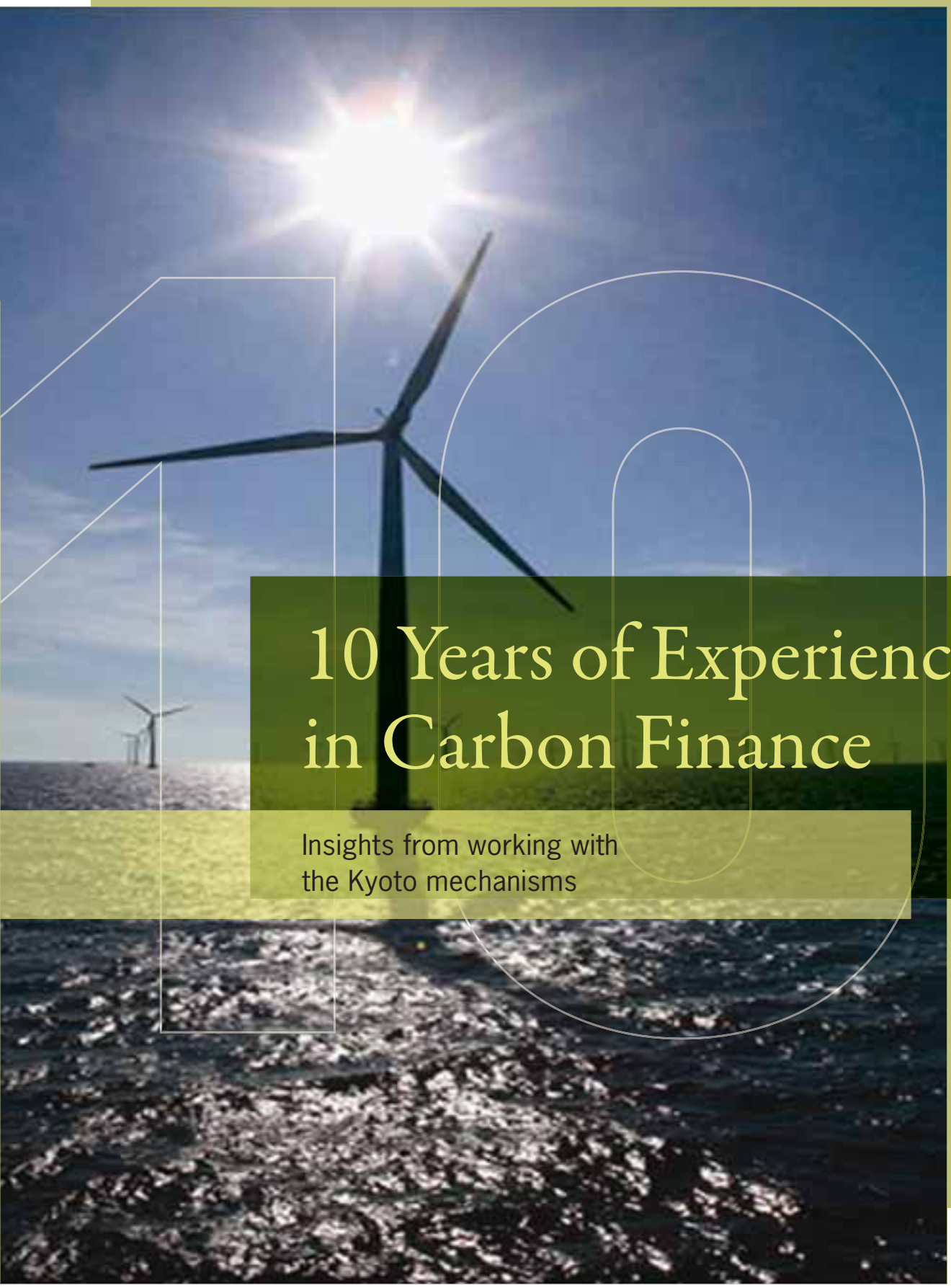

10 Years of Experience in Carbon Finance

Insights from working with the Kyoto mechanisms

Carbon Finance at the World Bank

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Contents

Figures

Tables

Boxes

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The process followed to conduct the work underpinning this report is outlined in Annex 8.

For more information, please feel free to contact the World Bank Carbon Finance Unit at helpdesk@carbonfinance.org.

The full version of this report can be found on the website of the World Bank's Carbon Finance Unit under ***Publications and Reports****: www.carbonfinance.org*

Washington, DC, May 2010

Abbreviations & Acronyms

AAU	Assigned Amount Unit
ACM	Approved Consolidated Methodology
AIE	Accredited Independent Entity
AIJ	Activities Implemented Jointly
AMS	Approved Methodology for Small-Scale Projects
ANR	Assisted natural regeneration
A/R	Afforestation/reforestation
BAU	Business as usual
BioCF	BioCarbon Fund
CBP	Community Benefits Plan
CCS	Carbon capture and storage
CDCF	Community Development Carbon Fund
CDM	Clean Development Mechanism
CDMF	Chinese Clean Development Mechanism Fund
CER	Certified emission reduction
CFL	Compact fluorescent lamp
CFU	Carbon Finance Unit (of the World Bank)
CH_4	Methane
CHP	Combined heat & power
C/ME	Coordinating/managing Entity
CMM	Coal mine methane
CMP	Conference of the Parties Serving as the Meeting of the Parties
CNG	Compressed natural gas
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
COP	Conference of the Parties
CPA	CDM Programme Activities
CPF	Carbon Partnership Facility
CSI	Cement Sustainability Initiative
DNA	Designated National Authority
DOE	Designated Operational Entity
EB	Executive Board
EC	European Commission
ECX	European Climate Exchange
EE	Energy efficiency
EF	Emission factor
ER	Emission reduction
ERPA	Emission Reductions Purchase Agreement
ERU	Emission Reduction Unit
ETS	Emissions Trading Scheme
EU	European Union
EUA	European Union Allowance
EU ETS	European Union Emissions Trading Scheme
FCPF	Forest Carbon Partnership Facility
FMNR	Farmer managed natural regeneration
FX	Foreign exchange
GHG	Greenhouse gas
GIS	Green Investment Scheme
GWP	Global warming potential
HFC-23	Trifluoromethane
IBRD	International Bank for Reconstruction and Development
IEA	International Energy Agency
IPCC	Intergovernmental Panel on Climate Change
IRR	Internal rate of return
JI	Joint Implementation
JISC	Joint Implementation Supervisory Committee
KM	Kyoto mechanism
LDC	Least developed country
LFG	Landfill gas

LoA	Letter of Approval
LULUCF	Land use, land use change and forestry
MOP	Meeting of the Parties
MRV	Monitoring, reporting and verification
$MtCO_2e$	Million tons carbon dioxide equivalent
MW	Megawatt
N_2O	Nitrous oxide
NPV	Net present value
NSS	National Strategies Studies Program
OECD	Organisation for Economic Co-operation and Development
O&M	Operation and maintenance
PE	Project entity
pCER	Primary certified emission reduction
PCF	Prototype Carbon Fund
PDD	Project design document
PFC	Perfluorocarbons
PHRD	Japan Policy and Human Resources Development Fund
PIN	Project idea note
PoA	Programmes of Activities
PP	Project Participant
PSU	Public sector undertakings
RE	Renewable energy
REDD	Reduced emissions from deforestation and degradation
RIT	Registration & issuance team
RMU	Removal unit
sCER	Secondary certified mission reduction
SF_6	Sulfur hexafluoride
SSC	Small-scale
tCO_2e	Ton of carbon dioxide equivalent
tCER	Temporary certified emission reduction
UCF	Umbrella Carbon Facility
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
VER	Verified emission reduction
WB	World Bank
WDR	World Development Report

1 Executive Summary

Under the Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC), the industrialized countries (so-called "Annex I" countries) adopted quantified emission reductions obligations. Collectively, these obligations amount to a reduction of 5.2 percent against 1990 levels over the five-year commitment period from 2008 to 2012. Countries can meet their obligations through domestic actions and partially through one of the Protocol's three market-based (a.k.a., flexibility) mechanisms, i.e., International Emissions Trading, Joint Implementation (JI), and the Clean Development Mechanism (CDM). The CDM and JI are two project-based mechanisms targeted at greenhouse gas (GHG) reducing projects in developing countries and Annex I countries, respectively (with the focus of JI being on countries with economies in transition). The Kyoto Protocol and its mechanisms provide the backdrop for carbon finance activities. Carbon finance is the generic name for the revenue streams generated by projects from the sale of their greenhouse gas emission reductions, or from trading in carbon permits.

Marking the 10th anniversary of the establishment of the World Bank Prototype Carbon Fund (PCF)—the world's first global carbon fund—this report seeks to take stock of the World Bank's experience of working with the Kyoto Protocol's project-based mechanisms over the past decade. The CDM, as the much larger system in terms of projects, emission reductions and host countries, is the basis for much of the report's discussion. JI is also discussed.

Policy-makers and negotiators are working on advancing the policy framework and the regulatory structures to mitigate GHGs at greater scale. Furthering the use of market instruments should incorporate the lessons of the past into future designs, making full use of the experience and learning that has been gained. This will mean building upon the successes of the current CDM and JI regulatory frameworks, addressing weaknesses, and abandoning what is not working. This publication seeks to make a constructive contribution to this debate, in full respect of the ongoing international climate change negotiations, by providing insights and recommendations from a practitioner's experience and perspective.

The role of the World Bank: a practitioner's perspective

Addressing climate change, both mitigation and adaptation, is a critical pillar of the development agenda. For the World Bank, addressing climate change is intrinsically linked to its mission of poverty reduction and the support of sustainable development in its client countries. Carbon finance is part of a larger response to leverage existing development finance and complements other financial instruments focused on mitigating and adapting to the impacts of climate change.

The role of the World Bank has been to catalyze a global carbon market that reduces the cost of achieving GHG reductions, supports sustainable development, and reaches and benefits the poorer communities of the developing world. Starting with the PCF, which became operational in April 2000 with an initial capitalization of $135 million, the World Bank carbon finance activities helped catalyze a then nascent carbon market and pave the way for the increased participation of public and private buyers. The carbon market has since become

more dynamic, with CDM/JI transactions totaling $27 billion from 2003 to 2009. Today, the World Bank has $2.5 billion in capitalized funds (grouping fund participants from 16 governments and 66 firms)[1]. Its portfolio is wide-ranging, spanning 57 developing countries and economies in transition and 23 different technologies in projects as diverse as energy-efficient lighting in Senegal, brick-making in Bangladesh, solid waste management in Mexico, wind power in China, and reforestation of the River Nile Basin. The World Bank experience is therefore relevant to a broad set of stakeholders.

At the same time, the World Bank portfolio includes a significantly greater share of projects hosted in Africa (i.e., more than 20%) than the global CDM experience (i.e., 2%), providing important learning and experience on extending the reach of carbon finance to the poorest developing countries. Moreover, the World Bank has made a significant contribution to the development of methodologies (i.e., about 40% of approved CDM methodologies) that define project eligibility, the calculation of the emission baseline, and the monitoring requirements for different types of project activities. Through this work the World Bank has helped open up new areas of carbon finance activities for the market, as once a methodology is approved, it can be used by any other similar project meeting the relevant criteria. With its partners in the carbon funds and in host countries, the World Bank has continuously sought to expand the opportunities from carbon finance and extend its reach to more sectors and more countries.

Developing carbon finance transactions: many good ideas, but not all are successful

Since the beginning of its engagement in carbon finance, the World Bank has reviewed more than 1,000 project ideas. Of these, more than 500 made it into the project pipeline. The World Bank has worked with project entities to further develop them to the stage of a carbon finance transaction and official recognition as a CDM or JI project. The experience has shown how carbon finance revenues can enhance the overall financial viability of GHG reducing projects and, because payments are performance-based, create positive incentives for good management and operational practices to sustain emission reductions over time. Carbon finance operations have demonstrated opportunities for collaboration across sectors, and have served as a catalyst for the incorporation of climate-friendly technologies into projects relating to rural electrification, renewable energy, energy efficiency, urban infrastructure, waste management, forestry, and water resource management.

Clearly, not all project ideas make it all the way to an approved CDM or JI project. For example, more than half of the World Bank's approved project ideas were subsequently discontinued and exited the pipeline, with 211 remaining active projects in the portfolio.

