mandated installations (about 40 percent of EU emissions) are capped on average at 6 percent below 2005 levels. Participants can internally reduce emissions, purchase EU Allowances (EUAs) or acquire CERs and ERUs (within a 13.4 percent average limit of their allocation over 2008–12). From 2012 onward, the EU ETS broadens its perimeter to regulate emissions from air travel, regulating flights landing or taking off from EU territory. The EU ETS will continue beyond 2012, with further cuts in emissions (by 21 percent below 2005 levels in 2020 or more, depending on progress in reaching an ambitious international agreement on climate change).

Figure 1: Overall carbon market evolution over 2004-10 (US$ billion)



Source : World Bank (2011a).

The CDM dominates by far the primary market for emission reductions, at 90% of transactions in value since 2002. Initially limited to pilot transactions by institutional buyers (such as the Dutch Government and the World Bank as the trustee of several carbon funds) in the early 2000s, the CDM market grew exponentially until 2008, driven by private sector buyers with an eye on EU ETS compliance. To a lesser extent, Japanese companies[3] and European and Japanese governments have also purchased CERs. From 2009 on, the CDM market declined sharply, amid persistent uncertainties on future mitigation targets and reliance on market mechanisms post 2012. It closed at US$1.5 billion in 2010, its lowest level since 2005, while limited confidence in the post 2012 market is putting at risk the principal window of carbon markets to the developing world. A number of other factors are further constraining the potential of carbon finance, including market fragmentation in the absence of a global agreement, transaction costs associated with complex mechanisms, low capacity in many countries, lack of upfront finance, weaknesses in the current 'project by project' approach and non-inclusion of some sectors with significant abatement potential (e.g., agriculture).

Though with a smaller volume of activity, the voluntary market offers opportunities for innovation and learning for market solutions. For example, protocols under North America-based Climate Action Reserve (CAR) use clear sectoral benchmarks to streamline additionality demonstration and reduce transaction costs, improve transparency in eligibility and provide predictability to investors. A number of

[3] Under the Keidanren Voluntary Action Plan, a large number of Japanese companies from 34 industrial sectors committed to stabilize CO_2 emissions from energy production and use to their 1990 levels by 2010. Though voluntary, this initiative is fully integrated within the government Kyoto Target Achievement Plan and is a source of demand for Kyoto assets (AAU, CER, ERU).

voluntary carbon standards are also broadening the scope of the market to the whole spectrum of Agriculture, Forestry and Other Land Use (AFOLU) activities, in particular through alternative ways to address reversal risks and generate permanent carbon credits from biological sinks such as the constitution of a buffer.[4] Further, experience gained with the voluntary market can prepare the ground for emerging compliance markets, through strengthening capacity and awareness, developing market infrastructure, or building a pipeline of compliance-grade assets (for a more detailed discussion, see Guigon, 2010).

1.3 New initiatives signal sustained interest in market solutions

The Conference of Parties to the UNFCCC in Cancun in 2010 resulted in several positive outcomes for carbon markets, notably continuation of the Kyoto Mechanisms beyond 2012 (including important improvements and reforms to the CDM), and agreement to consider establishing one or more market-based mechanisms to enhance the cost-effectiveness of mitigation actions by Parties. The Conference also formally recognized developing countries' Nationally Appropriate Mitigation Actions (NAMAs), some of which plan to use market mechanisms, and the much broader contribution of forest-related activities to limit climate change. The possibility of generating international credits from these activities was introduced (such as the reduction of deforestation and degradation through such initiatives as REDD+).

In the context of sustainable development, developing countries also agreed to undertake NAMAs aimed at reducing emissions. Forty-eight countries have to date submitted their plans to limit the growth of their emissions (UNFCCC, 2011). These actions range from broadly enunciated targets of varying form—absolute reductions from business-as-usual (BAU) or historical reference year emissions, or intensity limits[5]— to detailed programs of activities (including both policies and investments), with and without quantified GHG emission reductions; provision of support for finance, technology, and capacity by developed countries; and resort to market mechanisms. Negotiations so far have not defined NAMAs narrowly. This presents an opportunity for countries to shape the concept through learning by doing. NAMAs, especially those seeking support from international sources, will require monitoring, reporting, and verification (MRV) capacity. Clear boundaries and tracking will be necessary to avoid overlapping and double counting support for NAMAs.

Importantly, new market-based initiatives are emerging in both developed and developing countries, while the international regulatory environment remains uncertain. Three years after the Regional Greenhouse Gas Initiative (RGGI) on the East Coast of the US,[6] California's cap-and-trade scheme is to

[4] There are several factors such as harvest, natural decay after project is discontinued or comes to term, external disturbances such as drought, fire or pest attack that may lead to possible reversal of carbon sequestration in biological sinks. Several options have been explored to address the risk of such reversal, tying the liability either to the buyer (temporary crediting as with the CDM) or to the seller (constitution of a buffer or minimum time commitment as under several other forest carbon standards). The temporary nature of CDM credits issued to forestry activities is the main reason for their ban from the EU ETS. As a result, Kyoto-compliant LULUCF assets have so far accounted for less than 1% of volume in the CDM (and JI) primary market while the voluntary over-the-counter (OTC) market dominated forestry carbon market, with close to three-quarters of volumes transacted (see Hamilton, Chokkalingam, & Bendana, 2010).

[5] This includes 15 countries with economy-wide mitigation targets.

[6] Under the Regional Greenhouse Gas Initiative (RGGI), 10 Northeast and Mid-Atlantic US states aim to reduce power sector CO_2 emissions by 10 percent below 2009 levels in 2019.

start in 2012 (with emission obligations from 2013 onwards).[7] The Golden State could be joined by other American States and Canadian Provinces, under the Western Climate Initiative (WCI).[8] In Japan, Tokyo's metropolitan cap-and-trade system, the first ever city-level emissions trading system, started operations in April 2010 followed by the Saitama prefecture in April 2011. Australia is exploring carbon trading legislation again this year, with a proposal for a three-year annually-increasing fixed-price period that would transition into an emissions trading scheme. After the EU and New Zealand, this could become the third legislation establishing a country-wide (or supra-national) emissions trading system while similar attempts in other developed countries (Japan and the United States) have been delayed.

As developing countries formulate national climate change strategies and align them with overall development plans, a number of countries are designing market approaches that build on the experience and achievements of the CDM, and span a wide range of possible instruments. This includes combined approaches such as: several variants of baseline and credit mechanisms (upgraded CDM, sectoral crediting, NAMA crediting) and allocation mechanisms (sectoral trading and domestic emissions trading). Table 1 provides examples from countries in the Partnership for Market Readiness (PMR). These market approaches will help lower the costs of achieving specific low-carbon goals, mobilize additional (domestic and international) resources to sustain low-carbon benefits over time, and deliver additional benefits such as accelerated technology transfer and diffusion, enhanced energy security or increased competitiveness.

This may be a sign that the carbon market is entering a second stage, characterized by the growing engagement of developing countries beyond the supply of project-based emission reductions in the global mitigation effort, by the development of new mechanisms to deliver scaled-up abatement for a broader range of opportunities, and by more systematic capture of climate benefits from sustainable development.

Still, there are challenges associated with this transition. The lack of visibility beyond 2012 on the scope and reach of market mechanisms and associated demand for carbon assets is making buyers more conservative and discouraging the development of new carbon finance opportunities. It will take time to design, implement and adjust new mechanisms. Finally, the emergence of multiple frameworks in the absence of a global agreement may entail higher transaction costs and capacity needs, restricting access to the carbon market and delaying reaching maturity of supply. Considerable effort, ingenuity, and capacity will be required to maximize the benefits of the carbon market to developing countries and not delay climate action.

[7] The passage of Assembly Bill 32 (California Global Warming Solution Act AB32) in August 2006 sets economy-wide GHG emissions targets as follows: bring down emissions to 1990 levels by 2020 (considered to be at least a 25 percent reduction below business-as-usual) and to 80 percent of 1990 levels by 2050. Emissions trading will be a major instrument to achieve this goal, along with renewable energy standards, energy efficiency standards for buildings and appliances as well as vehicle emissions standards.

[8] The Western Climate Initiative (WCI) covers a group of seven U.S. States (Arizona, California, Montana, New Mexico, Oregon, Utah, and Washington) and four Canadian Provinces (British Columbia, Manitoba, Ontario, and Quebec), with an aggregate emissions target of 15 percent below 2005 levels by 2020. Not all finally may join the emissions trading component of the WCI. Other U.S. and Mexican States and Canadian provinces have joined as observers.

Table 1: Initial proposals under the Partnership for Market Readiness (PMR)

The Partnership for Market Readiness (PMR) provides grant-funding and technical assistance for collective innovation and piloting of market-based instruments. The Partnership brings together developed and developing countries, as well as other key experts and stakeholders, and serves as a platform for technical discussions on market instruments, to foster South-South exchange, facilitate collective innovation for pilot efforts and harness financial flows for implementation and scale up. Ten implementing countries are already confirmed, with a target of 15 (Brazil, India, Jordan, South Africa and Vietnam have expressed interest to join). The World Bank serves as the Secretariat of the Partnership.

Implementing country	Proposed sector(s)*	Requests PMR Support to Build the Following Market Readiness Components*
Emissions Trading Scheme (ETS) Proposals		
China	six pilot domestic ETS by 2013 (in four cities and two provinces) specific sectors to be determined	• trading rules for pilots • registry for local ETS • transaction platform, MRV and regulatory system(s) • emissions caps in pilots and emission allowances allocations
Turkey	to be determined	• improved MRV system (installation-level monitoring in line with EU ETS) • institutional capacity at government, operator and verifier levels • pilot opportunities for trading systems and sectoral crediting and the creation of a carbon exchange under the Istanbul Gold Exchange
Ukraine	energy, iron & steel	to be determined
Scaled-up Crediting Mechanism Proposals		
Colombia	transport	• sectoral leaders • mitigation actions registry • urban transport market initiative
Costa Rica	energy, transport, waste management, sustainable housing	• market potential for each sector • capacity development needs for the country
Indonesia	to be determined	• MRV system • private sector engagement • REFF-Burn program (reducing emissions from fossil fuel)
Mexico	housing, appliances, waste management, cement, urban transport, and energy efficiency	• objectives and scope of NAMAs (relationship with CDM PoAs, domestic targets, and potential for market development) • industrial capacity to increase market relevance to all carbon emitters • MRV system (inventory standards, registry and clearing house • criteria for domestic, supported, and market-assisted NAMAs
Morocco	to be determined	to be determined
Emissions Trading Scheme (ETS) & Scaled up Crediting Mechanism Proposals		
Chile	ETS: energy, transport, industry & mining, CPR Crediting Mechanism: energy, agriculture, forestry, transport	• institutional and financial tools to design and implement ETS • quantify achievable GHG emissions reductions • platform to discuss technical issues • MRV system consistent with international requirements
Thailand	Voluntary Crediting Offsetting: cities, carbon-intensive industry Domestic ETS: factories in industrial estates	• offsetting and trading system(unified it with other systems: national registry, data collection, and emission reporting formats) • baseline methodology, validation and verification guidelines • stakeholder consultations to identify targets to implement pilot projects

*Proposed plans based on presentations made in May 2011; proposals are subject to change.

2 The Multiple Benefits of Carbon Finance

This section highlights the main benefits of market mechanisms for developing countries and draws on a World Bank review of a decade-long experience in the carbon market (World Bank, 2010). It complements and updates a background paper on carbon markets (AGF, 2010b) prepared for the Secretary-General's High-level Advisory Group on Climate Change Financing (AGF, 2010a) by providing (more recent) quantification and illustration. The major constraints and challenges that currently limit the impact of carbon finance are discussed in Section 4 with options to address them.[9]

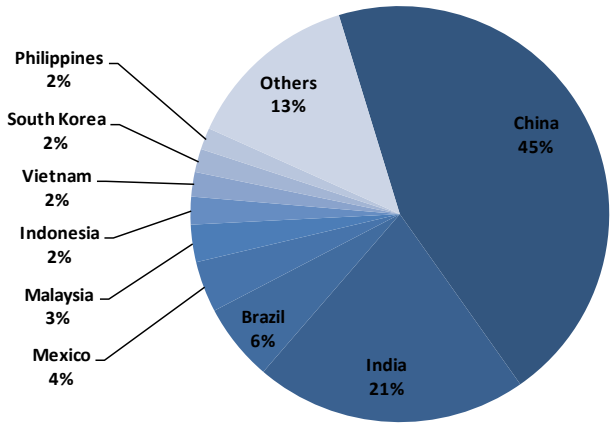
Ten years of experience working with market mechanisms demonstrates that carbon finance sparked the imagination of entrepreneurs all over developing countries, raising awareness of mitigation opportunities and catalyzing change towards more sustainable practices. This is exemplified by more than 3,000 projects registered to date under the CDM (with about 4,000 more at earlier stages in the pipeline) or other voluntary standards (see Figure 2). Not all opportunities have been equally explored by carbon finance, reflecting regulatory, methodological, or financial constraints specific to some sectors. Nonetheless innovation is continuing, for example with efforts to consolidate experience and knowledge through the development of multi-sectoral approaches to carbon finance (e.g., the proposed city-wide approach), to broaden the scope of the carbon market to a range of land-based activities (including soil carbon), or to integrate carbon finance into a package of measures targeted at specific sectors or into NAMAs.

[9] These include market fragmentation in the absence of a global agreement, transaction costs associated with complex mechanisms, low capacity in many countries, lack of upfront finance, weaknesses in the current 'project by project' approach, unequal geographic distribution and non-inclusion of some sectors with significant abatement potential (e.g., agriculture).