Key insights and lessons from developing carbon finance transactions include:

- The greater the carbon revenues, the greater the potential for stimulating and leveraging GHG-mitigating activities. Carbon revenues result from: (i) the volume of credits generated, which are highly dependent on the greenhouse gas intensity of the baseline (from which emission reductions are calculated); (ii) the carbon price, influenced by overall market trends and the risk of the carbon credits; and importantly, (iii) the length of the purchasing period, which has typically been limited as few buyers are engaging in long-term purchasing (due to the deadline and brevity of the Kyoto Protocol's first commitment period).
- Successful CDM/JI projects have features similar to those of more typical development projects: (i) a committed champion (within the company or government); (ii) strong project design and planning from the start; (iii) solid project financing; and (iv) clear potential to meet objectives (in this case, reduce GHG emissions).

[1] This report draws on experience from the Prototype Carbon Fund, BioCarbon Fund, Community Development Carbon Fund, Carbon Fund for Europe, Danish Carbon Fund, Italian Carbon Fund, Netherlands Clean Development Carbon Facility, Netherlands European Carbon Facility, Spanish Carbon Fund and Umbrella Carbon Facility.

- The main reasons for discontinuing previously approved project ideas have been: (i) the challenges of project financing (i.e., inability to reach financial closure); (ii) delays in project implementation (e.g., due to the time and procedures required to obtain necessary approvals and licensing from relevant national authorities); (iii) CDM/JI regulatory delays and frequent changes in the rules and procedures in the regulatory structures (e.g., changes in approved methodologies); (iv) an insufficient carbon finance revenue stream; and (v) challenges in clearing the due diligence screening processes.
- Upfront financing barriers for low carbon, but capital-intensive, project alternatives (e.g., renewable energy) are common in developing countries. Carbon finance alone, as an *incremental* financing tool, cannot easily overcome these barriers when accessible underlying financing is not available. Long-term forward contracts would be more common if there were post-2012 policy clarity, and would enhance the contribution of carbon finance. Moreover, better ways need to be found to exploit and leverage the synergies between (or the blending of) different financial instruments (e.g., commercial loans and public climate and development financing mechanisms) and carbon finance.
- For those projects that have secured financing, it is becoming clear that the bulk of the work associated with CDM projects and programs actually takes place after registration. In fact, successful project implementation and CER delivery—which is the key test for carbon finance—often take more time than originally anticipated and require sustained efforts. Successfully adhering to the relevant methodologies and procedures defined in the monitoring plan is key.

The project cycle: achieving environmental integrity, efficiency and effectiveness

The CDM, developed through a "learning-by-doing" approach, has achieved impressive results. There are currently more than 2,000 registered CDM projects and more than 2,700 projects that are expected to be registered in the global CDM pipeline. However, rules, modalities, and procedures, which were developed to ensure a rigorous project approval process and the issuance of credible emission credits, have inadvertently resulted in excessive delays and bottlenecks. The long timeframe associated with the CDM approval process (now amounting to approximately 18 months) is undoubtedly reducing the impact of the CDM. These delays have a disproportionate impact due to the relatively short Kyoto commitment period, as well as the shorter private sector investment horizon. Moreover, the transaction costs (i.e., validation and verification costs) have increased over time for both large and small scale projects. The lost carbon finance revenues associated with regulatory delays are estimated at €800 million. This sum does not appear to buy commensurate environmental benefits (i.e., avoided non-eligible tons) resulting from the intensive regulatory scrutiny.

The international community, the CDM Executive Board, and the UNFCCC secretariat (which supports the work of the CDM Executive Board) have started to examine how to streamline registration and issuance processes. Improvements are urgent because the viability of many CDM projects—particularly those that are small and/or depend most on carbon finance revenues—is reaching a breaking point with the increased transaction costs caused by the data and documentation requirements and delays. The CDM regulatory risks are indeed starting to consume more and more of the CDM benefits to project entities.

Recommendations for achieving a more efficient and effective regulatory process include:

- Efforts need to be made without delay to enhance confidence in the performance of the Designated Operational Entities as well as their accountability. In particular, enhanced capacity and better communication with the Executive Board is much needed along with the establishment of a robust appeals process.
- Streamlining the regulatory system should eliminate the current duplication of quality checks undertaken during the approval process and enable significantly faster registration and issuance processes. Enhancing

efficiency, while also ensuring environmental effectiveness, could be achieved by moving towards the automatic registration of successfully validated projects and applying a small discount to their claimed emission reductions (as a form of "environmental integrity" levy). These could subsequently proceed to automatic issuance of Certified Emission Reductions (CERs) for successfully-verified emission reductions. Random spot checks on projects could further enhance confidence in the environmental effectiveness of such a streamlined system.

- The entire burden (and costs) of delays should not be borne by project entities. Successfully registered projects should be allowed to start generating CERs from the date of their *submission* for registration (rather than the date of registration).
- Regulatory reliability is needed in the form of more predictable and objective rules and guidance. Providing for periodic reviews and revisions of CDM rules, procedures, and methodologies is critical to reflect evolving practical realities and maintain the environmental integrity of the system. But the process, timing, and triggers to initiate such reviews should be clear at the outset.

Methodologies and additionality: in need of simplified and pragmatic approaches

Environmental integrity of the Kyoto project-based mechanisms is critical for the overall climate regime, as well as for the carbon market, which is seeking confidence in the environmental quality of carbon assets. The CDM and JI seek to preserve environmental integrity through the demonstration of additionality, i.e., providing evidence that a CDM/JI project's emission reductions are *additional* to what would occur without CDM/JI. While an attractive concept in theory, the demonstration of additionality has turned out to be very challenging to implement and evaluate objectively in practice. The challenges stem from the fact that each individual project faces its own specific policy, regulatory, and economic circumstances and each project entity uses different approaches and investment appraisal criteria. All these factors make the task of assessing a specific project's additionality very challenging from a global perspective, and subject to questioning. At the same time, the CDM regulatory risks can make it very difficult to use the expected CDM revenues as indicators of the projects' financial viability to leverage the necessary underlying project finance.

In addition, while some approved methodologies have been widely used and have facilitated the uptake of many projects, too many methodologies are overly complex, conservative, and restrictive, thereby limiting their applicability.

Recommendations for achieving a more efficient and effective assessment of methodologies and additionality include:

- Review the implementation of the concept of additionality to reconcile the reality that good and effective emission reducing projects need to also be technically and financially solid, with the need to ensure environmental integrity. This means moving away from the current additionality assessment that focuses on individual investment decisions, and towards objective and more easily verifiable technical criteria wherever possible. This could include the use of standardized baselines together with automatic additionality clearance for activities meeting clear criteria and/or implemented in clearly specified geographic regions or under other circumstances.
- Simplify baseline methodologies through greater standardization wherever possible, such as standardized emission factors in the power sector, or default (deemed) values for energy-efficient equipment; such elements can already be found in some of the approved methodologies. Ambitious yet realistic stringency levels of these standardized baselines need to be achieved through an acceptable and pragmatic balance between (i) environmental integrity (and conservativeness), and (ii) environmental effectiveness (i.e., the ability to stimulate more GHG-reducing activities).
- Collaborate with practitioners and industry/sector specialists to ensure that methodologies, particularly monitoring requirements, build on and are consis-

tent with existing industry/sector practices, standards and/or reporting guidelines, and are tailored to contexts on the ground.

The specific case of Joint Implementation: opportunities & challenges

The World Bank was an "early-mover" with JI projects acting ahead of regulatory clarity at both the international level (with the verification procedures developed by the JI Supervisory Committee or "JI Track 2" procedures) and the national level ("JI Track 1"). As JI benefits from the safeguard provided by the overall national emission caps of the JI countries, the original intentions were for a simpler instrument. However, the situation for JI has turned out to be more complex than originally anticipated. In the countries that later joined the European Union (EU), JI has faced challenges mainly due to the interplay with the EU Emissions Trading Scheme (EU ETS) and concerns regarding double counting.

JI provides for a greater role for national authorities, and with it, creates substantial requirements for the host government in terms of capacity and institutions. JI experience to date shows that it takes time and resources to build national systems, institutions, and capacities as governments must develop rules to manage new national carbon assets. These rules include procedures and guidelines for project approval, issuance and transfer of Emission Reduction Units (ERUs). This has resulted in an additional host country risk associated with JI projects compared to the CDM. In addition, the different requirements and approaches adopted by each JI host country make it more complex for project developers seeking to navigate different countries.

Experience on the ground: capacity building crucial for geographic & sector reach

One of the main factors for successful carbon finance projects has been committed champions with the capacity to implement and follow through with projects. Conversely, weak capacity is a key reason for project ideas being discontinued. At the host government level, capacity to create enabling environments and clear regulatory frameworks to attract carbon finance is critical. As the world looks towards the post-2012 period and considers ways to stimulate greater amounts of GHG mitigation in a way that supports host countries' transition to low carbon growth, it is important to build on the capacity that has been created over the past decade.

In the global CDM experience, China's role is striking, as its share in the CDM portfolio is proportionally larger than its share in overall GHG emissions from non-Annex I countries. China's success can be attributed to various factors, including a GHG-intensive electricity grid and a large growing economy, which offer many opportunities for emission reductions. Another important factor to highlight is the capacity developed in China and the overall CDM support structure to facilitate CDM activities, which together have contributed to the country's overall successful implementation capacity. The world's and the World Bank's carbon finance activities have not been limited to China and the other large players (India, Brazil, etc.), but it is clear that there is potential to extend the mechanisms' reach more broadly.

To date, the renewable energy sector—critical for countries' low carbon development—has attracted the largest number of CDM projects. This is true for both the entire CDM pipeline and among already registered projects. Waste management and industry are the two other most popular sectors. The volume of CERs issued to date is largest for industrial gas projects, although their share is expected to dissipate at the end of the commitment period, when other projects move to the issuance of their respective CERs.

Sectors not reaching their full potential include transportation, energy efficiency, and forestry. Although the transport sector comprises nearly a quarter of all global GHG emissions, it represents less than 1 percent of the CDM and JI portfolio. This reflects the challenges that technology-shift projects face in overcoming the current additionality approach and the reality that transportation choices are driven by users, which are typically very difficult to assess. Despite its inherent attractive-

ness, demand-side energy efficiency, particularly at the household level, is difficult to implement in practice due to the range of well-documented barriers not captured in technology cost curve analyses complicating additionality demonstrations when reviewing investment analysis. Forestry, limited by being covered under the CDM only by afforestation and reforestation (A/R) activities, is also inhibited by the temporary designation of its credits and significant technical challenges associated with demonstrating compliance with the CDM land-related rules[2].

Reaching least developed countries (LDCs)[3]

The CDM, as a market-based instrument, has logically focused first on the lowest abatement cost opportunities—a sign that the price signal works. Such opportunities consist of single-source projects able to generate large volumes of emission reductions, and projects located in countries with the best (perceived) enabling environments and capacity. LDCs with relatively low levels of emissions at present, have largely been by-passed by the CDM experience to date.

It is clear that there is no substitute for good governance and enabling environments at the level of the host country. This requires continued and enhanced capacity development.

The potential role of carbon finance in LDCs must be considered in the context of those countries' specific situation and needs. The CDM has the potential to contribute, for example, to broader sustainable development by helping to meet the energy deficit with lower GHG-intensive activities, as well as to contribute to more sustainable land and forest management given reliance on natural resources in many LDCs. Through dedicated efforts by the BioCarbon Fund and the Community Development Carbon Fund and the sustained support from World Bank operations, the World Bank portfolio includes about one fifth of its projects in Africa.

Efforts are needed to remove the CDM-specific barriers that are preventing it from reaching LDCs and to contribute to sustainable development and poverty alleviation more meaningfully. Many of these measures are necessary for scaling up and enhancing the CDM's overall effectiveness. At the same time, the host countries themselves need to strengthen their efforts to make use of the CDM.

Recommendations for removing CDM-specific barriers to enhance the outreach of the CDM to LDCs include:

- Simplify procedures for project approval and issuance. The practical reality of LDC contexts must be taken into account. Reducing transaction costs and delays is vital for making small-scale projects viable.
- Simplify methodologies. Requirements to demonstrate the project's additionality and monitoring need to be adapted to smaller projects with less capacity and less available data.
- Account for unmet energy demand. The CDM methodologies currently underestimate the potential to reduce GHG emissions from the power sector and must be adjusted to reflect the *real* energy demand (and not just historical grid-connected energy supply) for meeting basic needs in LDCs. A realistic energy baseline could provide opportunities for the CDM to help provide new energy services using lower GHG-intensive options.
- Increase eligible land activities in the CDM and remedy "temporary" crediting in the afforestation/reforestation sector. The forestry and agriculture sectors represent a large CDM opportunity in many LDCs, but most land use activities, including agriculture, are not eligible in the CDM. In addition, CDM forestry projects are penalized with "temporary" credits (not recognized in some markets like the EU Emissions

[2] A study of BioCarbon Fund lessons learned from A/R CDM is under preparation; it aims to shed light on challenges project developers have encountered for effective project preparation and implementation and also on opportunities the mechanism has brought to the forestry sector.

[3] The United Nations defines these countries through the three dimensions of a country's state of development, namely, its income level, its stock of human assets and economic vulnerability. There are 49 LDCs with 33 in Africa. See www.unohrlls.org

Trading Scheme), thereby depressing the demand and price for these credits.

- Provide training in programmatic approaches (i.e., through Programmes of Activities). Programmatic approaches could unlock some of the mitigation potential of the CDM in LDCs, but further development of program rules, simplification and capacity building is needed.

The Kyoto mechanisms: challenging, yet rich & successful experience

Working with the Kyoto mechanisms has been challenging and improvements are needed. Nevertheless, the experience has been rich in learning and proven to be successful. The mechanisms have provided an important catalyst for development finance while simultaneously supporting GHG mitigation and sustainable development.

By adding to project revenue through the sale of emission reductions, carbon finance can increase the bankability of projects, thereby enhancing the creditworthiness of the borrowing entity and reducing its cost of borrowing. It provides a means of leveraging new private and public investment into projects that reduce GHG emissions. Experience shows that carbon finance, alone or in combination with other policy and finance instruments, has made a difference in favor of climate action and catalyzed a shift of much larger amounts of (essentially private) financial and investment flows to accelerate low carbon development in developing countries. This is the case for many renewable energy projects, including hydro, wind, and biomass.

The United Nations currently estimates that by the end of the Kyoto Protocol's first commitment period in 2012, the CDM and JI will have delivered over 1 Gigaton and approximately 0.2 Gigaton of offsets respectively, thereby making an important contribution to meeting the Kyoto Protocol's emission obligations. Between 2002 and 2009, transactions, in the form of forward contracts, covered about 2.2 billion CDM credits worth some $25 billion, leveraging more than an estimated $100 billion in underlying low carbon investment. Still, the leverage potential of carbon finance has not yet been fully explored, and must be further exploited to help mobilize both climate and development finance on a larger scale.

In addition to their contribution to meeting GHG commitments cost-effectively, the Kyoto mechanisms have generated other noteworthy benefits. There are many examples of how they have contributed to sustainable development in host countries. The CDM has supported basic development needs and broader socio-economic co-benefits, such as improving energy access and services as in the case of the Nepal biogas project, which has so far installed close to 20,000 biogas plants in the country, and providing solutions to waste management challenges as seen in several landfill gas recovery projects. The Kyoto mechanisms have also played an important role in contributing to technology transfer and even more to technology diffusion, such as the solar home system project in Bangladesh and the energy-efficient lighting projects. Forestry projects, such as the soil conservation project in Moldova, have demonstrated the synergies between carbon sequestration and the promotion of other environmental services and improving rural livelihoods.

It is also important to note the Kyoto mechanisms' contribution to raising climate change awareness and to building capacity in developing countries to use carbon finance to support GHG-reducing project activities. An integral component of the World Bank's carbon finance activities has been to contribute to the strengthening of the capacity in developing countries; it remains an area that needs to be sustained and enhanced.

Scaling-up with a programmatic approach: opportunities through Programmes of Activities & Green Investment Schemes

The urgent need to scale up mitigation efforts is widely accepted. Approaches to a successful scaling-up are expected to include a combination of policy-based and technological interventions to be defined by country-specific circumstances and capacities. Strategically, aggre-

gated programs could become good vehicles to scale-up system, subsector, or sector-wide mitigation efforts. The World Bank has been actively exploring various scaling-up opportunities: (i) technology-specific intervention, such as compact fluorescent lamp (CFL) market transformation activities; (ii) GHG-specific intervention, such as programs by rural development agencies to accelerate deployment of household bio-digesters to capture and utilize methane emissions from animal waste; (iii) industry-specific intervention, such as the reduction of gas flaring by the petroleum industry; and (iv) system-wide intervention, such as coordinated city-wide GHG mitigation activities across waste, transport, and energy end-use sectors.

Under the CDM and JI, Programmes of Activities (PoAs) offer a welcome means to move from an ad-hoc project-by-project approach to a more coherent programmatic approach that could enable the CDM and JI to make progress towards reaching their full potential, while also better supporting host countries' transition towards low carbon development. While there has been significant interest in PoAs, proof of concept is still underway, with the World Bank and others testing its implementation on the ground.

Some preliminary insights and recommendations on PoAs are nonetheless emerging:

- Capacity building is needed in host countries to be able to assess opportunities and develop the necessary infrastructure and support for PoAs.
- Careful consideration must be given to the design of a PoA (including the integration of future CDM revenue streams in the PoA's financing) and the coordinating entity's administrative and technical capacity.
- Clarification of rules are needed to facilitate implementation, and more testing is needed.
- Scaling-up through PoAs will demand simplification of methodologies and additionality. It will also mean moving away from seeking to precisely measure every ton of GHG emission reduced (at each project site) to estimating with proper justification and confidence the total GHG impact of the PoA.
- While the current focus of PoAs is on aggregating micro activities (e.g., cooking stoves, solar homes), scaling-up will also require including aggregating projects of larger size (e.g., individual hydro schemes or mini co-generation schemes).

In the same host countries as JI, Green Investment Schemes (GIS) involve the earmarking of revenues generated by the sale of Assigned Amount Units (AAUs) for use in environmentally-related projects ("greening"). The GIS have emerged over the past two years as a potentially effective vehicle for programmatic approaches by offering transactional benefits: it allows stronger upfront financial leveraging with timing flexibility for the "greening" activities (that can occur later and beyond 2012). GIS experience in Central and Eastern European countries offers interesting insights: (i) the GIS implies a much larger role for host countries and requires significant implementation capacity; (ii) GIS success is contingent on careful consideration of program design and disbursement arrangements to ensure efficient implementation of "greening" activities; and (iii) timing flexibility of "greening" activities require careful consideration of enforcement and remedy provisions.

If successful, GIS may offer fertile ground to test programmatic/sector-based approaches for GHG mitigation (e.g., in energy efficiency), which could be relevant for other market-based mechanisms as well as for public funding mechanisms.

Looking ahead

Stabilizing atmospheric concentrations of GHG to prevent dangerous human-induced climate change will require dramatic scaling-up of efforts. A suite of instruments and sound policies are needed; with market-based instruments having demonstrated that they can be part of the policy-makers' tool box. There are three main factors that will determine and influence the extent to which it will be possible build on the experience with market-based instruments over the past decade and make them more efficient and effective instruments in helping to

meet the climate change and development challenges that lie ahead:

- **Policy clarity:** Clarity on the post-2012 international climate change regime, as well as on countries' plans to use market-based mechanisms to meet domestic GHG objectives, is urgently needed. This could happen either through a more efficient globally harmonized market or through more complex fragmented markets. In the absence of such clarity—which creates demand for emission reductions—the carbon market and carbon finance risk losing momentum. Perhaps more serious, is the real danger of not being able to sustain, and of even losing the capacity developed over the past decade in so many countries, organizations, and companies in terms of integrating GHG considerations into policy and investment decision-making processes, and sustaining emission reductions over the long term. The lost opportunities would exacerbate the challenge of mitigating climate change over the coming years.
- **Mechanism reforms:** The CDM appears be hitting a limit in terms of the volumes of project activities which can be processed in a reasonable timeframe, largely because of its rules and procedures and insufficient capacity. The Kyoto mechanisms' achievements have provided an important base on which to build. In order to scale-up and expand their reach, meaningful and expeditious changes are needed. The international community, CDM Executive Board, and UNFCCC Secretariat are taking important steps in that direction and follow-through will be critical. At the same time, countries are assessing options and developing strategies to mitigate GHG emissions and move towards low carbon development. Taking the Kyoto mechanisms to the next phase, whether that is through reforms and/or new mechanisms, requires consolidating all the "learning-by-doing" and rich experience over nearly a decade, and making necessary changes to reduce transaction costs, and to enhance clarity and predictability to enable better leveraging of carbon finance revenues.
- **Sustained capacity building and enhanced engagement with developing country partners:** The Kyoto mechanisms, their institutions, and the capacity built throughout the world over the past 10 years are a remarkable accomplishment. Along with ambitious emission targets and necessary changes to the mechanisms, the effectiveness of carbon finance, both in terms of GHG mitigation and its contribution to sustainable development, will be enhanced if it can build on synergies with host country policies and other financial instruments. Capacity in developing countries needs to be sustained and enhanced to provide an enabling environment that allows carbon finance to better leverage climate-friendly investments. Moreover, the evolution of the market-based mechanisms will benefit from greater engagement from developing countries to ensure that the mechanisms better integrate the practical realities and offer meaningful opportunities to support low carbon development priorities.

Building on 10 years of experience: where the World Bank goes from here

Through this report, the World Bank is celebrating its first decade of involvement in carbon finance. Looking back at the road traveled, it has been a fascinating journey of discovery of how market mechanisms can set in motion investments and behaviors that dramatically change the way we look at development opportunities in the World Bank's client countries.

As the report documents, it has been a difficult journey at times but one that has been highly rewarding and in which we have learned a lot. Today, the global community has a much better idea of not only what works and does not work, but also what can be done to let market mechanisms reach their full potential to achieve climate change mitigation at the scale required to address effectively the global challenge our planet faces.

Strengthened by the rich experience harnessed over the past decade and convinced of the need to continue its support for mitigation actions, the World Bank proposes to embark on its next ten years of carbon finance. There is still a lot more to learn from the portfolio of projects we manage as we continue to help project entities

bring these projects to full implementation and deliver the emission reductions they are expected to generate.

While the global community strives to put in place an international climate regime post 2012, the World Bank will continue its work to expand the scope, scale and range of climate change mitigation activities in the various sectors of its clients' developing economies. Filling the climate finance gap will require that both the public and private sectors get engaged on a significantly larger scale than heretofore. The private sector has indeed a key role in financing mitigation through carbon markets and related instruments; official flows or international funding will be an important complement to build capacity, correct market imperfections, and target areas overlooked by the market.

How it proposes to move forward matters. Building on its experience serving as a market maker (in the very early days), and a contributor to the global experiment that the first commitment period of the Kyoto Protocol has provided, the World Bank recognizes that the best chance for using carbon markets to achieve successful large-scale GHG mitigation in the future will be a partnership between all countries involved. Thus in addition to continuing to "learn by doing", as is still required in many respects, doing so in close partnership with all stakeholders will help find better solutions that address the urgent and critical challenges of climate change.

As a participant committed to making the carbon markets work, the World Bank proposes to continue its informal bridge-building work whenever desirable by, for example:

- Facilitating technical roundtable discussions, bringing together rule makers (e.g., UNFCCC), those responsible for applying the rules (DOEs), project or program entities, and other stakeholders;
- Providing a forum for host countries—through its Host Country Committee—to advise the World Bank on its carbon finance activities and share experience on the ground; and
- Facilitating participation of developing country sellers and regulators in forums such as Carbon Expo to bring them in direct contact with "the market";

Going beyond such informal initiatives, the *Forest Carbon Partnership Facility*, established in 2008, is an encouraging example of pioneering work undertaken by a strong partnership of more than 50 countries, dedicated to tackling the complex issue of REDD (Reducing emissions from deforestation and forest degradation) and beyond (REDD+) along with other REDD initiatives. Building not only knowledge, but also trust and confidence among all stakeholders involved, has proven critical to moving forward on the difficult REDD+ agenda.

In addition the World Bank seeks to build on the achievements of and lessons from its existing carbon funds, especially the BioCarbon Fund and the Community Development Carbon Fund, to better support the development needs of the least developed countries.