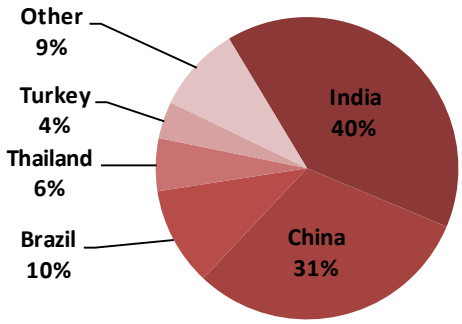
Figure 2: Carbon finance in developing countries: achievements in numbers

Clean Development Mechanism (CDM)	Verified Carbon Standard (VCS)

Registered project activities by host country

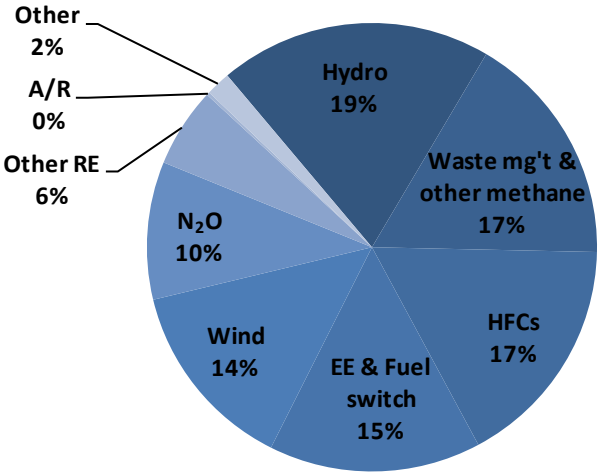


(total= 3,211)

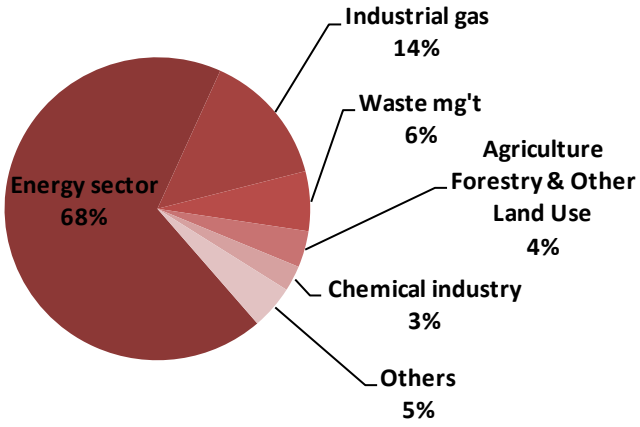


(total= 531)

Expected emission reductions per sector (registered projects)



(total= 485 $MtCO_2e$ per year)



(total= 55 $MtCO_2e$ per year)

Other RE: Biomass energy, Geothermal, Solar, Tidal
Other: Cement, CO_2 usage, PFCs and SF6, Transport

Others: Energy demand, Energy distribution, Fugitive emissions from fuels (solid, oil and gas), Livestock, enteric fermentation, and manure management, Manufacturing industries, Metal production, Mining/Mineral production, Transport, Waste handling and disposal

- 3,211 registered projects in 70 countries, with expected annual reductions of 485 $MtCO_2e$
- 647 million CERs issued
- > 3,000 projects in validation
- 1.15 billion CERs expected by end of 2012

- 531 registered projects in 25 developing countries, with expected annual reductions of 55 $MtCO_2e$
- 46 million VCUs issued to projects in developing countries

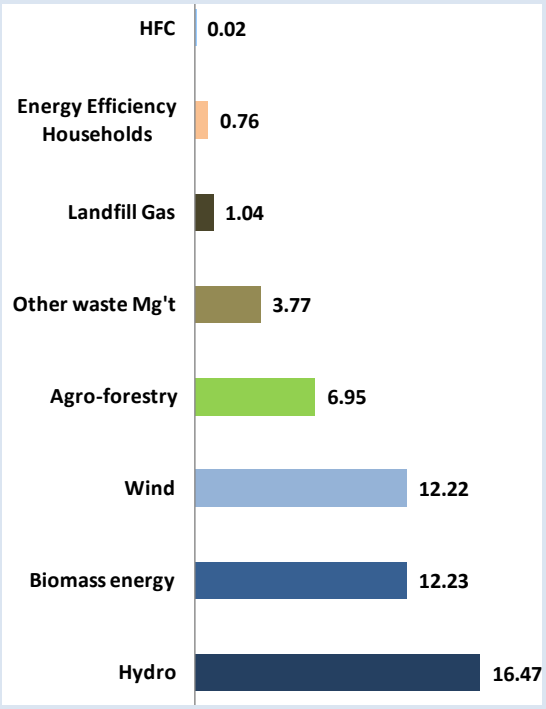
Less VCUs could be issued since some of these projects are also being issued CERs under the CDM

Source: UNEP (2011) and v-c-s.org (as of July 2011)

2.1 An important catalyst of low-carbon investment, complementing and leveraging other financial resources

Carbon finance revenues enhance the overall financial viability of low-carbon projects and as performance-based payments create positive incentives for good management and operational practices that sustain emission reductions over time. As illustrated in Figure 3, these incentives will vary greatly, depending on project type (which can be more or less capital-intensive) and the size of carbon revenues (which result from the volume of credits generated — dependent on the GHG intensity of the baseline, the length of the purchasing period — negatively affected by post 2012 uncertainties, and the price — influenced by overall market trends and project performance risk). Carbon finance revenues can be decisive and provide incentives to overcome social inertia, low awareness, transaction costs and financial barriers that can hinder climate-friendly action. For example, several Programmes of Activities are now accelerating the diffusion of energy-efficient equipment or development of renewable energy sources in rural areas (e.g., compact fluorescent lamps, efficient cookstoves, or biodigesters).

Figure 3: Ratio of investment to net present value of ERPA in World Bank CDM portfolio*



*: The nominal value of the ERPA is discounted at 10% per year, assuming all future payments occur in a period of five years.

Experience with the Kyoto mechanisms suggests that carbon finance alone or in combination with other policy and financial instruments has made a difference in favor of climate action and helped shift much larger amounts of (essentially private) financial and investment flows to low-carbon development. Over 2002-10, about 2.3 billion Certified Emission Reductions (CERs) have been transacted in the primary CDM market for approximately US$27 billion, which is estimated to have been associated with around $125 billion in low-emission investment, or an average leverage ratio of 1 to 4.6.[10] More generally it is estimated that should registered CDM projects materialize they could represent an investment of US$120 billion (two-thirds of which in renewable energy, equally led by hydro- and wind power) - (UNEP Risoe, 2011). Transaction activity is somewhat smaller in the so-called voluntary market: about 96 $MtCO_2e$

[10] Source: for market activity (World Bank, 2011a); for leverage ratio (World Bank, 2009). Underlying investment in low-carbon projects estimated using leverage ratio and market activity. ERPA: Emission Reduction Purchase Agreement.

changed hands for an estimated US$653 million over 2006-10 (Peters-Stanley, Hamilton, Marcello, and Sjardin, 2011).[11]

Actual financial flows to developing countries through the CDM are likely of a smaller magnitude as a vast majority of transactions are forward purchase agreements with payment on delivery. Depending on project financing, registration, and performance as well as delays in the regulatory process, the amount and schedule of payments may prove different. It is estimated that actual financial flows to developing countries through the primary CDM market reached to date US$5.4 billion, or about 20% of commitments.[12]

The CDM is also a source of monies for the Adaptation Fund, through a 2% share of proceeds on CERs issued to CDM projects. Proceeds from the CER monetization have so far mobilized US$154 million, rising potentially to US$310-420 million by end of 2012 (depending on CER issuance, prevailing price and exchange rate).[13] The CDM is an important source (and channel) of dedicated international funding for climate action in developing countries. By contrast to other major international sources dedicated to mitigation,[14] the CDM primarily channels private resources (more than 80% of CERs are purchased by the private sector).

Monitoring financial flows to developing countries through the (primary) carbon market is a challenging task, given the diversity of players, the number of transactions, and their confidential character (prices, volumes and other provisions like risk-sharing are often not disclosed). Estimates published by Bloomberg New Energy Finance, Point Carbon, the World Bank, or Bloomberg New Energy Finance and Ecosystem Marketplace (for the voluntary market), provide a conservative indication of market activity, despite significant efforts to survey the most active players along the value chain (from project developers and host countries to intermediaries and final compliance buyers). In addition, however much information is available on transaction volumes or prices, it does not give any idea of actual payment flows (that are often contingent on credits delivery, as mentioned above). Buchner et al. (2011) examine some possible options to improve information on offset markets.

[11] Note that these data capture not only primary transactions (purchase of ERs to the project sponsors) but a number of secondary transactions as well (including wholesale and retail, to final customers). About one-third of credits are estimated to have been retired by final buyers or suppliers, providing an indication of primary transactions (lower bound).

[12] As transactions and their contractual terms are confidential, it is extremely difficult to estimate actual payments. One assumes here that a project registered in year Y has been contracted in the previous year (Y-1) and that all payments occur on delivery. Actual financial flows through the CDM primary market are thus estimated as the sum, for all projects with issuance, of volume of CERs issued times contract price.

[13] For 9 million CERs sold as of April 30, 2011. Donations (US$85 million) and investment income (US$0.9 million) are other sources of funding for the AF. Source: Adaptation Fund Board (2011).

[14] Such as, the Global Environment Facility (GEF) – the largest provider of grants to address climate change for over twenty years (US$4.3 billion for mitigation over 1991-2014), and the Clean Technology Fund (CTF) – providing highly concessional investment capital for low-carbon transformation (US$4.5 billion).

2.2 A broad range of economic, social and environmental co-benefits

Under the 2001 Marrakesh Accords, it is the responsibility of host countries to determine whether proposed CDM projects will assist in meeting their sustainable development objectives. Hence, there is no internationally-agreed metric to assess the sustainable development benefits of CDM projects and approaches vary from country to country. Some countries have for instance identified priority areas for CDM that support development goals; some have also established fees on CER transactions to fund other climate-friendly activities (the most prominent example being so far the China CDM fund).[15]

Also some buyers in the compliance market and even more so in the voluntary market have been reportedly looking for projects that support host countries' sustainable development objectives. One example is the Community Development Carbon Fund (CDCF), a public-private World Bank managed carbon fund that has been operating since 2003. The CDCF targets small-scale projects located in the poorest countries that provide direct or indirect community benefits.[16] A number of standards have been developed to certify the existence of social and environmental benefits: the Gold Standard (focusing on sustainable energy), or the Climate, Community and Biodiversity Standards (focusing on land-based climate change mitigation projects including primary or secondary forest conservation, reforestation, agroforestry plantations, REDD etc).[17]

Box 4 provides anecdotal evidence of the co-benefits of carbon finance projects. As there is no internationally agreed metric to assess sustainable development benefits, there is limited scope for a more quantitative analysis in the context of carbon finance. Several attempts have been made, such as Watson and Fankhauser (2009), to identify and enumerate those projects that bring development co-benefits, and identify which co-benefits are more frequent and which projects are more likely to deliver. They did so by searching project design documents for keywords associated with different co-benefits (such as transfer and diffusion of technologies, contribution to employment and economic growth, and the contribution to environmentally and socially sustainable development).

They found that 96 percent of (the sample of) projects claim to contribute to environmental and social sustainability but most of these claims relate to economic growth and employment. Just over 80 percent of projects claim some employment impact and 23 percent better livelihood. There are relatively lower employment benefits from industrial gas projects (HFCs, PFCs and N_2O – 18 percent) and fossil-fuel switching projects (43 percent) than other sectors, where at least 65 percent of projects state employment benefits (reaching 100 percent for afforestation and reforestation and 75 percent for livelihood).

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[15] See http://www.cdmfund.org/ . Other countries implementing similar instruments include Thailand and Vietnam, Egypt and Jordan.

[16] Such co-benefits are typically meant to arise from the project itself and include contributions to local employment and infrastructure, freeing up financial resources for households, and improving air quality and living conditions. In cases where there are limited benefits or no identifiable benefits integral to the project, a separate Community Benefit Plan (CPB) is prepared in consultation with the identified beneficiary communities. These indirect benefits are typically financed by an additional price premium attached to each credit sold. See: *The Community Development Carbon Fund: Making Carbon Finance Work for the Poor* at http://siteresources.worldbank.org/INTCARBONFINANCE/Resources/Carbon_Finance_4-pager+5-12-11print.pdf

[17] See http://www.cdmgoldstandard.org/ and http://www.climate-standards.org/

Box 4: Carbon finance provides opportunities to support basic development needs

- **Improve access to sustainable energy and energy services** as exemplified by projects that increase generation capacity from (local) renewable energy sources (e.g., wind power, hydro, rice husk), that promote energy efficiency and demand-side management measures – a cost-effective short-term response to power crunch, or that deliver more sustainable energy services, in the form of lighting, heating or cooking (e.g., solar water heater programs);
- **Reduce local air and water pollution** for a healthier environment for instance through projects providing solutions for solid waste management, a challenge for many developing countries with rapidly increasing urbanization rates, as well as for wastewater treatment, or distributing advanced cook stoves, with the potential to improve lives, livelihood and the global environment;[*]
- **Promote management and conservation of natural resources** (e.g., protection of water resources and improvement in their quality, erosion control and soil restoration, biodiversity conservation, sustainable land management), with such examples as projects that sequester or conserve carbon in forest and agro-ecosystems;
- **Reduce chronically high unemployment rates**, and provide opportunities for empowerment of communities through capacity building and strengthening of local institutions, and improved livelihoods;
- **Contribute to technology transfer** and thereby facilitating the intensification of low-carbon efforts, as more projects can make use of and deploy the skills and technological resources recently acquired. Although the CDM does not have an explicit technology transfer mandate, it does appear to contribute to the transfer (and diffusion) of technology to developing countries, enabling other projects to make use of local skills and technological resources. A report for the UNFCCC analyzed the technology transfer claims made by project sponsors in the project design documents, taking a broad definition as "the use by the CDM project of equipment and/or knowledge not previously available in the host country." The findings reveal that at least 30% of all active CDM projects[†] (accounting for 48 percent of estimated emission reductions) involve technology transfer. Technology transfer varies considerably across project types and is generally associated with larger projects. The analysis also shows that the leading technology providers (supplying 58 percent of projects) are Germany, US, Japan, Denmark and China.