2 Introduction

2.1 What is carbon finance all about?

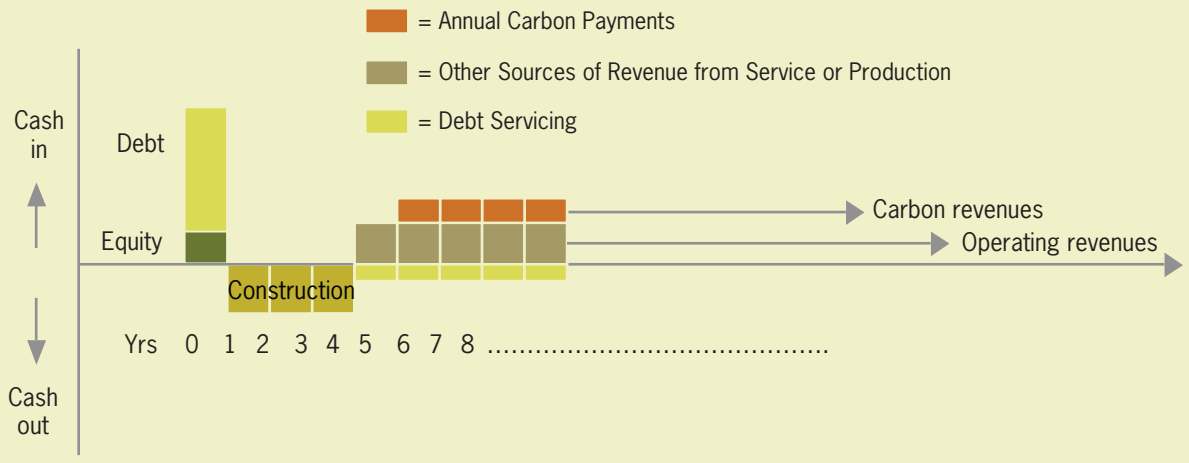
The Kyoto Protocol[4] to the United Nations Framework Convention on Climate Change (UNFCCC) provides the backdrop for carbon finance activities. Carbon finance is the generic name for the revenue streams generated by projects from the sale of their greenhouse gas emission reductions (see Figure 1) or from trading in carbon permits. It sets the basis for an innovative scheme to meet the GHG emissions objetives from industrialized countries through a global carbon market.

[4] The Kyoto Protocol was adopted in December 1997 and entered into force on February 16, 2005.

Indeed, the Kyoto Protocol provides that the industrialized countries (referred to as Annex I countries under the UNFCCC) can meet their quantified emissions obligations through (i) domestic actions (e.g., standards, taxes, subsidies, domestic emissions trading); and partially through one of the Protocol's three market-based mechanisms, i.e., International Emission Trading, Joint Implementation (JI), and the Clean Development Mechanism (CDM).

Marking the 10th anniversary of the establishment of the World Bank Prototype Carbon Fund (PCF)—the world's first global carbon fund—this report seeks to take stock of the World Bank's experience of working with these market-based mechanisms over the past decade. It shares insights and recommendations from the perspectives

FIGURE 1 Carbon finance: provides an additional revenue stream



of a practitioner, a carbon market player, a manager of carbon fund portfolios, and an active contributor to the regulatory process in terms of developing methodologies as well as providing assessments, analysis, and recommendations in response to the regulators' call for inputs.

Carbon finance is now a proven tool to support greenhouse gas mitigation. Market mechanisms, such as the CDM for greenhouse gas (GHG) mitigation projects hosted in developing countries, and JI for projects located in economies in transition, have demonstrated that they can complement and leverage other resources to unlock low carbon investment by overcoming barriers, driving innovation, and creating a revenue stream that sustains projects over time.

Kyoto mechanisms, developed under a "learning-by-doing" philosophy, have exceeded expectations, not only in terms of the number of projects, but also in terms of the awareness and capacity building that they have generated. They have certainly provided significant experience in the development, evaluation, implementation, and monitoring of GHG reduction projects.

The international community is entering into a new chapter of climate change mitigation that demands scaling-up all the mechanisms and tools at its disposal, including carbon finance. Such scaling-up requires analyzing the rich learning that has been gained over the past decade, consolidating it, and making necessary adjustments to enhance effectiveness and efficiency.

This report seeks to provide an objective assessment, based on practical operational experience, of the achievements as well as of the challenges that have been faced and that persist. It examines and explains the discrepancies between expectations and theoretical concepts, on the one hand, and practical reality, on the other. It also draws on concrete project experience to provide practical suggestions and recommendations to improve efficiency and effectiveness without compromising environmental integrity.

It is hoped that this work can be a constructive contribution to policy-makers and other stakeholders with responsibilities for advancing existing regulatory structures and frameworks to mitigate GHG emissions on a much greater scale. It is important that their response to the climate change challenge also supports the developing countries' transition to low carbon development.

2.2 How is the World Bank contributing?

Addressing climate change, both mitigation and adaptation, is a critical pillar of the development agenda and is intrinsically linked to the World Bank's mission of poverty alleviation and support of sustainable development in its client countries.

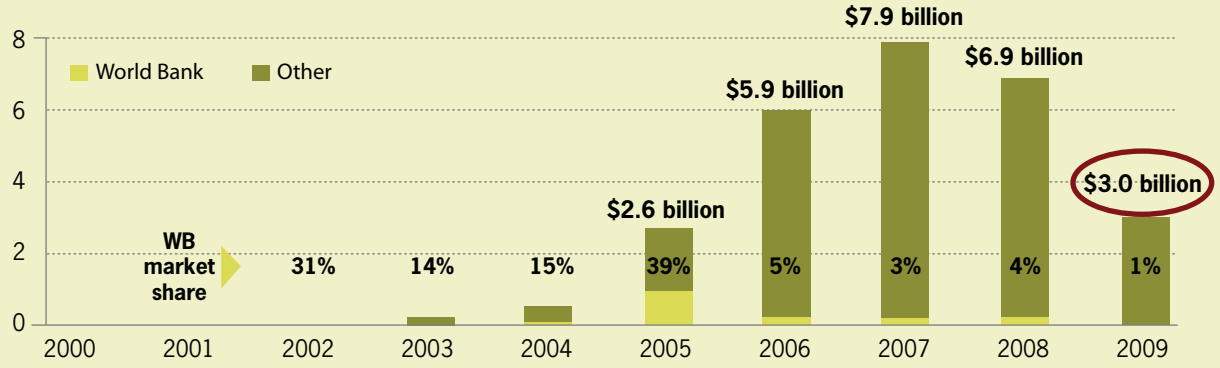
For the World Bank, carbon finance is part of a larger response to leverage development finance, and therefore complements other financial instruments. Thus, the insights gained from the World Bank's carbon finance initiatives are not only part of the larger global effort to combat climate change, but also go hand in hand with the World Bank's efforts to reduce poverty and improve living standards in the developing world.

> *"Climate change is a development, economic, and investment challenge. It offers opportunity for economic and social transformation…That is why addressing climate change is a critical part of the development agenda."*
>
> —Robert B. Zoellick, World Bank President
> UN Climate Change Conference,Bali
> December 2007

In April 2000[5], the World Bank, along with the government and private sector partners in the Prototype Carbon Fund (PCF), established the world's first global

[5] The establishment of the PCF followed earlier carbon finance preparatory and capacity building work undertaken in the late 1990s, when the World Bank engaged in a program of National Strategy Studies (NSS) and Activities Implemented Jointly (AIJ). The capitalization of the PCF increased to $180 million in 2002 and now stands at $220 million.

FIGURE 2 Value of CDM & JI transactions (per year)*
(US$ billion)



*vintages up to 2012.
Source: *State and Trends of the Carbon Market (WB).*

carbon fund[6], with an initial capitalization of $135 million. It was perceived as a bold move at the time, especially given that the entry-into-force of the Kyoto Protocol occurred 5 years later, in 2005.

The carbon market, in general, and the CDM in particular, have come a long way since the early pioneering days of the PCF (see Box 1). The PCF effectively helped catalyze what was then a nascent market for emission reductions into a vibrant carbon market. The CDM market had virtually no transactions in 2002, but growth was stimulated in 2005 by the Kyoto Protocol's entry-into-force, and the beginning of the EU Emissions Trading Scheme (EU ETS). The PCF helped pave the way for the increased participation of public and private buyers, that have dominated a much more dynamic carbon market. This is a welcome development and clearly part of the success story of the mechanisms. From 2003 to 2009, CDM/JI transactions totaled $27 billion, as illustrated in Figure 2. A marked decline in CDM/JI transactions in 2009 was largely due to the global economic downturn, the emergence of competing carbon assets (Assigned Amount Unit, AAUs), and the approaching end of the Kyoto Protocol's first commitment period in 2012, which is closing the window for many new projects that would otherwise enter the JI/CDM pipeline[7].

Since the PCF, the World Bank has created a whole family of funds and facilities (see Annex 1)—currently capitalized at approximately $2.5 billion, and involving participants from 16 governments and 66 firms. The World Bank's approach to carbon finance and its engagement in carbon markets has been guided by 3 main objectives:

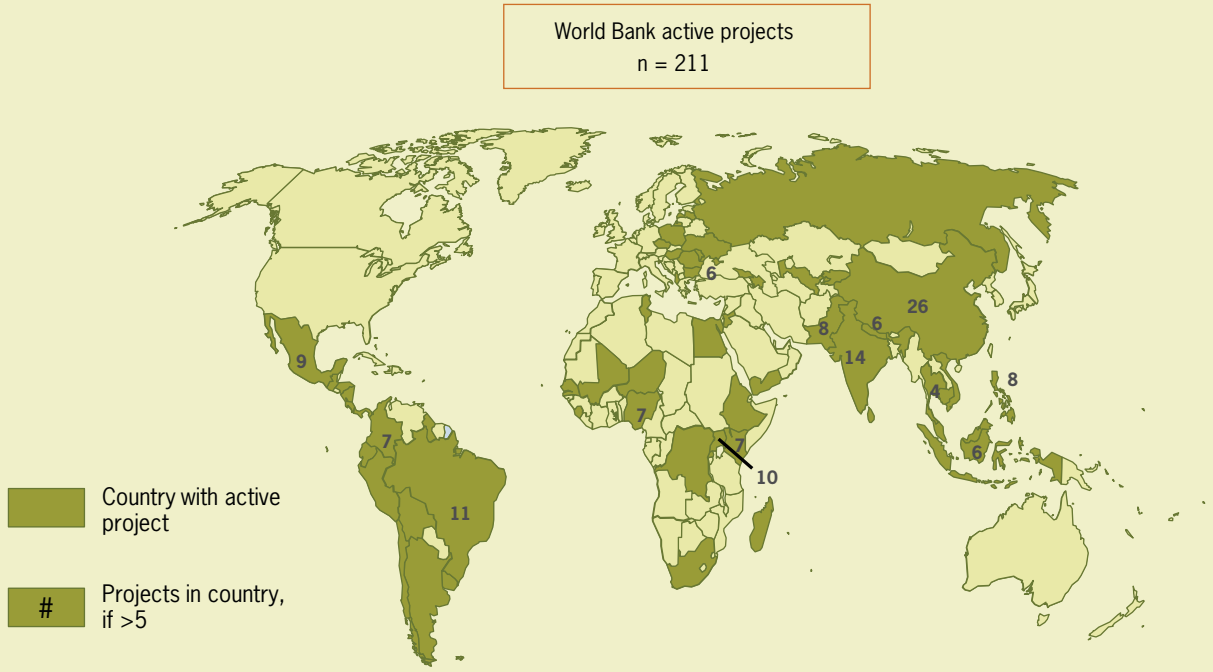
- Ensure that carbon finance contributes to sustainable development, beyond its contribution to global environmental efforts;
- Assist in building, sustaining, and expanding the market for GHG emission reductions; and
- Strengthen the capacity of developing countries to benefit from the carbon market.

The World Bank, through its carbon funds, has one of the largest portfolios in terms of the number of projects.

[6] The PCF, as well as the subsequent World Bank carbon funds, is a "compliance" fund, whereby fund participants do not receive financial returns, but rather receive their pro rata share of emission reductions generated by the fund portfolio in return for their financial participation in the fund.

[7] For more information on the performance of the carbon market, please see Kossoy and Ambrosi, 2010, State and Trends of the Carbon Market 2010, The World Bank.

FIGURE 3 World Bank's carbon finance portfolio by country



It is arguably one of the players with the longest history, as well as possibly the one with the most diversified project portfolio in terms of both geographic and sector coverage (Figure 3) and type of technology (Box 1).