Source: World Bank (2010) and for technology transfer, UNFCCC (2010)

[*]: It is estimated that smoke from cooking fuels account for nearly 2 million deaths annually (WHO and UNDP, 2009), which is more than the deaths from malaria or tuberculosis.

[†]: This could be as high as 44 percent of all projects, given that 24 percent of the project design documents do not specify whether technology transfer occurs and survey results suggest that 60 percent of these may in fact involve technology transfer.

Applying a more traditional and narrower definition of sustainable development (that focuses on long-lasting benefits instead of important but immediate and possibly impermanent benefits), 67 percent claim training or education benefits (increasing human capital), 24 percent reduce pollution or produce environmental co-benefits (increasing natural capital) and 50 percent have infrastructure or technology benefits (increasing manmade capital). Finally, their analysis indicates that contrary to common belief, small-scale projects do not appear to provide higher co-benefits than large-scale projects.

There is a growing acknowledgment of the co-benefits of carbon finance and increasingly efforts are deployed on how best to integrate mitigation measures and carbon finance co-benefits in broader sectoral planning or NAMAs.

2.3 Awareness, capacity and institution building

Considerable knowledge, experience and capacity have been accumulated in the carbon market on how to create real and measurable emission reductions. This is providing lessons and momentum for the design and piloting of market approaches by a number of developing countries. Countries are assessing and strengthening their readiness to use market instruments, developing new mechanisms and proposing reforms for the CDM. Accumulated knowledge and capacity includes:

- **Data for different activities** in a number of countries that can be used to assess GHG emissions and GHG mitigation potential;
- **A library of frameworks, guidelines and methodologies for accounting and monitoring** of emission reductions, such as definition of the baseline scenario, modalities for including significant sources/sinks, ways to account for leakage, approaches to demonstrate additionality or to deal with possible non-permanence of removals by sinks;
- **Experience in creating and strengthening domestic and international regulatory frameworks, institutions and infrastructures** to oversee the registration, issuance and transaction of carbon assets, such as Designated National Authorities in host countries, the CDM Executive Board and its panels at the international level, and the registries and market platforms in the voluntary market;
- **International and local expertise** to prepare and implement carbon finance projects and programs, including navigating the complex requirements of different carbon standards, accessing the carbon market and financial engineering.

3 Quantitative Estimates of Carbon Market Flows to Developing Countries by 2020

Estimating future carbon market flows to developing countries remains a delicate and heroic exercise. Many initiatives that look beyond 2012 are at the proposal stage and will likely be influenced by the outcome of the ongoing negotiations. Key features of these proposals are not fully specified, facing uncertainties on the amount of international carbon assets that could be used for compliance obligations, eligibility concerns and further qualitative restrictions (related to the country of origin or technology, for example). A number of scenarios are reviewed below with increasing collective ambition.

3.1 Four scenarios of increasing collective ambition

Four scenarios (detailed in Table 2) are considered (see Appendix for methodology):

- **Status quo**: enacted initiatives with targets set at the level they have been committed to now, essentially the EU Climate and Energy Package as well as some US regional initiatives;
- **Copenhagen low**: the full implementation of enacted and proposed initiatives aligned with unconditional pledges under the Copenhagen Accord;[18]
- **Copenhagen high**: the introduction of domestic cap-and-trade schemes in all major developed and key developing economies to deliver on pledges at the higher end of commitments under the Copenhagen Accord;
- **An illustrative 2°C scenario**, for reference purposes, with scaled-up collective action consistent with the objective of preventing global mean temperature to rise above 2°C (above its pre-industrial average), as agreed in Cancun. It is taken from the AGF report and assumes a 25% reduction of emissions against their 1990 levels across all developed economies and significant deviation from business as usual emissions in developing countries.

These scenarios consider EU[19] and other current OECD Annex B countries as the only source of demand for carbon assets from developing countries. They do not assume any links between current, upcoming and proposed initiatives in developed countries; linking is indirect in nature, through participation in a market for carbon assets from developing countries. The scenarios consider emerging initiatives in a number of countries, including Russia and Ukraine, South Korea, Brazil, China, India, Mexico, and South Africa, which may, at some point, generate possible demand for international carbon assets. By 2020 it is very likely that this demand would remain extremely limited, as these countries are host to a large reservoir of low-cost abatement options that could be tapped to meet domestic targets without purchasing carbon assets in the international market.[20]

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[18] The medium scenario is focusing on efforts by developed countries; there is no modeling of actions by developing countries in support of their (unconditional) international pledges.

[19] Includes here the 27 EU Member States (including Cyprus and Malta, which are not Annex B member, but participate in the EU ETS and have targets under the EU Climate and Energy Package), as well as Iceland, Liechtenstein and Norway, who are already joining the EU effort through the EU ETS, and Switzerland, who is in discussion with the EU for a possible future integration of the Swiss ETS.

[20] In addition, no demand for international assets is expected from Russia and Ukraine, as their pledges are above their baseline projection. See den Elzen, et al. (2010).

Table 2: Assumption on 2020 targets by scenarios

Country (Group of)	Status quo	Copenhagen low	Copenhagen high[a]	2°C scenario
EU ETS	21% below 2005	21% below 2005	30% below 1990	25% below 1990
EU non-ETS	10% below 2005	10% below 2005	30% below 1990	
US regional	RGGI[b] + California[c]	RGGI[b] + WCI[d]		
US national			17% below 2005	
Canada		WCI[d]	17% below 2005	
Australia & N. Zealand		15% below 2000	25% below 2000	
Japan		15% below 1990[e]	25% below 1990	
Russia			25% below 1990	
Ukraine			25% below 1990	
South Korea			30% below BAU	Significant deviation from baseline
China			40-45% reduction in carbon intensity	
India			20-25% reduction in carbon intensity	
South Africa			34% below BAU	
Mexico			30% below BAU	
Brazil			38% below BAU	

a: see footnote 18; b: 10% below 2009; c: 1990 levels; d: 15% below 2005; e: 15% as the average of Japan's Kyoto target (6%) and its internationally announced target by 2020 (25%).

Aggregation of mitigation targets for the scenarios shows a gradual increase in abatement by 2020 for developed countries, from 7% and 9% in the Status quo and Copenhagen low scenarios respectively to 18% and 25% in the Copenhagen high and 2°C scenarios respectively (below 1990 levels). Reductions in the Status quo scenario are mostly driven by the EU's 20% target. The addition of Western Climate Initiative, Australia, New Zealand[21] and Japan reduces emissions by another 2% compared to 1990 levels in the Copenhagen low scenario. The strong decrease in emissions in the Copenhagen high scenario is driven by US national targets and the EU move from a 20% to 30% target. Achieving a 25% cut in emissions across all developed countries in the 2°C scenario requires an intensification of efforts in Northern America and Oceania. In addition, actions taken by developing countries would result in a significant deviation from their BAU emission trajectories by 2020, -17% vs. BAU in the Copenhagen high scenario and even more in the 2°C scenario.

Even the most ambitious Copenhagen pledges will likely not be sufficient to prevent global mean temperature from rising above 2°C: they are likely to result in higher average global warming and larger and possibly irreversible impacts together with higher adaptation costs.[22] The analysis for this background paper shows that global emissions in 2020 would be around 53GtCO_2e in the Copenhagen low scenario (or 9% below BAU) and 49GtCO_2e in the Copenhagen high scenario (or 16% below BAU). The gap between the emission reductions in the pair of Copenhagen scenarios and the pathway consistent

[21] New Zealand already has an ETS in place. For modeling purposes however it is aggregated with Australia in one region.

[22] The *World Energy Outlook 2010* for instance estimates that a +2°C objective can only be achieved with the full implementation of the Copenhagen pledges in the period to 2020 and much stronger and costlier action thereafter, including a phenomenal push for technology deployment (IEA, 2010).

with 2°C — 41 to 48GtCO2e, as given in UNEP (2010) — is thus 5 to 12$GtCO_2e$ for the lower end of the Copenhagen pledges, and 1 to 8 $GtCO_2e$ for the higher end.

3.2 Estimated carbon market flows and auction revenues

Depending on the level of ambition of collective action, carbon market flows to developing countries by 2020 could range from US$1-2 billion to US$31-43 billion per year (see Table 3). The low scenario, quite similar to today's situation, sees only moderate demand for offsets (136 $MtCO_2e$ primarily from EU ETS), resulting in flows of only US$1-2 billion per year. In the medium scenario, demand more than doubles, to 352 $MtCO_2e$, as WCI broadens its reach and Australia, New Zealand and Japan are added; associated revenues are much larger, reaching US$5-9 billion. In the high scenario a significant jump in demand is expected (to 1.2 billion tCO_2e), mainly driven by the introduction of a US Federal ETS and the expansion of EU targets from 20% to 30%. Combined with higher prices, this leads to total flows of US$31-43billion. Demand in the higher scenario is four times larger than expected supply from CDM by that time, emphasizing the need to find solutions to scale-up emission reductions cost-effectively.

Table 3: Carbon market flows to developing countries by 2020

Scenario	Offset flows ($GtCO_2e$)	Offset price (US$ per tCO_2e)	Financial flows (billion US$)
Status quo	136	10-15	1-2
Copenhagen low	352	15-25	5-9
Copenhagen high	1,237	25-35	31-43
2°C scenario (from AGF)	~3,000	50	150

Source: World Bank analysis developed using McKinsey's "climate desk" tool (https://solutions.mckinsey.com/climatedesk/).

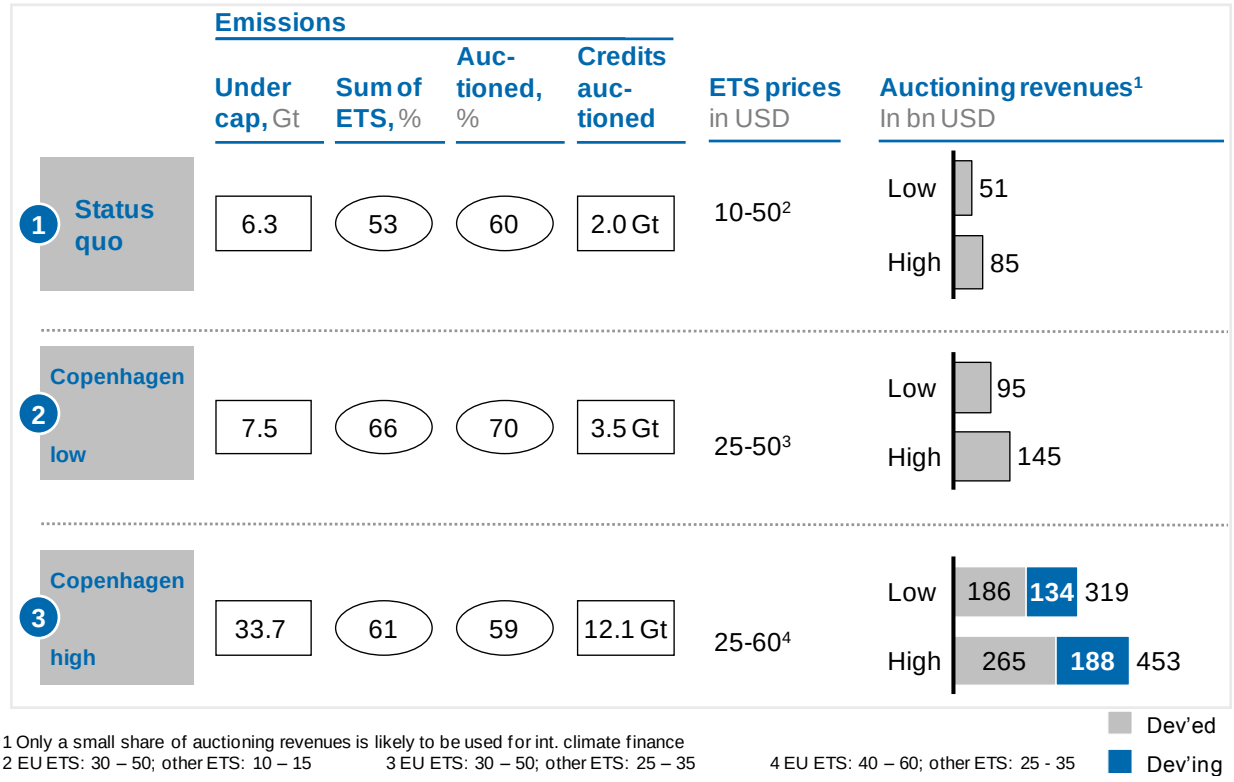
The 2°C scenario, which would require a much higher level of ambition, could stimulate offset flows in excess of $100 billion per year. This scenario has not been modeled explicitly. Rather we used numerical results from the AGF which reported financial flows of US$150 billion per year by 2020, on about 3,000 $GtCO_2e$ transacted at US$50 per tCO_2e (AGF, 2010). Other scenarios, with a different burden sharing, also indicate a sharp increase in market activity. For instance, international trading increases 6 times from a Copenhagen high scenario (high end of the Copenhagen pledges, fragmented carbon markets i.e., no direct linking) to a 2°C scenario (450 ppm with full cost-efficiency) – OECD (forthcoming).[23]

The auctioning (or sale) of allowances under each ETS can generate significant revenues, for both domestic and international use. For developed countries, estimates of auctioning revenues range from US$51-85 billion to US$186-265 billion, depending on the level of ambition (see Table 4). If only 10% of these revenues were devoted to international climate action, this could represent a source of public climate finance of US$5-9 to 19-27 billion to support developing countries (and higher than carbon market flows under the low and medium scenarios). Auction revenues in developed countries increase

[23] For the 450ppm scenario, the 2020 "allocations" are 17.5 $GtCO_2e$ for developed countries (12 percent below 1990), 31.3 $GtCO_2e$ for developing countries (12 percent below BAU) leading to global reduction in emissions of 6.3 $GtCO_2e$ (11%) from BAU. All numbers represent the Kyoto basket of greenhouse gases, including emissions from land use, land-use change and forestry. The emission pathway has no overshoot in temperature but allow a temporary overshoot in concentration. Preliminary results, communication from OECD (forthcoming).

significantly in the third scenario, given expanding coverage (with the establishment of a Federal US ETS) and higher prices (consistent with more ambitious targets). Revenues in developing countries are also substantial, possibly between US$134 and 188 billion, or as much as 50% of those for developed countries. It is assumed that the share of credits auctioned in developing countries is lower than in developed countries, accounting for the reduction in the share auctioned between the low and high scenarios.

Table 4: Estimates of auction revenues in developed and developing countries



1 Only a small share of auctioning revenues is likely to be used for int. climate finance
2 EU ETS: 30 – 50; other ETS: 10 – 15 3 EU ETS: 30 – 50; other ETS: 25 – 35 4 EU ETS: 40 – 60; other ETS: 25 - 35

Source: World Bank analysis developed using McKinsey's "climate desk" tool (https://solutions.mckinsey.com/climatedesk/).

A sensitivity analysis, appended to this document, has been carried out to assess the impact on flows to developing countries of three rules surrounding the carbon market, namely supplementarity (i.e., the balance between domestic action and use of flexibility mechanisms, including offsets), the fate of surplus Kyoto permits beyond 2012, and the inclusion of land-based carbon opportunities in the carbon market (notably REDD+). Other factors, not discussed here, include the macroeconomic outlook as well as structural and technical change, and land-use accounting rules for developed countries. Importantly, emissions and removals resulting from land use, land use change and forestry activities (LULCUF) in developed countries could represent according to some estimates in-between 1 to 9% of these countries 1990 emissions (excluding LULUCF). Depending on accounting options, LULUCF could thus offset a significant part of the required effort by developed countries towards their commitments –with potential implications for the scale and activity of a global carbon market (see den Elzen et al., 2010).

4 Options to Scale up Carbon Market Flows to Developing Countries

This section discusses possible options to scale up carbon market flows to developing countries, on both the demand and supply sides, as well as options to streamline the rules that intermediate them. Predictability and ambition, ingenuity, market reforms and local capacity are all are needed to maximize the benefits of carbon markets to developing countries.

4.1 Ambitious mitigation targets with greater scope for market mechanisms for cost-effectiveness

The level of global ambition and the appetite for market mechanisms are two major determinants of carbon market flows to developing countries. Mitigation targets for 2020 pledged so far reach about two-thirds of what is needed to achieve the 2°C target (see Section 3.1). Greater use of market mechanisms, taking advantage of the diversity in abatement costs across sectors and regions, could encourage countries to scale up their mitigation efforts while lowering the cost of doing so. On the ground, there is evidence that market-based instruments – and notably the use of offsets from developing countries - contribute to cost-efficient mitigation. If the World Bank's experience can be considered representative of others in the CDM (&JI) market, many buyers are meeting a portion of their obligations at less than $15 per ton CO_2e reduced, a cost lower than many other options, such as purchasing EU Allowances, internal investment decisions or national policies and measures.[24]

Modeling results demonstrate the crucial role of offsets in keeping the cost of climate policies manageable for developed countries, as cheaper mitigation options in developing countries can be mobilized through the carbon market. Dellink, Briner, and Clapp (2010) for instance examine the broader implications for developed countries of different supplementarity limits. Their findings confirm that higher supplementary limits lower mitigation costs for developed countries by a factor of two when increasingly larger amounts of offsets are allowed (from 20% of the reduction effort to unrestricted use of offsets).

In addition to cost-effectiveness, giving more scope to market mechanisms can also provide opportunities to mobilize resources (through auctioning of allowances and international trading – see Section 3.2) and engage the private sector in climate action (see Section 2.1). Beyond 2012, the main constraint to the carbon market is perhaps a lack of demand beyond current initiatives, with no further encouragement to build up a substantial and credible supply of carbon assets. For both developed and developing countries, this could be a missed opportunity to use a powerful instrument for low-emission development.

Developed countries can meet a larger proportion of their mitigation commitment through abatement purchased abroad by

- implementing high(er) supplementarity limits in their domestic (or regionally integrated) ETSs. This is already the case in the NZ ETS (full supplementarity) while the supplementarity limit of

[24] For instance, the Climate Cent Foundation (Switzerland) estimates that the reduction of CO_2 emissions abroad is cheaper than in Switzerland by a factor of five (http://klimarappen.ch/en/foundation/portrait.html).

the EU ETS increases should its cap tighten as EU adopts a 30% target. There are however delicate trade-offs involved with slackening supplementarity, see Box 5.

- directly acquiring a greater portion of international carbon assets to meet their commitments (as is done currently under a number of public carbon procurement programs). Funds could be mobilized through carbon-linked instruments (auctioning of ETS allowances, carbon taxes). This would complement other (non-market related) public assistance for low-emissions development, under ODA or climate finance such as support through the German International Climate Initiative (funded through proceeds of auctions of EU Allowances).[25]

Box 5: How to increase supplementarity while maintaining incentives?

Increasing supplementarity lowers compliance costs but can possibly undermine the necessary transition to low-carbon infrastructure (as extensive use of offsets in the short term could lock in investment in high-emitting infrastructure) — see discussion in Hood (2010). At the same time, less domestic action and a lower carbon price also affect fiscal revenues from auctioning or sale of allowances.

One solution to contain compliance costs while maintaining incentives would be to allow offsets to be surrendered (above and beyond the supplementarity limit) and to cancel an equivalent amount of allowances. This could be implemented for instance through the establishment of a strategic reserve of allowances, which would enter the market only in exchange for offsets.

4.2 Harmonization and long-term policy clarity on future frameworks

Long-term policy clarity is urgently needed as chronic uncertainties on future frameworks are making buyers more conservative and are discouraging the development of new carbon finance opportunities. Beyond 2012, the outlook for the carbon market is complex and depends on the likely commitments of major emitters and the mechanisms adopted at the domestic and international levels to achieve these commitments. Without much visibility to date on the scope for market mechanisms and associated demand for carbon assets beyond 2012, market activity remains limited, ten times less than pre-2013 volumes.[26] These uncertainties are multiple and relate to the volume of international carbon assets that can be used to meet compliance obligations,[27] eligible mechanisms or standards,[28] project type,[29] and

[25] Since its launch in 2008, the International Climate Initiative is supporting 220 climate-friendly projects in developing countries and economies in transition with some €450 million. About €120 million per year are budgeted, from the proceeds of the auctioning of EUAs.

[26] Around 20-30 million of post-2012 CERs are transacted annually according to Point Carbon (2011). Also, lasting and compounding uncertainties result in lower price and more risk being borne by buyers (e.g., through contingent provisions on asset eligibility).

[27] Thus far the EU Climate and Energy Package represents the only substantial (and reasonably predictable) source of demand for offsets from non-Annex I countries beyond 2012. Other potential sources remain speculative at this stage as plans for emissions trading (in particular level of ambition and rules governing use of international emission credits and allowances) are being finalized (e.g., California or Australia), reviewed (e.g., New Zealand) or postponed (e.g., Japan, South Korea).

[28] Not all future demand is to be met systematically through CDM as there is political support in all major developed countries for the Cancun decision to establish new market mechanisms under the UNFCCC to "enhance the cost effectiveness of, and to promote, mitigation actions". For instance, Japan is preparing a bilateral offsetting mechanism with 15 pilot projects in nine countries that could co-exist along current Kyoto Mechanisms; EU is supporting sectoral approaches that could represent an increasing share of its demand for emission reductions; California may be open to international offsets from sectors and regions,

country of origin.[30] Under such conditions, it is also extremely difficult to estimate the future price of carbon assets and the amount of additional carbon revenues that could flow to projects.

A potential market disruption resulting from continued lack of visibility post 2012 could take a heavy toll on market capacity and confidence. To mitigate such risk governments could work to sustain momentum in the market while new policy initiatives are being developed. They could, for example, dedicate a fraction of their international climate finance pledges to test and showcase new approaches, such as concepts for country or sector programs, new methodologies, CDM reforms and new mechanisms. This would be a cost-efficient use of climate finance that would target least cost-options and be performance-based. It would also help build up a supply pipeline for a future scaled-up market, preventing supply shortages and price pressures.

As more initiatives emerge there is a real risk of market fragmentation. Harmonizing rules would help to ensure a minimum compatibility of carbon assets across regimes. This would keep transaction costs and capacity needs manageable, open up access to the carbon market and avoid delays in the maturity of supply. A more inclusive carbon market would maintain liquidity and efficiency. While immediate direct linking of markets may be difficult or not fully beneficial to all parties,[31] the gains from indirect linking through well-functioning crediting mechanisms appear to be very large, reflecting the vast low-cost abatement potential in a number of emerging and developing countries (Dellink, Jamet, Chateau, and Duval, 2010). Importantly, the mitigation cost savings from direct linking of ETSs in developed countries are much smaller than those from indirect linking through a well-functioning crediting mechanism. This finding essentially reflects the much greater heterogeneity in marginal abatement costs between developed and developing countries than among developed countries themselves, as well as the much greater low-cost abatement potential available in developing countries.

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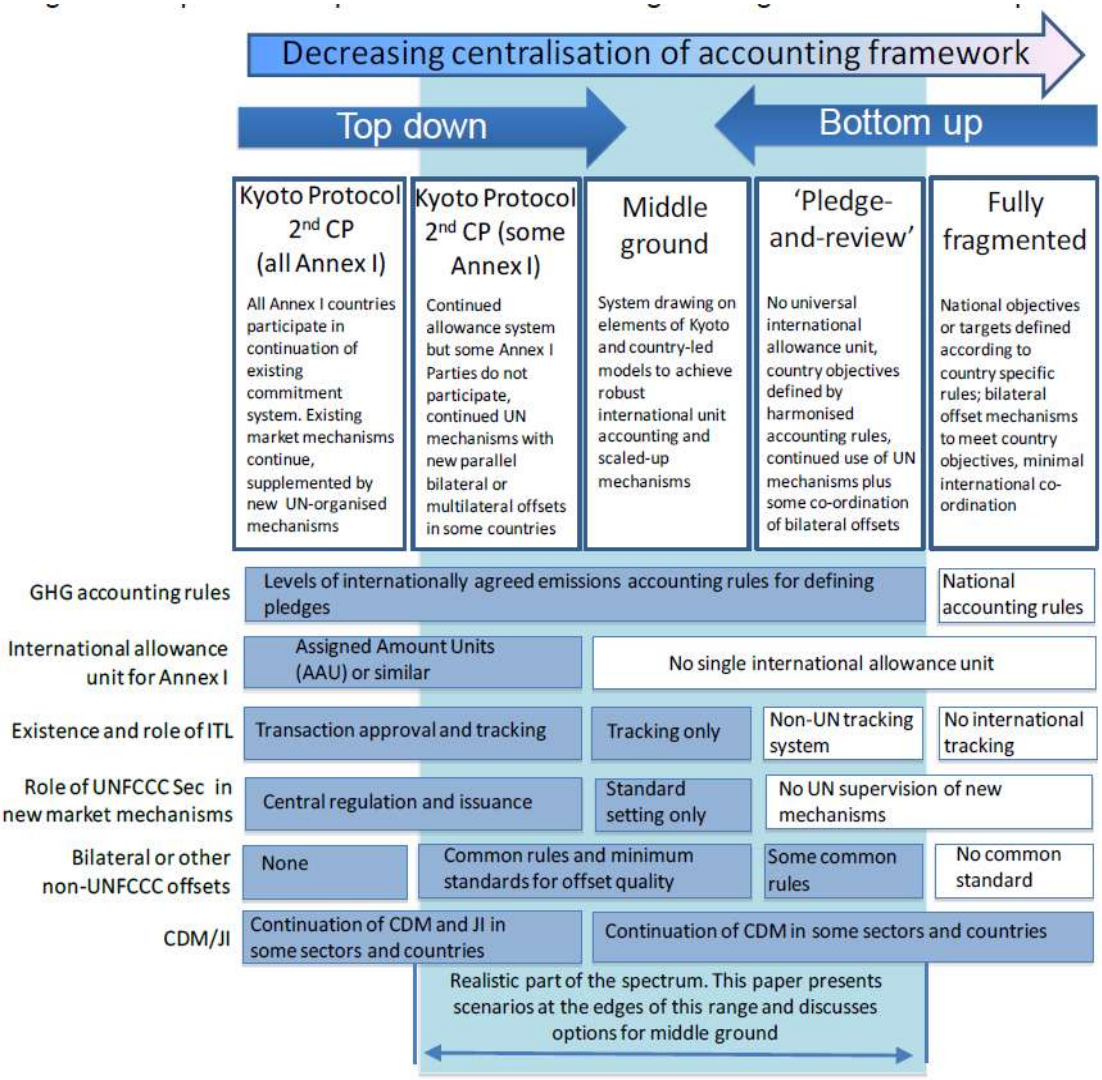
including from REDD+ activities, which so far are outside the scope of the CDM. In turn, while there also appears to be keen interest by several developing countries to participate in such new mechanisms, it will take some time to elaborate and agree upon a common set of rules and modalities (such as baseline setting and MRV requirements) and the relation between new and existing mechanisms (in particular in term of accounting).

[29] For instance it is yet unclear whether the ban from Phase III onward on credits from project activities targeting the destruction of HFC-23 and N_2O from adipic acid production will be extended from the EU ETS to non-ETS sectors.