World Bank experience as a pioneer in carbon finance transactions

From the early beginnings of the PCF in 2000, the World Bank has established a 10-year track record of developing carbon finance transactions with an active portfolio of different carbon assets secured through contracts to purchase emission reductions, paying for them annually or periodically once they have been verified by a third party auditor and (in most cases) issued as Kyoto-compliant assets. (See Annex 2). These carbon assets are:

- CERs: Certified Emission Reductions from CDM projects;
- ERUs: Emission Reduction Units from JI projects;
- AAUs: Assigned Amount Units associated with project activities in JI host countries;
- tCERs: Temporary Certified Emission Reductions associated with CDM forestry projects; and
- VERs: Verified Emission Reductions[1] associated with some early carbon finance transactions. VERs are paid upon successful verification by an independent auditor, with the aim of subsequently being converted into a Kyoto asset (i.e., CER, ERU, tCER or AAU).

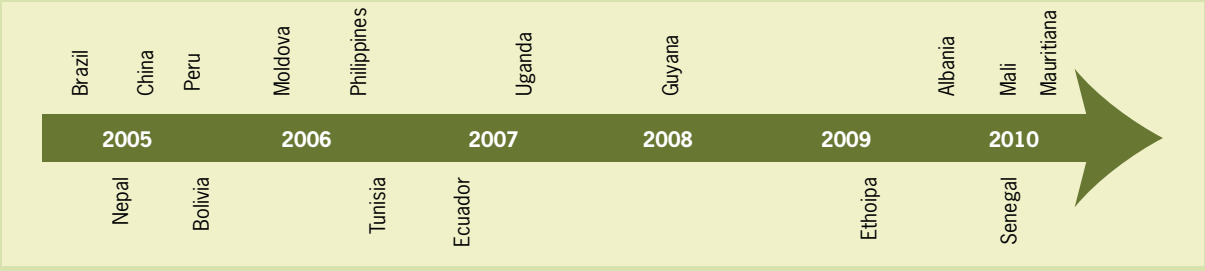
Today, the World Bank continues to assist in the building, sustaining, and expanding of the market for GHG emission reductions and to contribute to host countries' sustainable development. The portfolio is diversified and wide-ranging, spanning 57 developing countries and economies in transition and 23 different technology types as diverse as energy-efficient lighting in Senegal, efficient brick making in Bangladesh, solid waste management in Mexico, wind power in China, and reforestation of the River Nile Basin. At the same time, the World Bank portfolio includes a significantly greater share of projects hosted in Africa than the global CDM experience, providing important learning and experience on extending the reach of carbon finance to the poorest developing countries. In several countries, identified in the figure below, the World Bank carbon finance activities facilitated the registration of their first CDM project.

Similarly, the World Bank carbon funds have pioneered many first-of-their-kind technologies: they were the first to register projects in 7 different technology categories[2], thereby opening the door for the subsequent registration of 411 (mostly non-World Bank) projects.

The World Bank has also taken an active role in contributing to the bottom-up rule-making for the CDM by providing inputs to the CDM regulatory body (the Executive Board), and developing new methodologies. To date, the World Bank has contributed to the development of 52 different methodologies across 12 sectors. More recently, the World Bank has also engaged intensively in the policy discussion to develop programmatic approaches for scaling-up and extending the reach of carbon finance transactions. This has been combined with actively testing and implementing the concept, as demonstrated by the inclusion of 17 CDM Programmes of Activities (PoAs) in its pipeline and portfolio, including the registration of the first PoA in Africa (and third in the world).

The pioneering spirit continues, with the establishment of 2 facilities focused on the post-2012 period: the innovative Forest Carbon Partnership Facility (www.forestcarbonpartnership.org) and the Carbon Partnership Facility (www.carbonfinance.org).

Note: The Félou regional hydro power project registered in May 2010 is registered as a project by the UNFCCC in Mali, Senegal and Mauritania as the entity distributing power to these three countries is managed by their collective governments.



[1] The difference between VER transactions and transactions involving Kyoto assets is that the buyer pays upon delivery of a verified emission reduction and thus assumes the Kyoto regulatory risks (i.e., of converting to a Kyoto asset). The prices paid for VERs are thus lower than prices paid for CERs.

[2] Based on UNEP RISØ categories, http://uneprisoe.org/

Box 1.1

3

Origins & Implementation of the Clean Development Mechanism and Joint Implementation

3.1 The Kyoto Protocol & the Marrakesh Accords

The ultimate objective of the UNFCCC, adopted in 1992, is the "stabilization of greenhouse gas concentrations at a level that would prevent dangerous anthropogenic interference with the climate system." It provides the overall framework for governments' collective efforts towards climate change mitigation, following "common but differentiated responsibilities" based on "respective capabilities."

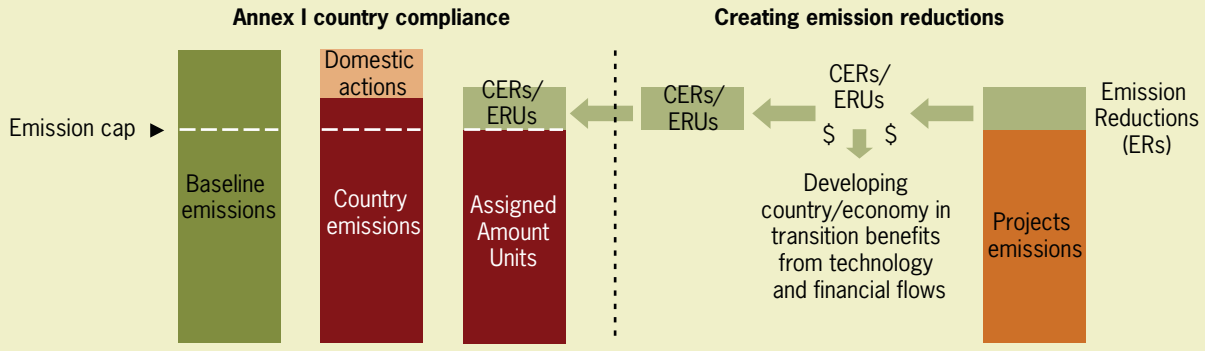
The Kyoto Protocol to the UNFCCC (adopted in 1997 and entered-into-force in 2005), provides for specific quantified emission obligations for industrialized countries (including countries with economies in transition from Central and Eastern Europe). These countries, referred to as Annex I countries under the UNFCCC (and listed under Annex B in the Kyoto Protocol), have collectively agreed to reduce their GHG emissions by approximately 5% below 1990 levels on average during the Protocol's first commitment period from 2008 to 2012. This essentially translates to a 5-year emissions budget for each Annex I country called Assigned Amounts. Developing countries have no quantified emissions obligations.

The Kyoto Protocol provides that Annex I countries have flexibility on the domestic policies and measures they wish to implement to meet their respective emissions obligation. They may also meet some proportion of their quantified emission obligation through three market-based mechanisms ("Kyoto Mechanisms"), namely:

- The "Clean Development Mechanism," which allows the transfer of Certified Emission Reductions ("CERs") to Annex I countries from projects located in non-Annex I countries under Article 12 of the Kyoto Protocol;
- "Joint Implementation," which consists of the transfer, on a project-by-project basis, of Emission Reduction Units ("ERUs") among Annex I countries under Article 6 of the Kyoto Protocol;
- "International Emissions Trading," which allows the trading of Assigned Amount Units ("AAUs") and other Kyoto Protocol credits (including CERs and ERUs after they have been generated by a project) among Annex I countries under Article 17 of the Kyoto Protocol. "Assigned Amounts" refers to the quantity of GHGs that a party to the Kyoto Protocol is allowed to release into the global atmosphere as calculated on a yearly basis in Annex B of the Protocol.

The first two mechanisms, which generate CERs and ERUs, are "project-based," in that they enable Annex I countries to purchase ERs from projects that reduce or sequester GHG emissions in economies in transition and non-Annex I countries. Each individual CER, ERU, and AAU equates to one metric ton of carbon dioxide equivalent (tCO_2e) and is of equal weight for the purpose of meeting the emissions obligations of Annex I countries.

FIGURE 4 How project-based mechanisms work



The rationale behind the adoption of market-based instruments as a key element in policy-makers' tool box to meet GHG objectives stems from the fact that (i) the costs of mitigation are not evenly distributed across sectors or around the world; and (ii) the impact of a ton of GHG emitted in the atmosphere is insensitive to the location where it occurs. Given that capital is not unlimited, it makes sense to provide flexibility to seek to mitigate GHG emissions where it is most cost-effective to do so. Figure 4 seeks to illustrate how the project-based mechanisms work in the context of meeting the overall GHG obligations of industrialized countries. Reductions of emissions from an eligible CDM/JI project below a baseline can be used towards meeting the obligations of Annex I countries, or their entities.

While the Kyoto Protocol created the mechanisms and outlines the main principles, the rules and modalities for the implementation of the Kyoto mechanisms (discussed later in the report) took some time to assemble. They were finalized in 2001, through the adoption of the 2001 Marrakesh Accords[8].

3.2 The project cycle

The CDM and JI[9] project cycles are similar to usual project investment cycles (i.e., they include such steps as feasibility studies, seeking financing, obtaining construction and environmental licenses), although new elements are added, such as the preparation of a project design document (PDD), the validation of the project, and the verification of emission reductions (Figure 5). In theory, these can be undertaken concurrently with the normal development of a project, but it has not always been possible to do so in practice, since delays in the CDM, as well as JI, have lengthened the overall project cycle. In some cases, reaching the implementation stage takes longer than expected, particularly when projects occur in environments with low capacity or complex regulatory or approval procedures.

Not all project ideas can be converted into CDM or JI project activities as there are more project ideas than there is financing available.

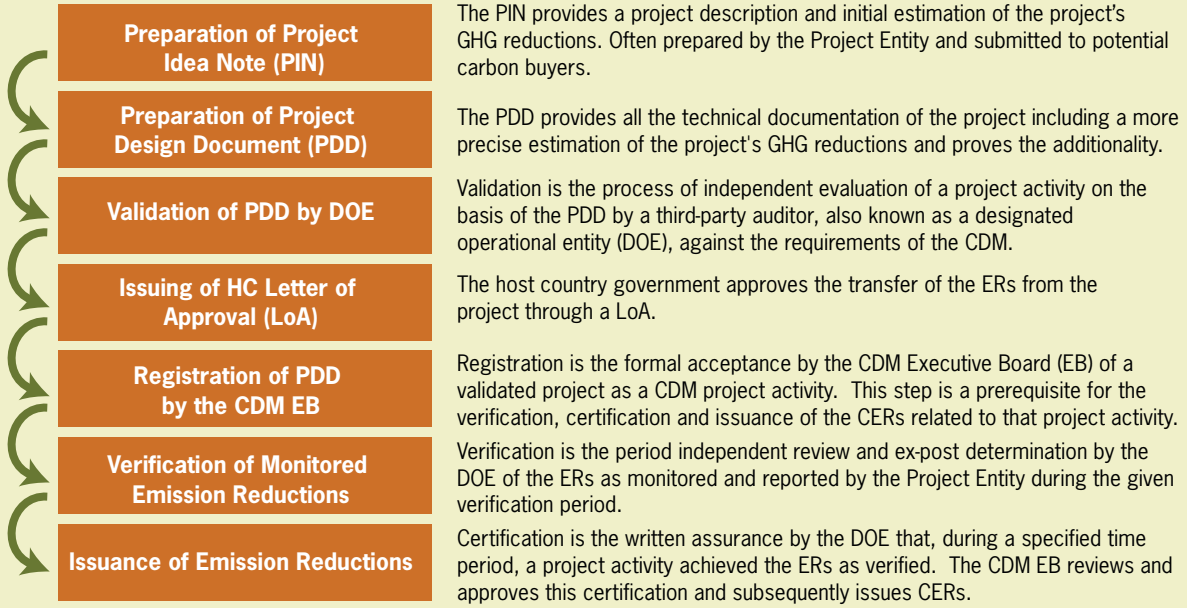
3.2.1 *From a project idea to a carbon finance project*

In the context of its carbon finance activities, the World Bank reviews every project idea note (PIN) proposed

[8] The 2001 Marrakesh Accords (FCCC/CP/2001/13/Add.2) can be found on the UNFCCC website: http://unfccc.int/resource/docs/cop7/13a02.pdf

[9] CDM and JI operate under distinct regulatory frameworks. However, the underlying work to develop a carbon finance transaction is essentially the same.

FIGURE 5 Steps in CDM process



Source: Based on JI project cycle template provided by Global Carbon and information on the UNFCCC website.

for inclusion in its carbon finance pipeline. It has now reviewed more than 1,100 PINs, about half of which have been retained for inclusion in its pipeline of projects. The main reasons for not accepting PINs related to uncertainties concerning the eligibility of the proposed idea as a CDM or JI project and the capacity of the project entity to turn the idea into reality. Subsequently, approximately 40% of the approved PINs "survived" and became "active projects" in the World Bank portfolio or pipeline (with the remaining 60% dropping out of the pipeline)[10], as indicated in Table 1.

The significant drop-out rate between approved PINs and active projects can be attributed to:

- the challenges of project financing (the main reason for abandoning a project is typically the inability to reach financial closure);

TABLE 1 From project idea to registration: the World Bank experience

Attrition Rate*	
As of March 1, 2010	
Number of PINs reviewed	1,151
Project Ideas accepted	534
Number of active projects	211
Number of projects that will be sent for Registration/Determination	67
Number of projects in process of Registration/ Determination	75
Number of projects that are Registered/Finally Determined**	69

** PoAs are considered a single project*
*** 21 of the 69 Registered/Determined projects have issued*

[10] Other carbon finance portfolio managers have also reported the experience of reviewing large numbers of project ideas to ultimately pursue a smaller subset. For example, the Nordic Environmental Finance Corporation (NEFCO) reports having evaluated 200 investment proposals through the Baltic Sea Region Testing Ground Facility (TGF) to ultimately develop a portfolio of 13 projects. (http://nefco.org)

- implementation delays due to the time and procedures required to obtain the necessary approvals and licensing from relevant national authorities;
- the challenges of the changing CDM or JI methodologies and requirement to adhere to each new guidance after project development and regulatory delays;
- an insufficient carbon finance revenue stream in a market where the value of emission credits is not clearly defined beyond 2012; and
- the challenges of clearing due diligence screening processes, including meeting the World Bank social and environmental safeguards (Annex 3).

It is also the case that a few projects were eventually withdrawn from the World Bank pipeline and, later developed by another project developer or buyer.

About one-third (69) of the World Bank active projects have been registered with the CDM Executive Board (EB) or finally determined as JI projects. The remainder either have been submitted for registration and are awaiting a decision (67) or are in the process of being submitted (75). This statistic is slightly below that of the global CDM pipeline where about 40% of the projects have been registered, mainly due to the longer time spent in validation on average (discussed later).

To date, all World Bank projects that were validated and submitted for registration have been successfully registered (the success rate for *all* the projects submitted for registration by the CDM is 96.5% according to UNEP RISØ). The ultimate goal is, of course, to register (or "finally determine" in the case of JI) all the projects in the pipeline and to generate emission reductions which can be issued.

Features of a successful project

What are the features or circumstances of a project that make it more likely to become a successful CDM or JI project activity? From our experience of looking at more than 1,100 project ideas and actively working on more than 200 projects, it is possible to outline four key "success" factors. These key features closely mirror those found in successful development projects more generally:

- **A committed champion**: Someone within the company or government who enthusiastically promotes the progress of the project through its critical stages to obtain resources and/or active support from top management. External technical assistance may be necessary when facing low capacity, but temporary consultants do not make effective champions.
- **Strong project design & planning from the start**: This includes feasibility studies as well as financial and methodology assessments early in the project cycle. Detailed upstream financial and technical due diligence must be completed on project ideas, and early consideration must be given to monitoring requirements that will arise once the project is operational (or commissioned) and ready to generate emission reductions.
- **Strong project financing**: Projects must make financial as well as technical sense to lead "to real, measurable and long-term benefits related to mitigation of climate change" as per the Kyoto Protocol. Furthermore, like other investment decisions, CDM/JI projects are also affected by the issues and challenges of the overall investment climate in host countries.
- **Clear potential to meet objectives (in this case) reduce emissions**: Projects that have the ability to reduce large volumes of GHG reductions relative to their baseline are more likely to attract investors and carbon asset buyers. Also, larger projects are better able to absorb the fixed CDM transaction costs.

Risk assessment

While there are evidently close parallels to be drawn between more typical development projects and CDM/JI projects, it is also clear that CDM/JI projects, while providing additional benefits in the form of carbon finance, also involve additional risks. In addition to the usual political and technical/commercial business risks, there are specific CDM/JI risks. There is no single or uni-

Box 2

World Bank approach to assessing CDM/JI project performance risks

A project's expected emission reductions are outlined in its project design document (PDD). However, the actual performance of a project and its emission reductions can be affected by a variety of factors. To estimate what will be the actual emission generation and issuance, the World Bank conducts a risk assessment of each project. A project's estimated emission delivery evolves through its lifecycle.

The World Bank's project performance risk assessment tool estimates project risk on the basis of historical performance of projects with similar characteristics, enhanced by project-specific assessments. Qualitative inputs, based on knowledge of the specific circumstances of each project, are also taken into account.

The tool evaluates a project's expected future emission reductions performance using six risk categories: (i) Financial Risk; (ii) Technology & Implementation Risk; (iii) Social & Environmental Risk; (iv) Methodology, Monitoring & Verification Risk; (v) Host Country Regulatory Risk; and (vi) Additionality Risk. These categories were identified based on the World Bank's collective experience and represent the key drivers of a project's emission credit issuance probability. The first three risk categories are common to any project finance activity, while the next three risks are specific to carbon finance activities. The tool also takes into account the "Business Environment Risk," which reflects risks such as poor governance, civil war, and sovereign default. These can affect project implementation, performance, and thus the expected emission reductions to be generated.

form way (or tool) to assess risks from CDM/JI projects. Box 2 provides an overview of the World Bank's approach for performing a risk assessment of the performance of individual CDM or JI projects.

Project preparation phase

The World Bank carbon funds typically get engaged in carbon finance transactions at the inception stage, i.e., at the time when a project idea is developed. They are therefore focused on the "primary" segment of the market for CERs (and ERUs). Once a project idea is approved in the World Bank pipeline, it enters a phase of project preparation where, on the one hand, the standard World Bank due diligence is conducted, and on the other, the carbon asset is developed according to CDM/JI rules. This may involve the following:

- working with the project entity to assist it in its efforts to secure financial closure;
- ensure the proposed project is developed in accordance with the CDM/JI rules (e.g., ensuring that proper baseline measurements and data gathering are done according to CDM methodologies);
- developing a new methodology, as was the case particularly in the early days of the Kyoto mechanisms; and
- developing a Project Design Document (PDD)[11], which includes the project description i.e., the baseline methodology, monitoring methods/plan, GHG emission calculations, a statement of environmental impact, and any stakeholder comments received.

Signing of the Emission Reductions Purchase Agreement (ERPA)

Every project has its own specificities. However, in the World Bank's experience, it takes, on average, roughly two years from project idea acceptance to the signing of an ERPA. But the timeline for signing the ERPA can vary for different sellers and buyers (and has varied within the World Bank portfolio) and depends on the willingness and expectations of both buying and selling parties. Signing the ERPA earlier in the project development cycle, when there are more uncertainties and risks, implies a relatively lower

[11] See UNFCCC CDM website: http://cdm.unfccc.int/index.html; the UNEP "CDM Information and Guidebook" is also a good reference.

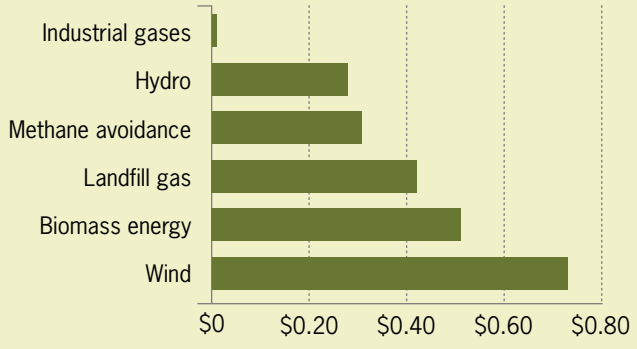
price; and signing later when there is greater certainty on the project's prospect, typically resulting in a higher price. With a legal commitment the World Bank typically actively engages with the project entity to support the project's progression through the CDM/JI project cycle.

Costs

In terms of the costs of developing a carbon finance transaction from PIN up to the signing of an ERPA, the experience of each project developer, buyer or project entity itself will likely be different and there is no standard reference.

From the World Bank carbon funds, costs associated with the preparation of a project, including due diligence work, have amounted on average to about $200,000 per project (excluding additional regulatory costs for validation and periodic verifications, and excluding any capacity building work[12]). Project preparation costs vary with the countries in which they are undertaken, the capacity of the project entity, the type and size of the project, and the complexity of the due diligence work. Figure 6 shows the unit cost (per expected ton of CO_2 reduced) according to different types of projects in the World Bank portfolio.

FIGURE 6 World Bank project development costs by technology ($/expected ton of CO_2 reduced)



Source: World Bank, 2009 (from 53 World Bank registered CDM projects considered)

The differences in unit project costs largely correlate with project size. Unsurprisingly, the project development unit cost for large projects, and notably the industrial gas projects[13], are very low due to the large volume of expected emission reductions from these projects. In other words, technologies that provide for larger scale projects generate more emission reduction credits, thereby spreading the fixed costs.

3.2.2 *Validation: independent audit*

The validation, conducted by an accredited Designated Operational Entity (DOE), is the process of independently evaluating a project activity on the basis of the Project Design Document (PDD) against the CDM requirements[14]. This step is critical to maintaining the environmental credibility of the system, as it essentially serves to check every project, through desk review as well as a site visit, so as to correct any errors, and in the extreme, remove non-CDM compliant project proposals from the CDM pipeline.

- In practice, a DOE's validation decision typically goes through 3 internal levels of review:
- The audit team reviews the PDD and supporting documentation, conducts a site visit, and produces a validation protocol with their assessment and recommendation.

[12] The World Bank and other organizations have done a lot of work on capacity building to enable host countries and the local private sector to understand the Kyoto mechanism, and to assess carbon finance opportunities. This work is difficult to quantify and not included in the project preparation cost estimate, but has clearly been critical and beneficial to all market players involved in the CDM (and JI).

[13] The First Tranche of the World Bank Umbrella Carbon Facility consists of 2 large HFC-23 projects in China.

[14] This section focuses on the CDM process, but it should be noted that the JI process is similar, with the term "determination" used instead of validation. Under JI, the determination is performed by Accredited Independent Entities.

[15] The UNFCCC uses the term "project participant". An entity can become a project participant before or after registration of a CDM project, but must always have a letter of approval from a Kyoto Protocol Party before it can do so and subsequently receive CERs from that project. (CDM Rulebook, http://cdmrulebook.org/69)

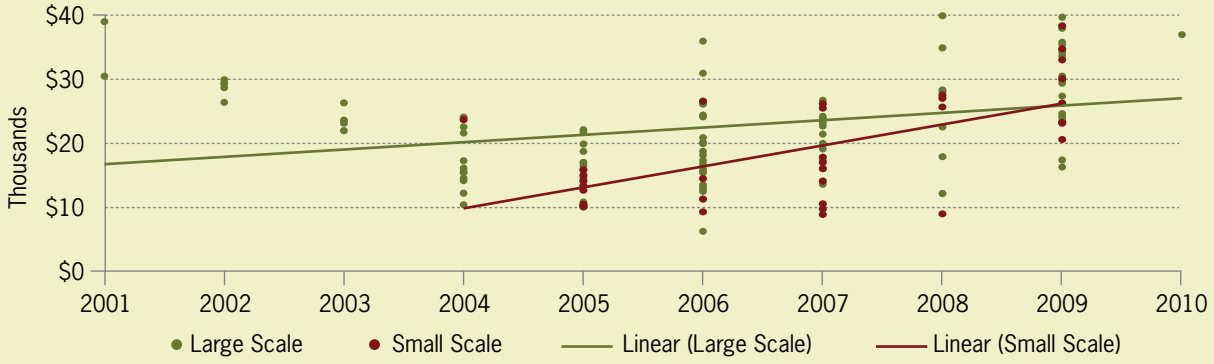
- Once all questions are addressed by the project entity[15] based on clarifications and additional supporting documentation, a draft validation report is produced by the audit team. The draft validation report is then sent for an independent internal technical review by certified sector experts, who will clear it or issue further requests for information. Any additional request has to be responded to by the audit team and/or the project participants and then cleared by the sector experts.
- Once the document has been cleared, it will be finally checked for completeness and consistency before a final validation report is issued (additional requests could come from this last check).