[30] So far, to be eligible in the EU ETS, CERs generated post 2012 must come from a project registered before end of 2012 or if registered after 2013, from a project based in an LDC or a project based in a country that has entered into a bilateral agreement with the EU. No such bilateral agreement has been signed to date leaving likelihood, content and process for such agreements an open question.

[31] Provisions for linking exist for a number of (operational and proposed) cap and trade schemes but their diversity in design creates significant challenges. Among the most relevant design features are the ambition of target, treatment of sectors exposed to international competition, existence of cost containment options and their interaction with environmental effectiveness (such as price caps which spread through linking, or price floors which are undermined through linking), various preferences on volume, asset class and standard of eligible offsets. Also, it is important to carefully assess the distribution of the gains from linking across countries, as certain sectors (e.g., carbon intensive companies) may be particularly affected in the selling country. For a broader discussion, see OECD (2009).

Figure 4: Options for international GHG accounting and the building blocks that underpin them



Source: Prag, Aasrud, and Hood (2011).

Clarity and harmonization are also required on rules and infrastructure for monitoring transactions of GHG units and accounting towards pledges, given that the emergence of multiple carbon regimes may lead to a system less centralized than the one currently in operation under the Kyoto Protocol.[32] Two main factors are likely to render the post-2012 framework more complex.

[32] Where the integrity of the carbon market and the compliance with mitigation pledges is guaranteed by common and consistent rules (one ton is one ton in the inventory, in the allowance market, in the offset market) and by the International Transaction Log, or ITL (the backbone of international emissions trading that connects the national registries and the CDM registry and is in charge of verifying the validity of transactions (issuance, transfer and acquisition between registries, cancellation, expiration and replacement, retirement and carry-over). Units in regimes tributary to the Kyoto Protocol (e.g., EUAs in the EU ETS, NZUs in the NZ ETS) are aligned on AAUs for issuance, transaction, etc…

- The introduction of (voluntary) emission reduction pledges by some developing countries, some of which are conditional on international support – including market mechanisms, with risk of double counting of emission reductions achieved through the CDM or other crediting mechanisms towards developing countries' own pledges or the mitigation targets of developed countries (as buyers of carbon assets).[33] Erickson, Lazarus, and Larsen (2011) examined the implication of double-counting of international offsets and found that it could effectively dilute the ambition of pledges by up to 1.6 billion tCO_2e in 2020 (or more than 10 percent of the global emissions gap to a an emission pathway consistent with 2°C).

- With multiple standards defined, keeping consistency across units (e.g., comparability of emission reductions with different baseline settings under different standards) and tracking their movements (with registries administered by different entities) will likely be more challenging. Buyers purchasing different types of carbon assets[34] and sellers possibly supplying carbon assets under different standards[35] will add another layer of complexity.

Prag, Aasrud, and Hood, (2011) assessed a range of options for international GHG accounting, from a top-down, centralized model based on the Kyoto Protocol, to a fragmented, bottom-up approach with minimal international coordination (see Figure 4). They considered in greater detail a middle ground option, combining elements of Kyoto and country-led models to achieve robust international unit accounting and scaled-up mechanisms. In particular, the analysis explores how country-led flexible market mechanisms might include some level of international involvement to build trust in the environmental quality of mechanisms and to encourage harmonization of standards to facilitate investment.

4.3 Options to improve the scale, efficiency, scope and reach of the carbon market

While the absence of firm and sustained demand post 2012 poses a major risk to the continuity of the offset market, specific constraints in the current set-up need also to be addressed, such as high transaction costs, limited scale, and limited scope. The CDM remains a work in progress building on the principle of "learning by doing" with resulting imperfections and bottlenecks that are constantly being identified and then addressed with varying degrees of success. Following the Conference of Parties/Meeting of Parties (COP/MOP) last December in Cancun, however, reforms have shifted into a higher gear in particular through introducing standardized baselines in the CDM and streamlining additionality testing for certain categories of projects. These reforms have potentially far reaching consequences for inclusion of projects located in the poorest countries. At the same time a streamlined, cost-effective, and efficient CDM could become a viable testing ground for new concepts and serve as a bridge towards new market mechanisms.

[33] Re: crediting, the definition of a baseline scenario consistent with quantified emission-reduction goals (sometimes as emissions-intensity) or pledged actions is adding here another challenge for comparability of units.

[34] e.g., EU ETS mandated installations buying CERs, companies with obligations under the California cap and trade buying CRTs, Government of Japan buying possible emission reductions generated under a bilateral offset scheme.

[35] This is another opportunity to learn from current practices in the voluntary market, where several projects are being issued CERs, VCUs or other VERs, requiring particular scrutiny and reconciliation procedures to avoid double-counting.

Reform project-based mechanisms to increase confidence and reduce transactions costs

Among Cancun's outcomes are a number of important improvements and reforms to the CDM, such as the decision to move forward the starting date of the crediting period (to streamline procedures and reduce delays) and a higher degree of standardization for baseline setting, additionality testing and Programmes of Activities (PoAs).

Over the past few years, the processing time for projects has risen due to capacity bottlenecks (for consultants and auditors employed for validating projects and verifying emission reductions) and the complexity and volatility of CDM regulatory requirements. Such delays and uncertainties led to higher transaction costs, risks, losses in CER volumes and lower market values that further eroded the interest of project sponsors for carbon finance mechanisms over the long term.

Timelines for registration have recently improved, notably through the Cancun decision on start of the crediting period,[36] which has the potential to add three to six months worth of CERs (or the average time from request of registration to effective registration) to a project's expected delivery. At the same time, lead time to issuance continues to be a significant concern.[37] This puts particularly at risk those projects that do not have any sources of revenue other than carbon finance (e.g., programs for the diffusion of CFLs, installation of biodigesters or improved cookstoves, etc) or where carbon revenues can improve project viability and bridge the gap between implementation of the underlying investment and the accrual of other revenues (e.g., from timber in the case of afforestation or reforestation projects).

With the recently approved "Guidelines for the establishment of sector specific standardized baselines", it is now possible to use standardized baselines – but not mandatory. The guidelines allow DNAs to secure approval for CDM carbon crediting frameworks for entire sectors in countries or even regions, and therefore in perspective to move beyond project-by-project crediting. Under the guidelines for standardized baselines both the baseline and the additionality requirements are defined ex ante to project implementation and the guidelines allow a range of different types of projects to be implemented. For example, in the cement industry the cleanest 45% facilities could be used to establish the baseline emission intensity and then a more stringent benchmark would be used to demonstrate additionality e.g., the emission intensity of the top 20% cleanest facilities. Once the standardized baseline is approved a crediting framework is created that would allow to use these ex ante agreed thresholds to define creditable emission reductions from fuel switch or energy efficiency measures in existing facilities or building new low emission facilities under the CDM. It is important to note that this example could result in a substantial under crediting of achieved emissions reductions which is similar to a potential design feature of new carbon crediting mechanisms (partial crediting).

Standardized carbon crediting frameworks have the potential to substantially streamline CDM procedures for highly replicable projects including wind and hydro power generation (together 50% of the overall CDM pipeline). This alone could greatly improve the access of the CDM for the poorest countries and regions including LDCs. Standardized baselines could also facilitate the integration of the CDM into

[36] The CDM Executive Board was requested to revise the procedures for registration to allow the effective registration date/start of crediting period "to be the date on which a complete request of registration has been submitted by the designated operational entity where the project activity has been registered automatically."

[37] Median time from the end of the monitoring period to the date of issuance averages currently almost one year. Source: UNEP Risoe (2011).

national development, energy, climate policy strategies and corresponding policy measures and to better blend CDM revenues with other sources of funding due to the broader sectorial perspective and the key role of the national governments/authorities in establishing these frameworks.

Furthermore as standardized baselines move beyond a pure project-by-project approach to the definition of baseline and additionality, they open the perspective to extend the CDM to the crediting of policies and with that to include sectors not yet really reached by the CDM such as transportation and demand side energy efficiency on a larger scale. Finally crediting frameworks that define the scope and overall volume of eligible carbon credits in advance of project implementation could facilitate the testing of new approaches for crediting activities in the land use, land-use change and forestry (LULUCF) sector. These new approaches could go beyond the current CDM eligiblity requirements for afforestation/reforestation projects or introduce new concepts such as partial crediting as discussed for nationally appropriate mitigation actions (NAMAs). In this way the CDM could make possible early action on new approaches in a limited but sufficient extent to enable ensure that practical experiences inform further decision making on new instruments.

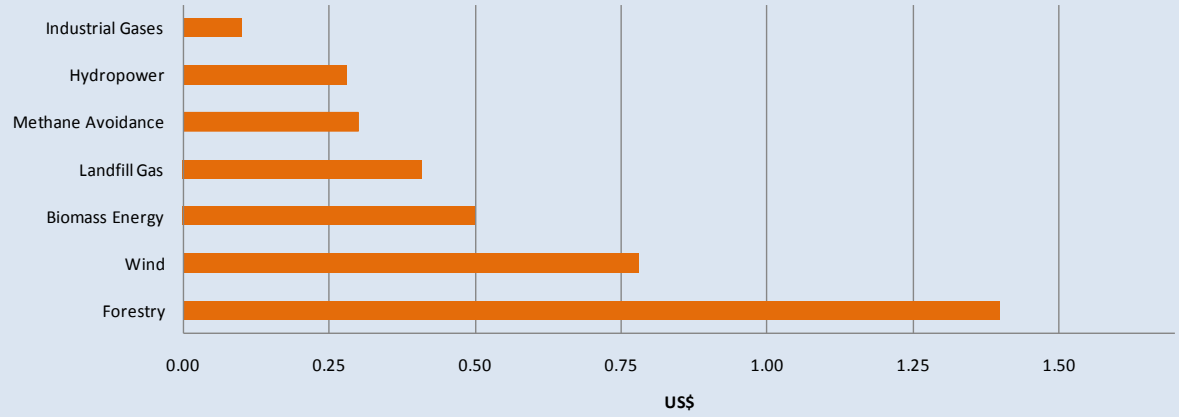
Standardization efforts could be pursued towards a fast-track registration of projects implemented under a standardized baseline framework as well as for monitoring and verification of emission reductions. The EB63 approved "Procedure for submission and consideration of standardized baselines" defines the approval process for standardized baselines. It does not regulate the project cycle for those activities that are implemented under a standardized baseline framework. Without such a procedure – basically a fast-track registration process for projects using standardized baselines – the project cycle for these projects is likely to become excessively complex. A complex project cycle could undermine the benefits of the whole approach and perversely establish disincentives for DNAs to start testing standardized baseline frameworks, especially if the standardized baseline frameworks may result in under crediting relative to the alternative of using the traditional CDM. A fast track-registration process for activities using standardized baselines should allow registration on the basis of eligibility criteria (check list approach) without prior validation on the level of individual activities. Once the activities are implemented, auditors would double-check their compliance with the eligibility criteria in the verification stage.

So far CDM standardization is limited to baseline setting and additionality testing. The Cancun decisions on the CDM did not include monitoring and verification (MV). However MV will be indispensable in each standardized carbon crediting framework and the existing procedures for individual projects or programs will not always be sufficient to meet the needs. Implementing activities based on sector or technological specific baselines requires the option to use MV procedures on a more aggregated level including accepting verifications, for example, based on changes in market penetration rates for low carbon technologies/products. DNAs should therefore have the possibility to suggest more specific MV procedures when seeking approval of standardized carbon crediting frameworks. Finally a fast-track registration process as outlined above would require the adaptation of corresponding verification procedures as well.

Box 6: Transaction costs associated with project-based mechanisms can be relatively high for particular technologies and smaller projects

Costs associated with the preparation of carbon finance projects amount on average to US$200,000 per project (excluding methodology development, adding on average US$125,000 per methodology – with higher costs typically experienced for afforestation and reforestation, and recurring verification costs). Depending on the volume of ERs projects are expected to generate, these costs can represent a non-negligible share of anticipated carbon revenues (See Figure 5 for ratio of costs to expected ERs showing for instance that CDM forestry projects, which typically fetch prices around $5per tCO_2e, face particularly significant transaction costs). Guigon and Bellassen (2009) analyzed in great detail the transaction costs associated with prominent standards in the voluntary market and reported similar findings, notably greater burden for small-scale projects, possibly up to €2-3 per tCO_2e.

Figure 5: World Bank project development costs by technology (US$ per expected ton of CO_2e reduced)



Souce : World Bank (2011b)

Pilot programmatic approaches to scale up impact

Given the inherent constraints of the project-by-project approach, often scattered, decentralized, time-consuming and costly (see Box 6), the CDM (and the voluntary carbon standards) have had limited direct influence on investment trajectories and emission trends of sectors and regions within countries. In addition, should demand for emission reductions rise significantly in the next decade (e.g., under the Copenhagen high scenario), it will be extremely difficult to deliver supply at scale effectively and efficiently. All projects currently registered under the CDM are expected to deliver less than 500 million CERs per year (nominal PDD value, not adjusted for project performance), and this includes a significant share of emission reductions from industrial gas projects, which may no longer be eligible in some countries or schemes (see Figure 2). Looking forward, about 2.5 billion CERs are expected to be generated over 2013-20 (taking into account possible inflow of new projects, adjusting for performance), or slightly more than 300 million CERs every year (World Bank, 2011a).

While new mechanisms are under negotiation, programmatic approaches, such as the CDM Programme of Activities (PoA), are already helping to scale up mitigation efforts and can generate important experience for low-emission planning, including through NAMAs. The concept of Programmes of Activities (PoAs) was developed in response to calls to simplify project preparation and registration procedures and expand the scale of CDM project activities. In early discussions, programmatic CDM was perceived primarily as a tool for promoting CDM in less-developed regions, in particular for widely dispersed micro-scale activities and for demand-side energy efficiency or renewable energy activities (such as distribution of efficient cook stoves, efficient light bulbs, biogas plants, and solar water heaters). The results: 23% of the PoAs to date are in Africa (against a 2.6% share in number for regular CDM activities) and one-third target demand-side energy efficiency (only 3.6% for regular CDM activities). The transport sector would receive a significant boost from the programmatic approach however complex methodologies, multiple institutions, and modest emission reduction volumes continue to limit the development of PoAs in this sector. Forestry is another sector that lends itself well to this approach. However, issues similar to those in the transport sector continue to hinder the development of PoAs.