The time required to complete a project's validation has increased over the past years. It currently takes approximately 12 months, on average, to complete, with some variability depending on the project. The costs of validation for individual projects have been on an upward trend (see Figure 7), reaching on average $28,000. Moreover, small-scale projects have *not* been exempted from the trend of increasing validation costs. In fact, they have been increasing faster than for larger projects, even though the intention from the Marrakesh Accords was to simplify procedures for small-scale CDM projects. This may be in part because validation (and verification) prices are not based on the size of the project, but rather on its degree of complexity, and small projects are often in sectors that tend to be more complex to validate (e.g., a small-scale dispersed solar home system project is more complex than a single large industrial facility).

The increase in DOE costs and the extended time it takes to complete validations have been driven by several factors such as: (i) a sharp increase in the demand for DOE services; (ii) the lack of, and competition for, CDM experts; (iii) CDM regulatory demands, volatility[16], and restrictions; (iv) risks (reputational, financial); and (v) insufficient systematic support from the CDM EB and the UNFCCC Secretariat (for example, the validation and verification manual was only finalized in November 2008). Another important factor has been the increasingly vocal concerns of stakeholders and the CDM

[16] For example, methodologies have been revised over time with more stringent requirements, provoking surges in submission prior to changes. As a CDM project and its PDD are developed closely following an approved methodology, when methodologies are about to be changed (which can be frequent), project developers that are developing a project using that methodology typically rush to submit their projects to avoid having to make significant changes to the project or its documentation, as these can be costly and can have significant impacts on the project if methodology changes are significant.

FIGURE 7 Cost of CDM validations (World Bank experience)



Note: Inflation-adjusted (2010 dollars) €/$ exchange rate calculated as spot FX rate on day of transaction
Source: World Bank portfolio and pipeline (2010).

EB regarding the too often unsatisfactory quality of validations. Increased scrutiny at registration by the CDM EB and enacted DOE suspensions,[17] (thus creating significant reputational risks) are resulting in more detailed questions and documentation requests at the validation stage. In the World Bank's experience, these requests are sometimes excessive.

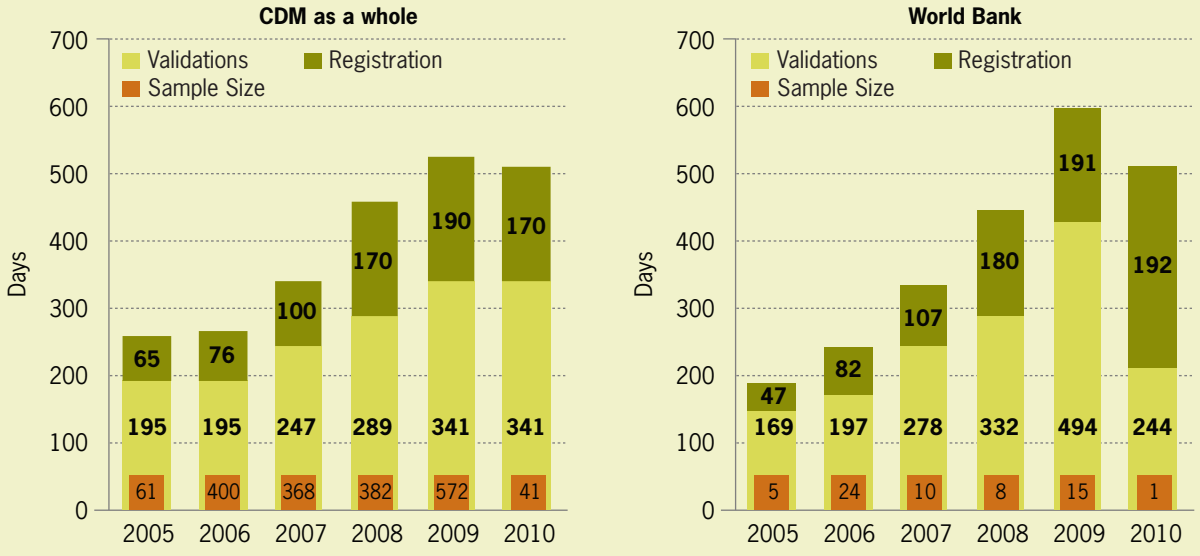
The World Bank recognizes that some of the delays during validation may not be caused by DOEs themselves. Once DOEs request documentation, project participants may not always be prompt in responding to these requests, thereby slowing down the validation process. Experience shows that weak capacity at the project entity level has a clear impact on the validation timeline. It is also the case, as discussed later, that some of the documentation requested is simply not adapted to reality in some host countries, such as in least developed countries (LDCs) or for some types of projects such as micro-scale or small-scale projects. There may also be delays at the level of the host country CDM Designated National Authority (DNA) who is responsible for providing a letter of approval (LoA) for each proposed CDM project[18]. Indeed, while there is considerable variation among countries regarding the time required to secure an LoA, it takes more than 5 months on average (UNEP RISØ 2010).

In 2009, validations of World Bank projects have taken, on average, longer than the average time for a project in the global CDM pipeline (Figure 8). Explanations can be found by looking at the characteristics of the few specific projects that took an unusually long time to validate and influenced the average performance of the World Bank's smaller validation sample, such as the Uganda Nile Basin Reforestation project which took more than 800

[17] Since late 2008, four DOEs have been suspended at various times by the CDM EB, with two of them reinstated to date. Together, these four DOEs are involved in more than 60% of the global CDM pipeline.

[18] The DNA must issue the necessary statements that the project entity participates voluntarily in the project and must confirm that the project activity assists the host country in achieving sustainable development.

FIGURE 8 Length of CDM project registration process (from start of validation)



Note: Purposely exclude projects that went to re-evaluation
Source: UNEP RISØ

days to validate. The characteristics of this project and a few others that took a long time to validate include:

- weak project entity capacity, which is a critical factor;
- relatively new sectors and methodologies, as well as country contexts with which DOEs were not yet very familiar and where there were no (or limited) precedents from which to draw;
- changes in methodology during the course of validation; and
- delays linked to the DOEs (i.e., DOE suspension, lack of capacity, frequent changes in auditors).

As regards the environmental effectiveness of the validation process, one (albeit insufficient) indicator is the rate of rejection. Not all projects submitted for validation receive a positive outcome. As outlined in Table 2, the DOEs have rejected 7% of the projects that underwent validation between 2003 and 2010. Key issues at the validation stage usually relate to (i) the applicability of the CDM methodology; (ii) the baseline; and especially (iii) the determination of a project's additionality.

3.2.3 *Registration: regulatory approval*[19]

For CDM projects, the largest risks associated with the registration process are twofold: (i) rejection; and (ii) delay. As noted earlier, the World Bank has a good track record regarding registration (i.e., no rejection); and so does the CDM in general (i.e., success rate of 96.5%). The largest risk for the World Bank and other projects in the global CDM pipeline is delay, which can be significant and have important implications.

The assessment of the registration process and its delays must be made against the backdrop of the fact that there are now more than 2,100 registered CDM projects, which in itself is a testament to the impressive amount of interest and action the CDM has generated on the ground. It surpasses general expectations at the time the Kyoto Protocol and the Marrakesh Accords were agreed[20].

A successful registration means that the validated project becomes a CDM project and can generate CERs,

TABLE 2 **Projects submitted for validation between 2003 and 2010: rejection rate**

	Rejected at validation*
# of projects that have completed validation	2,251
Projects receiving negative validation	148
Percentage	**7%**

Source: UNEP RISØ, March 2010
*excluding validations terminated prior to completion & validations withdrawn

which can be used to offset the emission obligations of the Annex I countries that have ratified the Kyoto Protocol[21], as well as the emissions of installations covered in the EU ETS, and in any other domestic emissions trading scheme recognizing CERs as a compliance asset.

But there is room for improvement in this process. As acknowledged by the CDM Executive Board (EB) in its November 2009 EB's annual report that was discussed at the Copenhagen climate negotiations:

> *The challenge for the Board, and the [secretariat] as part of its support structure, remains unchanged: to efficiently implement and administer the mechanism while ensuring its environmental integrity.* (FCCC/KP/CMP/2009/16, paragraph 10)

Indeed, the current situation contrasts with what was envisioned by the 2001 Marrakesh Accords[22] where 8 weeks was the agreed timeline to complete the registration of a project (except in the case of requests for reviews —discussed later). Projects seeking to be registered currently need, on average, 6 months to complete the CDM registration process.

[19] This section focuses on the CDM experience. Registration is referred to as "final determination" under JI rules.
[20] See, for example, Haites 2004, Rahman et al. 2010, or Dhakal 2001.
[21] Annex B of the Kyoto Protocol lists the countries with quantified emission obligations. All Annex B countries have ratified the Kyoto Protocol, with the exception of the United States. (http://unfccc.int)
[22] See the modalities and procedures for a Clean Development Mechanism as defined in Article 12 of the Kyoto Protocol: FCCC/CP/2001/13/Add.2, paragraph 41.

The completeness check by the UNFCCC secretariat—marks the point at which projects having received a positive validation by the DOE are submitted to the CDM EB for registration—was not a step originally envisioned in the Marrakesh Accords' CDM modalities and procedures. This completeness check is currently taking approximately 3 months to perform. In addition to understaffing at the UNFCCC secretariat[23], a key reason for such delay is the deliberate use of the completeness check as an additional quality control on the technical content of the project submission (i.e., an additional check on the successfully validated project), rather than simply focusing on the completeness of all the documentation.

In addition to the challenges at the validation and completeness check stages, CDM projects have been experiencing increasing delays even after passing a successful validation and completeness check.

It was originally envisioned that the CDM EB would focus its activities on the more executive functions of broader CDM policy and guidance, and would largely rely on the independent and accredited DOEs to scrutinize individual projects at validation and on that basis process the registration of successfully validated projects. However, the Marrakesh Accords have provided for the possibility to request reviews of the registration of a project activity when deemed warranted by either (i) a party involved[24] in the project activity, or (ii) at least 3 members of the EB. The parameters for reviewing a request for registration are set as follows:

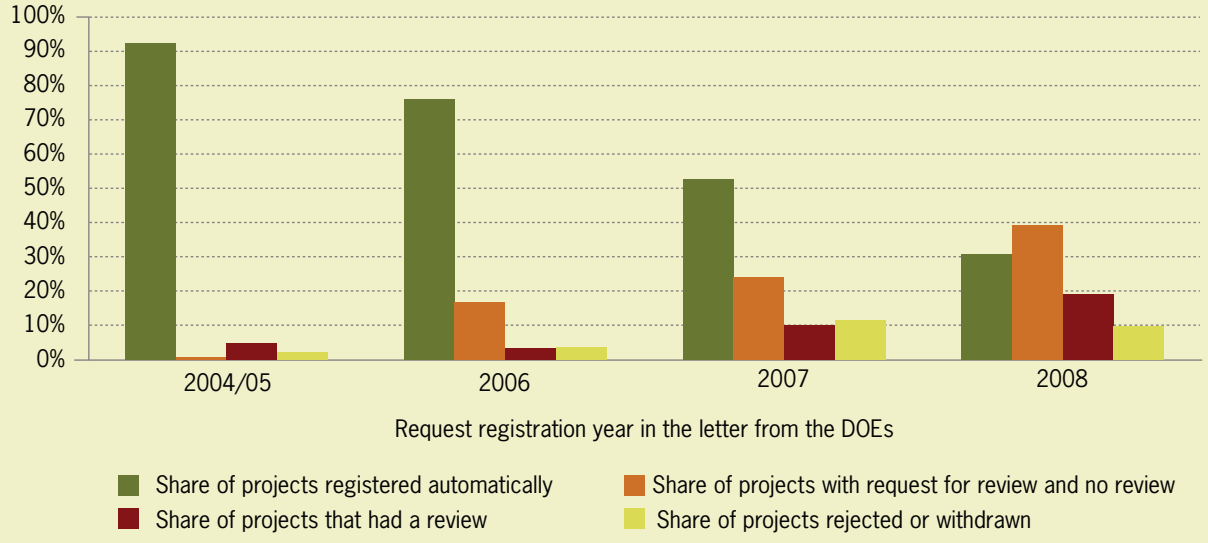
The review by the Executive Board shall be made in accordance with the following provisions:

- *It shall be related to issues associated with the validation requirements.*
- *It shall be finalized no later than at the second meeting following the request for review, with the decision and the*

[23] See Annex 12 of report from February 2010 meeting of the CDM Executive Board (EB 52).