Further simplifications of the PoA rules have been discussed, aiming at ensuring environmental integrity without requiring excessive cost and effort. Programs, even within the same sector and using the same technology, are very different as they need to be modified to suit country-specific circumstances, the capacity and mandate of the coordinating entity, and the appropriate incentive mechanism. Practitioners need to move from a narrow approach that measures each ton of GHG emission reductions to a holistic approach that estimates, with appropriate justification and confidence, the total GHG impact of a PoA. This will encourage the involvement of more stakeholders and support the scaling-up of sector, sub-sector, and system-wide emission reduction efforts.

Include sectors bypassed under existing market regimes

Forestry projects are penalized with “temporary” credits that are not recognized in some markets (e.g., the EU ETS), thereby depressing demand and price for these credits. Agriculture and avoided deforestation, both with significant GHG reduction potential and high relevance to poor communities throughout LDCs, are currently not eligible project types under the CDM. Given progress made in international negotiations on REDD and greater attention paid to the triple win of sustainable land management (development, climate resilience and mitigation), the future may look brighter for these types of projects, to the potential benefit of LDCs.

Another effort to scale up the impact of carbon finance within its current settings relate to multi-methodology programmatic approaches, such the city-wide approach to carbon finance (see Figure 6) – for which the CDM Executive Board has just issued rules. Cities are central to the fight against climate change, being both major contributors and highly-vulnerable human and economic centers. Home today to more than half of the global population (and that trend is on the rise), they consume as much as three-quarters of energy production worldwide with a similar global carbon footprint. Though they have significant mitigation potential, the participation of urban authorities and urban mitigation projects in the global carbon market remains extremely limited (see Clapp et al., 2011), for a review of success and challenges with urban carbon finance projects). City-wide approaches to carbon finance can be designed to help cities incorporate GHG mitigation concerns into their urban planning processes. For cities with limited budgets, carbon finance can help justify the effort of coordinating with various stakeholders (including their own departments) and help deal with the higher cost involved in choosing a lower-emission technology. City-wide approaches can also be designed to help establish voluntary GHG mitigation programs involving multiple cities. Clear and standardized GHG emissions baselines that can be used at urban scale and internationally harmonized urban inventory accounting are a prerequisite. Similar applications of multi-methodology approaches would be highly relevant in a rural context, enabling an integrated landscape approach to mitigation with likely significant adaptation benefits.

Figure 6: Integrated Carbon Finance Approach for a City

Source: World Bank (2010b)

Facilitate the participation of the poorest countries in the carbon market

The project-based market is concentrated in a handful of host countries, leaving the poorest countries behind. China accounts for more than two-thirds of contracted CER supplies while Africa's share, though growing, remains at a few percents (World Bank, 2010). Two countries (China and India) host two-thirds of the registered CDM projects while LDCs account for 0.9% only. LDCs also face among the highest rejection rates (either by DOEs or by the EB) and processing times (marginally higher in the lead to registration and significantly higher -- 50% -- in the lead to first issuance – perhaps also reflecting delays in project implementation). Finally, only four projects based in LDCs have been issued CERs, which represent 0.0075% of all the CERs issued to date.

Yet there are large mitigation opportunities in the poorest countries and carbon finance could truly contribute to the broader development agenda. Energy poverty is one such challenge, with direct implications for livelihood, economic growth and sustainability. Access to modern energy in Africa is unacceptably low. Today only 24% of Africa's population (or 560 million people) have access to modern

energy. In African LDCs such as Rwanda and the Democratic Republic of Congo, 93 and 94, respectively, out of every 100 people have no access. Carbon finance has a huge potential to contribute to development in Africa. An estimated technical potential of more than 3,200 CDM projects (including 361 PoAs) exists for clean energy in Sub-Saharan Africa. If realized, this could provide more than 170 GW of additional power generation capacity, which is more than twice the region's current installed capacity (de Gouvello, Dayo, & Thioye, 2008).

Clear and concise rules to encourage access to carbon markets through environmentally and socially responsible development of hydro resources and regional interconnections in Africa can increase the potential economic dividend from regional integration to make all participating countries better off. Rules to include credit for carbon sequestration in soils can improve productivity in the agricultural sector and can encourage income generation for poor farmers as well as more sustainable land-use management, leading to better resilience of local communities to climate change. Finally, progress in the treatment of suppressed energy demand can help carbon finance contribute to providing clean energy services to low-income countries and communities.

There are a number of avenues being explored to offer a fast-track CDM for low-income countries, such as:

- Standardization of baselines for key technologies/project types particularly relevant for low-income countries and regions, such as efficient cook stoves, efficient lighting, solar water heating, rural electrification, domestic bio-digesters, etc. This includes usage of deemed savings factors, benchmarks and default values as well as simplified additionality criteria such as market penetration rates. Further steps in this regard also include standardized monitoring requirements, e.g., through monitoring of changes of market penetration rates for clean technologies.
- Simplified PoA procedures for PoAs targeting micro-scale activities: For PoAs with dispersed micro-scale activities (e.g., CFL lighting projects, energy efficient cook stoves, etc.) automatic inclusion of individual CDM Programme Activity (CPA) units could be allowed on the basis of compliance with applicability criteria. This way, DOEs would only validate the inclusion at the verification stage since the Coordinating and Managing Entities would be responsible for including the CPAs based on clear and transparent eligibility criteria.
- Building on the simplified inclusion of CPAs within a PoA, a simplified registration process for projects using standardized baselines in low-income countries and regions could be established. The streamlined approach could combine validation and verification at any time after the project has been implemented. Registration would occur as the result of complying with a list of identified compliance requirements.
- The fast track CDM could broaden its scope for projects in low-income countries and regions, and allow for a broader spectrum of land use, land-use change and forestry (LULUCF) projects, while increasing the threshold of simplified small-scale methodologies for projects generating up to 60,000 tCO_2e per year from 16,000 tCO_2e per year currently.
- New approaches to ensure environmental integrity and conservativeness could be considered, such as clear requirements on eligible technologies, on the design of PoAs and on procedures for the assessment of material vs. non-material influences on emission reductions. Some of these elements of 'good practice' have already been introduced in recently approved CDM

methodologies, e.g., in a simplified methodology for small-scale CDM project activities for solar water heating.

4.4 Innovation to turn carbon into finance

Securing sources of funding sufficient to meet investment capital needs has proven a major constraint in advancing most carbon finance projects, especially in LDCs where the availability of commercial loans is limited. Long-term finance from local financial institutions is inadequate and often costly. Even for qualified entrepreneurs, the high cost and stringent commercial conditions of loans frequently do not match project needs and often become unsustainable. Scarcity of equity funding is another constraint. Access to international funding is an even greater challenge, particularly for the poorest countries where risky business environments and economic instability discourage private sector investment.

While carbon finance can provide a recurrent source of revenue during the life of a project, it does not address the need for upfront financing of the underlying investment as most often payment for credits occurs on delivery (i.e., once the project is operational). Although some advance payments have been seen in the market (up to 10-20 % of the value of carbon transaction), albeit under stringent and costly guarantee arrangements, there have been few attempts by financial institutions to monetize forward carbon revenue streams to provide (in part or in full) the investment capital required, given the risks to underlying projects, often low familiarity with carbon finance and post-2012 uncertainty.

Several institutions, among which MDBs,[38] are exploring a range of solutions to leverage carbon finance and unlock low-emission investment, such as frontloading mechanisms that turn anticipated carbon revenues into upfront finance, risk mitigation tools that enhance the confidence of financiers in the value and predictability of future carbon credits, revolving funds where accruing revenues can support a next tranche of investments, and structured finance with innovative use and combination of instruments, each addressing specific barriers and needs.

Box 7 presents an example of risk-mitigation products specific to carbon finance. There are other on-going initiatives to address the upfront finance challenge, notably around carbon-linked bonds. Other concepts, such as a guaranteed carbon sales contract, a carbon mezzanine debt facility or a carbon price support facility, are presented in appendix to this document; they remain to be tested and current post 2012 uncertainty is a major barrier to more innovation in this field.

Box 7: The International Finance Corporation Carbon Delivery Guarantee

By offering a carbon delivery guarantee (CDG) product, the International Finance Corporation (IFC) helps maximize the value of future carbon credits and enhance the impact of carbon finance on low-carbon investment. IFC's CDG is a structured financial product developed specifically for the carbon market. It assures the delivery of carbon credits from projects in developing countries to buyers based in industrialized countries. Acting as a value-adding intermediary, the IFC sells carbon credits with

[38] MDBs are actively supporting the development of the carbon market, including through 21 carbon funds and facilities with $4.2 billion in capital, some of which are targeting segments not yet tapped by carbon finance, bringing continuity by purchasing credits beyond 2012, and providing upfront financing and risk-management products.

guaranteed delivery into the secondary markets, enabling these credits to fetch a price higher than through a direct transaction between buyer and seller, as the CDG eliminates delivery risk to the buyer. The seller benefits from the IFC's credit rating and profits from this higher price (minus a transaction fee). IFC has completed three Carbon Delivery Guarantee transactions (2.2 million CERs) with structured carbon finance exposure for IFC's account: Himadri Chemicals (India, waste-heat-to-power project), Rain CII Carbon (India, the largest merchant of calcined coke in the world), and Omnia Fertilizer (South Africa, one of the country's leading fertilizer producers).

IFC also offers innovative debt financing to projects and Programmes of Activities (PoAs) that rely on carbon revenue from sale of post-2012 carbon credits to bankable buyers. By monetizing firm carbon off-take agreements, IFC helps projects reach financial closure despite few or no fixed assets and substantial dependence on future generation of emission reduction credits. IFC is furthermore exploring "green bonds" linked to underlying project performance. Green bonds could be linked to various asset classes, including projects reducing emissions from deforestation and degradation in developing countries, and could mobilize debt from new investor classes such as pension funds.

4.5 Capacity building and knowledge sharing to support readiness

The multiplicity of emerging frameworks, the transition to new market mechanisms (yet to be defined) and the still relatively recent Programme of Activities approach are increasing the capacity and knowledge gaps, thus leading to a risk of carbon finance bypassing opportunities in sectors and countries. Capacity building and knowledge-sharing initiatives towards public, private and financial institutions must be sustained, drawing on knowledge, experience and capacity accumulated so far, to increase participation in the carbon market and build an enabling environment to leverage carbon finance for low-emission development. Preparation and effective use of market mechanisms can be broken into building blocks for market readiness, such as discussed in Aasrud, Baron, and Katousakis (2010) and experimednted with the Partnership for Market Readiness (see Table 1). Some priority directions include:

- Support greater engagement of delegates in climate negotiations to ensure market mechanisms better reflect the practical realities and offer meaningful opportunities for development;
- Assist governments, regional authorities and municipalities in integrating carbon finance opportunities with long-term development planning more systematically (for instance, through low-carbon growth studies or low emission development strategies), and climate action with budgetary and fiscal planning;
- Build lasting institutional capacity (not only of governments, that may change over time, but also of national development banks or business associations) to promote successful design, implementation and monitoring of low-carbon investment plans (including of NAMAs);
- Support the development of standardized baselines, test benchmark approaches, pilot new market mechanisms (including in the context of NAMAs);
- Prepare the capacity and systems for MRV, including understanding of which standards are widely recognized and their implications in a domestic context;
- Engage domestic financial institutions to raise awareness and build capacity around carbon finance (and more broadly low-carbon opportunities) at local banks, including for innovative use and combination of financial solutions, such as special interest rates offset by carbon revenues, guarantees, frontloading mechanisms, other sources of climate finance — see Box 8;

- Prepare the institutional capacity of market agents for operational and transparent carbon markets, including for instance working with exchanges, third party auditors, etc…
- Provide advisory services to companies from developing countries, which are increasingly interested in the voluntary carbon space as buyers, for learning or marketing purposes, or as sellers, in the absence of a strong compliance demand, on scope and drivers of this market and gains from participation, on best practices for GHG accounting, on benefits and implications of various offset standards (costs of certification, market appetite, reputation …), on access to market and promotion of carbon neutral product and services (notably for agricultural commodities);
- Continue to advance knowledge, distill early lessons and share experience as the second stage of the carbon market is also one of learning by doing.

Box 8: Advisory Work and Capacity Building with Domestic Banks

Financial institutions in emerging markets often lack the technical knowledge and organizational capacity required to participate in carbon markets as lenders and as potential aggregators of carbon reductions. Project companies may as a result be unable to attract financing for undertaking investments in projects that could generate a separate cash flow stream from sales of carbon credits. IFC's Carbon Finance Advisory Services (AS) product for financial institutions (FIs) aims to help IFC partner banks enhance their understanding of carbon markets, build their capacity to integrate carbon revenues into credit appraisal, and strengthen their underwriting capacity. IFC also provides transactional support that aims to build capacity for carbon credit aggregation from the client base of FIs. The CF AS product for FIs can be combined with credit lines, loan guarantees, and risk-sharing products when offered to local FIs. The product's first client was the Industrial Bank of China. The IFC is also actively offering training to financial institutions interest in expanding their activity in the realm of carbon finance, including, more recently in Armenia and Georgia.

Through its planetBanking initiative, the IDB is also helping its client commercial banks in Latin America to implement green lines dedicated to low-carbon and environmentally sustainable investment. Through these facilities, banks are able to capitalize on opportunities to extend adequately structured financing to projects with carbon benefits and provide additional services to support carbon project identification and development. Furthermore, once the needs of underserved niches with carbon reduction potential have been explored, banks are supported in the development of innovative products and services which to address these gaps in the market. In 2008, the IDB financed a pilot project with Bancolombia, Colombia's largest commercial bank. This exercise allowed Bancolombia to compile a shortlist of potential carbon projects requiring over US$100 million in financing and with the capacity to generate 2.8 million tons of CO_2e reductions per annum, in addition to identifying a large client group with a high potential for generating further projects. On the strength of this portfolio, Bancolombia entered into a joint venture with a carbon project developer in an arrangement which provides a commission to Bancolombia investment officers who identify the carbon reduction potential of projects which generate carbon revenue. The IDB is now working with client banks in Panama and Argentina, and is progressively extending technical support and targeted training to all client banks implementing green credit lines and financing facilities.

The CF-Assist Program is the capacity building program on carbon finance for the World Bank Group. Since 2004 it is has benefited from support by Australia, France, Denmark, Spain and Switzerland with Spain and Switzerland suporting the second phase financially. In its current phase and in light of developments in the international climate policy/global carbon market as well as WBG strategic programs and corporate priorities on climate finance products, CF-Assist focuses on: (i) Scaling up Carbon Finance through programmatic approaches ; (ii) Carbon Finance in Urban Areas; (iii) Blending carbon/climate finance in support of low carbon development strategies. The program delivers in partnership with other UN and private sector partners the biggest annual global events on carbon and climate finance "Carbon Expo" in addition to annual regional events (Exchange for momentum). It supports the preparation and dissemination of knowledge products including the annual *State and Trends of the Markets* report. It designs and delivers through the WB e-institute distant learning courses on cutting knowledge such as Low emissions development, offset mechanisms such as the CDM and its programmatic approach, cities and climate change (Learn to scale). Finally it creates and facilitates south-south knowledge platforms which connect national teams and experts tasked with designing a low emissions development strategies, national mitigation action as well as monitoring to facilitate the cost effective spreading of knowledge generated by teams and supported by WB and other capacity building efforts (Share to accelerate).

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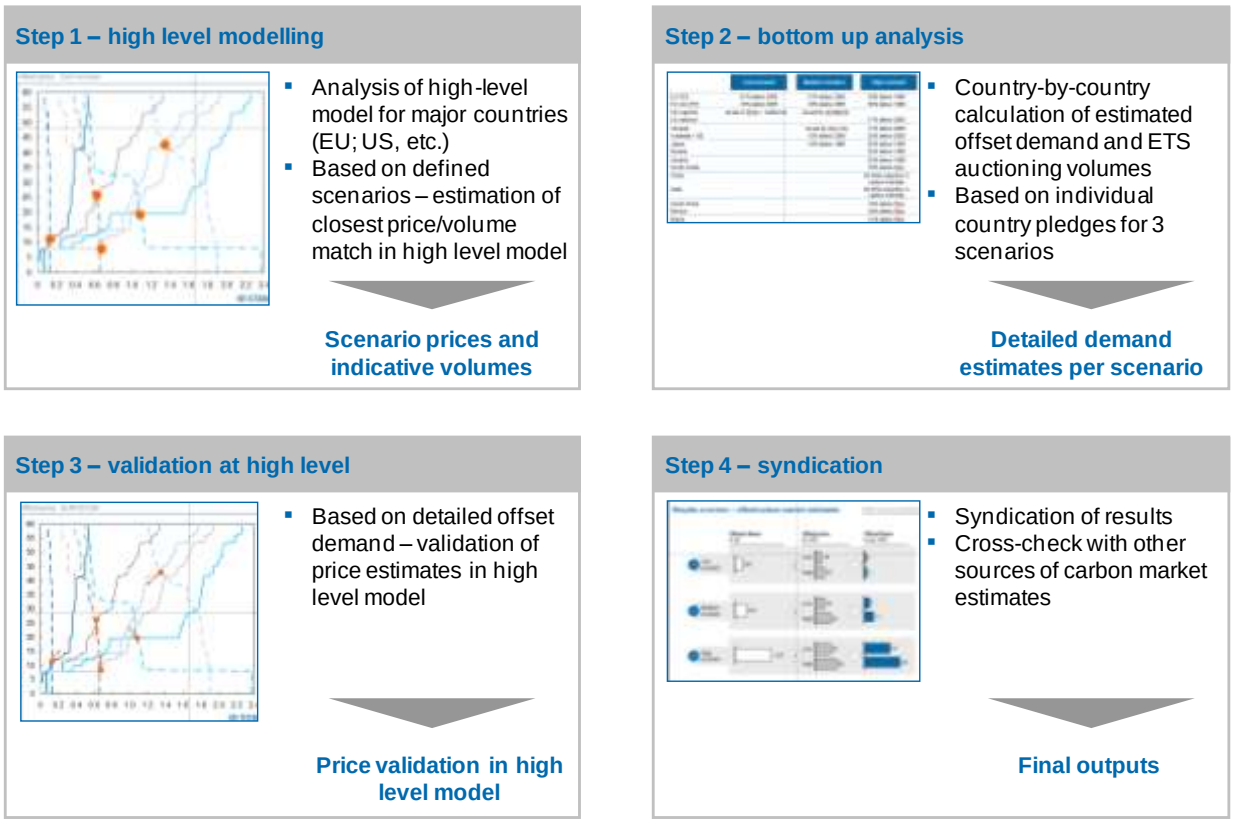
Appendix 1: Methodology

Estimates presented in this paper have been obtained through a combined top-down (for macro-economic consistency) and bottom-up (for greater details on demand specifics) modeling approach that is described below (see Figure 7):

- First, a high-level model was used to broadly define demand and supply for three scenarios. This high-level model yields the approximate price and demand forecasts for each scenario.
- Second, a bottom-up model was developed to specifically estimate offset demand for every emissions trading system defined in the three scenarios. Detailed data on BAU emissions, historic emissions and targeted abatement was used to generate ETS-level demand estimates.
- Third, based on the refined demand numbers, prices were validated in the high level model to make sure supply and demand match.
- Finally, results were validated against other sources.

Figure 7: Carbon market flows were estimated using a four step process



A number of assumptions had to be made for carbon market forecasts:

- **Offset rules**: As more ETS are being established (most recently California), it is becoming increasingly apparent that a common set of international rules for offsets is unlikely in the short term. Most countries have different definitions for offsets and impose restrictions specific to their markets. An example is the qualitative restrictions in effect for Phase III of the EU ETS (new

projects from LDCs only, ban on credits from HFC/N_2O projects). Another example is California, where a focus is placed on international forestry credits (and domestic offsets, under standards different from the CDM, chiefly Climate Action Reserve, or CAR). This has been reflected in the modeling partly by assuming different absolute levels of offsets for each region. However, the fact that the ETS may also differ in terms of types of projects and geographies that are allowed as offset providers is not reflected since the model assumes one common offset price. The same goes for rules on supplementarity. Hard rules are assumed for the EU and US, for other countries a share of required abatement was set to come from offsets.

- **Supply**: Supply curves were used to estimate the size of, and prices in, the offset market. Reductions in supply in the high scenario from national abatement by developing countries was taken into account, this was however counteracted by the assumption of forestry/agriculture to become partially available for offsets.

- **Auctioning**: Many treasuries argue that revenues from auctioning permits do not create new tax revenues but merely replace existing tax revenues. For this reason, it is considered unlikely in the scenario modeling that 100% of these revenues will be used for climate finance and that a significant share will be diverted internationally (in many countries auctioning revenues are used to reduce impacts on the economy). This uncertainty is captured in the modeling by the fact that auctioning revenues are shown in full with no assumption on the share that goes towards climate finance.

- **ETS in developing countries**: Under the High scenario, it is assumed that ETS are also introduced in developing countries. The impact of an ETS in developing countries on international climate flows will depend on if and how the ETS is integrated into global carbon markets. There are two main ways this could potentially play out that are described below:

  1) A developing country ETS is not linked to a developed country ETS other than indirectly via offset markets. This assumes that credits are not sold directly between the developed and developing country ETS. The rationale for this scenario is that developing countries are unlikely to seek prices at a level that would be attractive to, for example, the EU ETS. The counterfactual is that some developing countries might only be motivated to introduce their own ETS if there is a chance of linking and creating significant trading flows.

  2) A developing country ETS is linked to a developed country ETS, with greater price convergence. This has been considered unlikely for this analysis by 2020.

  In this analysis, option 1 has been modeled. The assumptions mean that the supply of offsets have de-facto been reduced in the modeling since abatements within the developing countries' ETS are no longer assumed to be available for sale. This has limited impact on the modeling results as domestic targets in developing countries are assumed to be met by low cost options that may not be eligible as offsets in future.

Appendix 2: Sensitivity analysis

A sensitivity analysis was carried out as part of the modeling exercise described in Appendix 1 to assess the impact of three rules surrounding the carbon market on revenue flows to developing countries.

1. **Supplementarity**, i.e., the balance between domestic action and use of flexibility mechanisms, including offsets: a higher supplementarity limit translates into a larger demand for offsets and lower mitigation costs in industrialized countries and globally. At the same time, less domestic action and a lower carbon price affect fiscal revenues (e.g., from auctioning permits).

   Supplementarity limits vary widely across ETS for example: 6% of the cap on *average* in the EU ETS (over 2008-20) and 3% of effort for EU governments over 2013-20; unlimited for the NZ ETS; or 8.7% of the total cap in California. The sensitivity analysis focused only on the EU as it is assumed to be the only region where there would be a significant impact of changes in supplementarity since the price levels in most other ETS are already broadly in line with international offset prices. If supplementarity were to be relaxed in the EU, market flows to developing countries would increase significantly (at least four-times on average) as both demand and prices increase (Figure 8). A secondary effect is that the ETS volume (auctioned) and price would decrease as auctioning is replaced by offsets. These numbers should be considered very indicative since they rely on multiple assumptions, e.g., how the EU would change offset rules when removing any limitations.

Figure 8: Supplementarity: changes could increase offset flows but would reduce auctioning revenues significantly

			Status quo & Copenhagen low	Copenhagen high
EU	With limits	Offset Price	USD 10-25 /t	USD 25-35 /t
		Offset volume	130Mt	310Mt
		Offset value	**USD 1.3-2 bn**	**USD 1.3-3.3 bn**
		ETS Price	USD 30-50 / t	USD 40-60 / t
		Auctioning revenues	**USD 47 – 78 bn**	**USD 55 – 82 bn**
	Without limits	Offset Price	USD 15-30 /t	USD 25-40 /t
		Offset volume	200-350Mt[1]	500-800Mt[1]
		Offset value	**USD 3-10.5 bn**	**USD 12.5-28 bn**
		ETS Price	USD 15-30 / t	USD 25-40 / t[2]
		Auctioning revenues	**USD 19-38 bn**	**USD 14-35 bn**
Other ETS		**No significant change expected as offset and ETS price level already at same level and supply/demand balancing***		

Source: World Bank analysis developed using McKinsey's "climate desk" tool (https://solutions.mckinsey.com/climatedesk/).

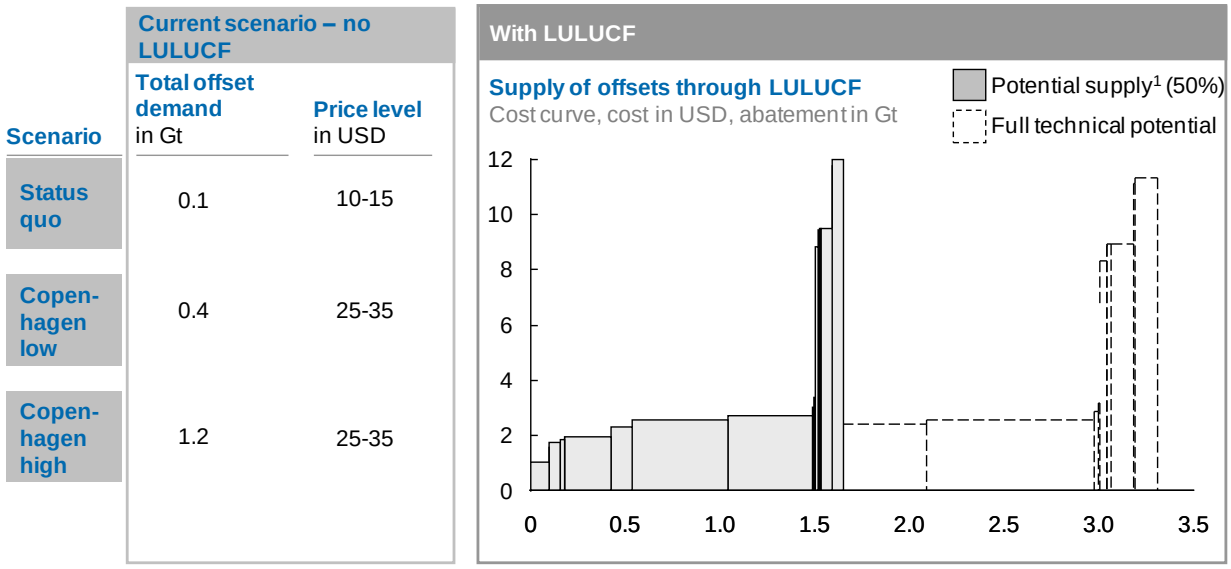
2. **Fate of excess Kyoto permits** (a.k.a. AAU overhang): Russia and Ukraine (and to a lesser extent Poland and other EU-10 Member States) will meet their commitments under the Kyoto Protocol

with a significant surplus of Kyoto permits, or Assigned Amount Units (AAUs), remaining; at least 5 billion for Russia and 2.5 billion for Ukraine. Full banking and use of this surplus could offset a significant part of the effort required by developed countries towards future commitments, decreasing their targets in practice to a maximum of an 11% reduction in emissions below 1990 levels by 2020 (den Elzen, et al., 2010). To a large extent, virtually all projections of future carbon market activity assume banking won't be allowed.[39]

Even a moderate AAU overhang (20%) could have a significant impact in the low scenario modeled, almost eliminating demand for offsets with the potential for a real risk of collapse of the offset market. In the 100% case, the demand reduction of 0.7Gt per annum would have significant impact in all scenarios. For the low and medium scenario, there would be no remaining offset demand (assuming that AAUs would be priced below other offsets). Even for the high scenario, demand would be cut by more than 50%, resulting in lower prices and a reduction in offset flows by 70%.

3. **Broadening offset market to all land-based carbon opportunities**: Since LULUCF abatement measures offer a significant abatement potential at a very low cost, the inclusion of such abatement levers has a significant impact on offset flows. While the EU has to date explicitly excluded avoided deforestation credits and all other land-based and forestry credits from its ETS, California and the WCI are likely to allow credits from forestry projects and avoided deforestation (REDD+).

Figure 9: In principle total offset demand could be met by LULUCF supply



1 Only share of full technical potential to meet credit quality standards – unclear how much will be available

Source: World Bank analysis developed using McKinsey's "climate desk" tool (https://solutions.mckinsey.com/climatedesk/).

[39] Moreover, targets for climate action by 2020 pledged by Russia and the Ukraine are above their expected business as usual emissions by that time, potentially resulting in new surplus AAUs (den Elzen, et al., 2010). Should these surplus AAUs be forfeited, the developed countries reduction target would be 3 to 6% less ambitious.

Assessing the potential supply curve for deforestation credits is very challenging. It will be a major question of how compliance-grade REDD+ credits will be defined (with what type of baseline) and how they will be priced when they come into the market. REDD+ activities present a number of specific implementation challenges, as described in (Karousakis & Corfee-Morlot, 2007). As can be seen from the McKinsey abatement cost curve for deforestation, even if only 50% of the technically available potential supply is considered (since not all projects will be compliance-grade), the resulting supply could in theory be sufficient to cover demand in all three scenarios (see Figure 9). Since the cost of the LULUCF measures is far below the cost of other offset projects, LULUCF project cost would determine the offset price. Since there are no functioning schemes for REDD+ credits, it is unclear what price supplying countries would demand for these offsets. Some countries appear to consider prices of US$5 as appropriate but this should be considered a very preliminary indication.

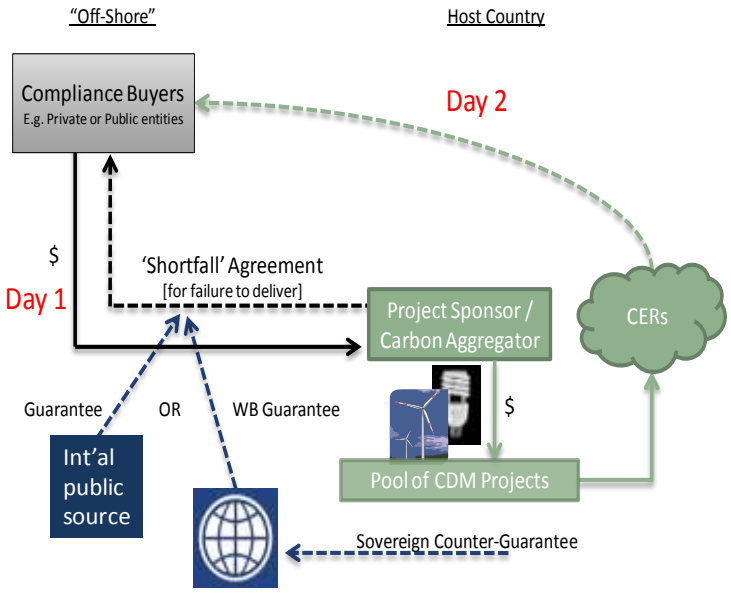
Appendix 3: Concepts for financial innovation with carbon finance

Three innovative ideas are presented below to potentially leverage carbon finance and address the upfront financing barrier to low-emission investment. They have not yet been tested.

Guaranteed Carbon Sales Contract

Key barrier: *Carbon revenues do not contribute to the initial funding of low-carbon projects*. Developing country sponsors (both public and private) often lack the financial resources needed to fund the initial capital costs of projects. As a result, potentially viable low-carbon projects are not taking place. The Guaranteed Carbon Sales Contract could convert the future flow of carbon offsets into an upfront payment that can be used to finance these low-carbon projects.

Product description: The purchaser (e.g., a compliance buyer or purchasing agent) and the seller (e.g., a state-owned entity in charge of low carbon projects or a national development bank) would enter into a purchase/sales contract under which the seller agrees to deliver in the future an agreed volume of carbon offsets according to a specified schedule in exchange for an upfront payment by the purchaser representing the total value of the offsets to be acquired. The seller would also commit (through a 'shortfall' undertaking or agreement) in the event of failure to deliver any offsets to 'reimburse the purchaser for its payment, plus interest (negotiated at the time of contracting). This 'shortfall undertaking' could be guaranteed by an international financial institution.[40] The shortfall agreement and corresponding guarantee would protect the purchaser against all risks of non-delivery (including non-performance of projects and regulatory registration risks). The host sovereign would issue a counter-guarantee to the international financial institution[41] (which could provide for immediate repayment or convert the obligation into a loan to the seller). The upfront payment, the volume of offsets and the shortfall terms (notably the interest rate) would be negotiated at the time of contracting and would be set out in the Guarantee Carbon Sales Contract.



The basic carbon guarantee instrument is amenable to customization. One option could be to have an international entity provide the guarantee. This variation would, among other things, provide flexibility to forego the requirement for a sovereign counter-guarantee, which, in turn, should widen the opportunity

[40] This would be a new guarantee product in the case of the World Bank that would require internal approval.

[41] In the case of the World Bank, this would be required under the World Bank's charter.

to use this carbon guarantee for private sector issuers or in countries hesitant to provide sovereign counter-guarantees. However, any guarantor may require some indemnity from the seller to encourage compliance with the offset delivery obligation.

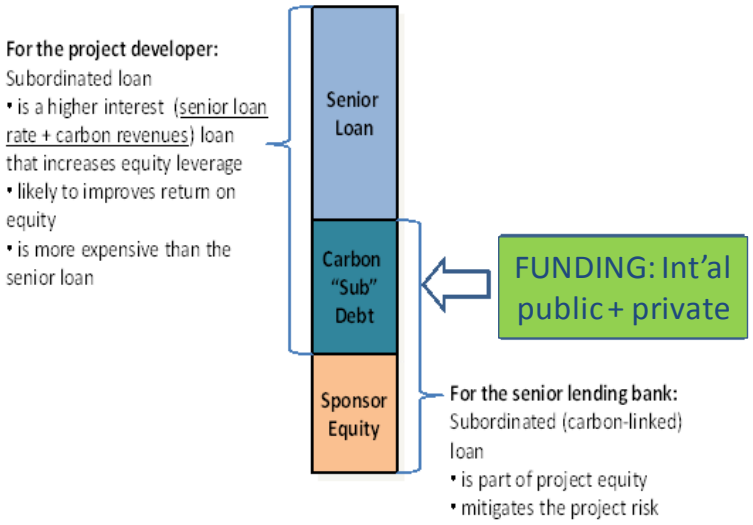
Product's catalytic impact: The product is conceptualized to induce purchasers to provide upfront funding for low-emission investments in developing countries with the comfort that delivery risk is guaranteed by a creditworthy offshore guarantor. The product would serve to enable sellers to raise additional foreign capital flows for the upfront funding of sound development projects (such as energy efficiency and renewable) that often are not undertaken for lack of available moneys. The product would present an important upside for sellers by enabling them to build more green infrastructure using carbon revenues that have not been forthcoming in the past (in part because the number of projects generating offsets have been limited by this lack of upfront funding). Typically, these projects would generate benefits for the seller that extend beyond the generated offset revenues (for example, energy savings for energy efficiency projects). If the project failed to generate registered offsets, the seller would typically face a loan obligation for a project that still generated benefits (e.g., energy savings), assuming the underlying project becomes operational. The structure in addition allows the multilateral guarantor to leverage public resources by "crowding-in" the private sector.

Product applicability: Energy efficiency, solid waste management projects or other applications where the projected aggregate carbon finance revenues from the project are a high proportion of the initial capital investment. The product could also apply to renewable generation projects, but the impact is anticipated to be less marked as the present value of the anticipated carbon revenues is smaller compared to the upfront capital cost requirements.

Carbon Mezzanine Debt Facility

Key barrier: *Inability to finance projects for which lenders require a lower debt leverage that equity sponsors are unable to satisfy.* Lenders look for lower leverage in projects with less established technologies and/or sponsors with limited track records. Lenders typically look for larger equity contributions from project sponsors (over 30% of the total cost) and less debt. At the same time, many mitigation technologies typically have higher capital cost requirements and sponsors with weaker or smaller balance sheets. The combination of these factors makes raising the required amount of equity a key challenge. The Carbon Mezzanine Debt Facility would address this leverage constraint by supporting mezzanine financing that serves to reduce the equity funding need.

Product description: The Mezzanine Debt Facility would provide project debt financing that is subordinated to the senior loans. The subordinated debt would be supported by a proportion of the anticipated carbon revenues that serves to generate the potential for an additional return (the 'sweetener') to compensate for its subordinated status. The subordinated debt would face the same project performance risks as the senior lenders (albeit in a subordinated position), as well as the delivery, regulatory and other risks specifically related to the carbon offsets, but with the potential of higher returns than the senior loans should the carbon revenues materialize. The Mezzanine Debt Facility would be financed through multilateral/public sector funding, complemented by private sector investors. International public funding would ensure liquidity in the Facility to provide the loans to projects. The Facility would also be funded through private capital (although this may be limited in an initial period). Under a possible variation (notably in a subsequent phase), international public sources would not provide funding to the Facility but instead would provide the subordinated debt issued from the Facility with a guarantee of a minimum delivery and floor price for the carbon offsets 'sweetener', thereby encouraging investors to fund the Facility by absorbing the carbon revenue risks. While this variation does not furnish the liquidity itself, it provides the potential for a public sources to better leverage its resources by catalyzing more private sector or other public sector financiers.



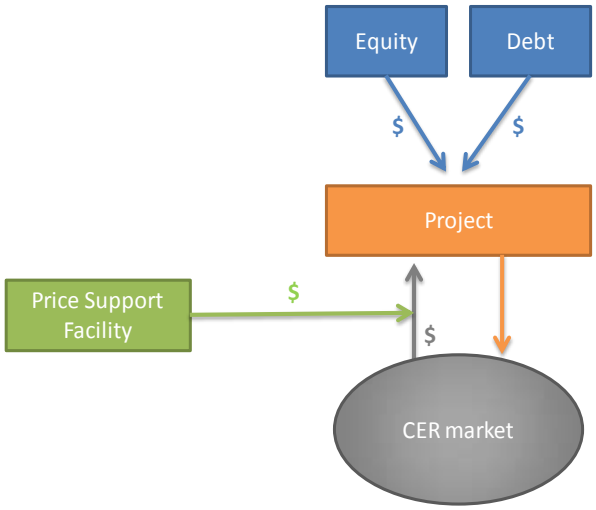
Product's catalytic impact: The product would enable more projects to achieve financial closure by satisfying the needs of senior lenders and overcoming a funding constraint facing sponsors. With carbon-linked subordinated debt: (a) the senior lenders see the carbon "sub" debt as virtual equity (as the lender is senior both to the carbon-linked debt tranche and to the equity), and (b) the project equity sponsor is able to raise more debt within its equity funding constraints. The Mezzanine Debt Facility would crowd-in private investment in two ways: (i) by catalyzing the senior debt and the equity, and (ii) potentially by attracting private capital to the Mezzanine Debt Facility itself.

Product applicability: This product is likely to be most attractive to developers of renewables, where the aggregate carbon revenues are typically less than 10% of the capital cost of the project (for projects where revenues are relatively larger, the carbon guarantee might be preferable).

Carbon Price Support Facility

Key barrier: *Uncertain and volatile price of carbon offsets — due for example to regulatory uncertainty or market illiquidity —that dampens willingness of equity and debt investors to rely on these flows*. Uncertainty about the future price of carbon offsets limits the ability of project investors to rely on prospective carbon revenues to finance the projects generating greenhouse gas emission reductions.

Lenders and equity providers typically deeply discount the offset revenues due to uncertainty in long term offset prices. The Carbon Price Support Facility would provide down-side price protection.



Product description: The Price Support Facility would provide a minimum ("floor") price guarantee to eligible projects. If the carbon price were lower than the specified floor, the project investors would receive a supplement from the Price Support Facility to match the floor price. The Price Support Facility would only cover price risks, and not other risks (such as performance, delivery or registration risks). A key design challenge for this facility would be to determine the basis for calculating the proffered floor price for eligible projects.[42] The Price Support Facility obligations could be funded by international public financing source, such as MDBs or some climate funds. Under a variation of the Facility, these sources would guarantee payments to be made by the Price Support Facility, instead of funding the facility itself.

Product's catalytic impact: The product would enable more projects to achieve financial closure by providing prospective investors with greater predictability regarding future prices and thereby increase their willingness to fund these projects. This comfort regarding a floor price will help to "crowd-in" private sector financing. Its catalytic impact, however, would likely be greater for equity investors than lenders since the latter are a more conservative investor class that are likely to heavily discount these revenues that remain subject to performance and other risks.

Product applicability: This product could be useful for low-emission projects where the incremental carbon revenues can help to secure additional investment in the project. It may also be useful in combination with the Carbon Mezzanine Debt Facility.

[42] The Facility could be structured to generate its own revenues. For example, if the market price is higher than the agreed floor price, the Price Support Facility and the protected project could share the difference (in an agreed proportion) between the market price and the floor price. This would enable the Facility to build a reserve with its share of the upside and to draw on this reserve when the market price is lower than the floor price.