[24] There are usually two Parties involved in a CDM project activity: (i) the host Government; and (ii) the Annex I Government (that authorizes the participation of the Annex I buyer).

FIGURE 9 Request for registration by year: EB decisions



Source: UNEP RISØ, March 2010

reasons for it being communicated to the project participants and the public (3/CMP.1, Annex, paragraph 41).

It is understood that the review process was introduced to ensure that all projects are credible and to avoid crediting non-eligible projects. Concerns over the quality of the DOE's work have prompted the EB, particularly in recent years, to make frequent use of the provisions for reviewing a request for registration. In its 2009 annual report, the EB acknowledged that it has been "*...required to review an unacceptably high proportion of projects*" to ensure environmental integrity.

Roughly 50% of all CDM projects (i.e., 1,091 out of 2,256 projects) had requests for review at registration, but that overall figure masks the yearly evolution (Figure 9). In fact, while approximately 90% of projects submitted for registration in 2004/2005 were registered automatically by the CDM EB, this proportion has consistently decreased and has shrunk to 30% in 2008—the last date for which a complete set of data is available for this statistic. This means that out of all the projects requesting registration in 2008, the EB decided to review the request for registration for 70% of them. By 2008, less than 7% of all projects submitted for registration had been rejected and denied registration.

In addition to the direct transaction costs associated with validations and the costs to project participants of going through the CDM approval process (in terms of staff resources), it is also important to take into account the impact of the delays. Registration delays push back the date on which a project can start generating CERs, which effectively reduces the potential volume of CERs that can be transacted, as the majority of CER buyers seek to purchase CERs for compliance with the Kyoto Protocol's first commitment period ending in 2012. These delays can therefore be particularly costly. Table 3 seeks to illustrate the financial impact of the increases in CDM approval delays for individual projects through hypothetical examples: a loss of revenue amounting to €277,000 for a small project to €1.1 million for a large project, assuming a price of €9.5 per CER. Not quantified here, but also critical, is the impact the delays are having on a project's cash flows.

Thus, the more a project relies on CDM revenues for its financial viability (or said differently, the more "additional" is a project), the greater the weight that CDM regulatory risk has on its overall risk profile.

At the aggregate level of the entire CDM, the value of lost CERs associated with the increase in approval delays observed since 2008 is estimated to be around €800 million (Figure 10).

There are also implications in terms of cost of money, with revenues today worth more than revenues tomorrow, as well as important broader implications in terms of potentially causing loss of interest and possible

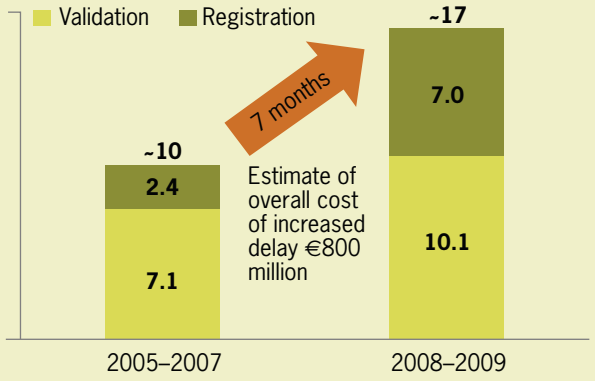
TABLE 3 Quantification of lost revenues from CDM approval delays: hypothetical project examples

	Small project	Average project	Large project
Annual emission reductions (tCO2e)	50,000	100,000	200,000
2-year ERPA volume (tCO2e)	100,000	200,000	400,000
3-year ERPA volume (tCO2e)	150,000	300,000	600,000
Price of CERs (Euros)	9.50	9.50	9.50
Value of 2-year ERPA (Euros)	950,000	1,900,000	3,800,000
Value of 3-year ERPA (Euros)	1,425,000	2,850,000	5,700,000
Impact of 7-month* additional delay in registration:			
Loss of revenue in first year (Euros)	277,083	554,167	1,108,333
As % loss for a 2-year ERPA	29%	29%	29%
As % loss for a 3-year ERPA	19%	19%	19%

Assumption: projects are commissioned and generating emission reductions

* 7 month delay represents the average time increase for registration from 2004–2007 to 2008–2009

FIGURE 10 Estimation of costs associated with lost CERs due to increased delays at registration



Note 1: Average months to achieve registration is taken from UNEP RISØ
Note 2 : Estimate of lost revenue due to delay is calculated by taking the average expected tons per month from projects registered in 2008 & 2009 (11,250 tCO_2e) and multilying 6.6 months, (i.e., difference between the 2005–2007 average and the 2008–2009 average.) This is then multiplied by the total number of project registered over the period 2008–2009 (1,114) and by €9.5 Euros as a proxy for the pCER price over the 2008–2009 period to arrive at €785,787,750.

lost opportunities to stimulate more GHG-friendly projects.

Conclusions and recommendations on registration stage

The saying that the CDM is a "victim of its success" may indeed be true. The current regulatory bottlenecks and delays at the level of projects requesting CDM registration are (at least partly) due to the huge influx of projects submitted during 2008 and 2009, which was difficult to absorb in a system that performs multiple checks on projects.

It is also true that there have been some legitimate concerns regarding the performance of DOEs and some vocal critics[25] arguing that registered CDM projects were not all additional and should not all have been registered. The increased delays at registration coincided with the decision by the CDM EB to intensify scrutiny of DOE validation reports as a means of strengthening the registration process. The EB therefore requested the UNFCCC secretariat to review validation reports, and also set up a Registration and Issuance Team.

However, it is becoming very clear through the World Bank's work with a diverse group of project entities, that along with the transaction costs and the relatively short Kyoto commitment period, the increasing timeframe associated with the CDM approval process has become difficult to fit into typically shorter private sector investment decision-making processes. This is undoubtedly reducing the impact of the CDM. The excessive delays contribute to the CDM regulatory risks and have a substantial negative impact for project entities seeking to implement GHG-reducing projects.

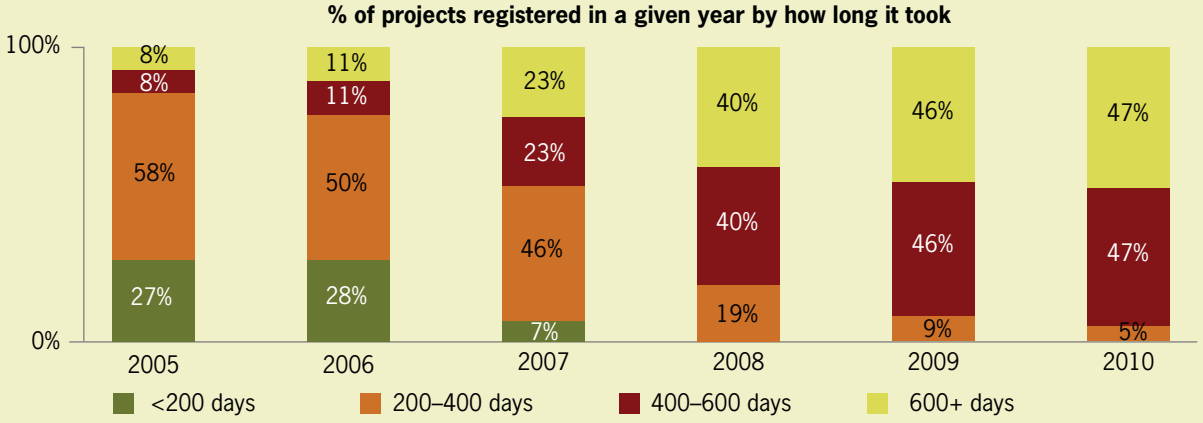
Recommendation: To compensate for the regulatory delays that are not the fault of project entities, the date on which a successfully registered project can start earning CERs should be moved from the date of actual registration to the date on which it is *submitted* for registration.

The EB, it must be noted, has not ignored this issue of delays and has been introducing timelines for the processing of projects to increase predictability. The EB is also currently in the process of developing procedures for an appeals process that should assist in (i) ensuring and maintaining due process; and (ii) providing an incentive to promote good performance by the CDM regulatory bodies (DOEs and the EB). The CDM EB is seeking ways to improve the registration and issuance procedures, as requested by the 2009 Copenhagen[26] decision on the CDM (i.e., Decision 2/CMP.5). The UNFCCC Secretariat is also seeking to improve the effectiveness of its support to CDM and JI, as per the Draft CDM Management Plan 2010[27].

From the perspective of the practitioner seeking to develop CDM projects, all these developments are wel-

[25] See for example Wara and Victor (2008) and Michaelowa and Purohit (2007).
[26] The Fifth Session of the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP 5) took place in Copenhagen in December 2009.
[27] See Annex 12 of the report from the 52nd meeting of the CDM Executive Board (EB 52) which took place in February 2010: available at http://cdm.unfccc.int/EB/052/eb52rep.pdf

FIGURE 11 Delays in CDM validation and registration (according to share of projects)



Note 1: Includes both the time of validation and registration
*Note 2:*Purposely excludes projects that went for re-validation
Note 3: From PDD publishing to registration date in UNEP RISØ

come and necessary to maintain interest and confidence, and must remain of the highest priority. As shown in Figure 11, a minority of projects make it through the CDM regulatory approval process in less than a year. Proportions need to be inverted: in the not too distant future, only a minority of projects should be processed in more than a year.

The costs associated with these delays are significant and are consuming more and more of the CDM benefits. It is important to examine whether this enhanced and intensive scrutiny at registration is efficient and effective and is indeed translating into commensurate environmental benefits. While it is beyond the scope of this report to undertake such a comprehensive assessment, the analysis below suggests that the current scrutiny burden placed on projects seeking registration may be too heavy-handed compared to the benefits achieved, and with too many compliant projects being penalized and delayed.

As shown in Table 4, the environmental benefits resulting from the intensive scrutiny at registration—in terms of ensuring that CERs are denied for non-eligible projects—are, in the end, rather small. From 2004 to 2010, as a result of the increased scrutiny at the stage of projects requesting CDM registration, (either through outright project rejections or modifications to claimed emission reductions) 15 $MtCO_2e$ did not enter the carbon market, representing 3.8% of the CERs associated with all the projects requesting registration. Looking at 2009 alone, the year when scrutiny at registration has been greatest, the impact of the CDM EB enhanced scrutiny at registration (and outright rejections) was slightly greater on avoided non-eligible tons, amounting to 6% of the CERs associated with all the 2009 registration requests.

It is becoming essential to improve the CDM regulatory system and to achieve a better model to balance the critical need of ensuring environmental integrity with a regulatory process that is streamlined, appropriately staffed, clearer in its decisions and interpretation, and generally more predictable.

Recommendations: Based on the current CDM regulatory model, increased effectiveness would require, inter alia:

- Incentives to enhance the capacity of DOEs to carry out high-quality validations. Payments for re-submissions, and clear and efficient appeals procedures to

TABLE 4 **CDM registration and rejections: GHG implications**

Registration Statistics 200–2010***	Avg tons /year	%
Requested for registration (by volume; tCO_2e)	419,986,920	100.00%
Registered (by volume; tCO_2e)	404,161,866	96.23%
Put under review (by volume; tCO_2e)	67,681,065	16.12%
Rejected by EB (by volume; tCO_2e)	15,581,318	3.71%
Volume changed in review process (by volume; tCO_2e)	243,736	0.06%
Total non-eligible tons rejected by EB at the registration stage	**15,825,054**	**3.77%**
Euro value of non-eligible tons (assumes €9.50 per ton)	**150,338,013 Euros**	

Note: Only accounts for issuance requests that have completed the review process.
Source: IGES Database: April 1, 2010

establish due process[28] on DOE performance must be combined with closer interaction between the DOEs and the EB[29], along with intensified training and capacity development of DOEs. Restoring trust in the performance of DOEs is critical to both the environmental integrity of the CDM and how it is perceived, as well as to speeding up validations and enhancing the efficiency (and reducing duplications) of the overall CDM registration process.

- Move from the current review system involving multiple checks per project to one based on automatic registration of successfully validated projects. Such a change in registration procedure could be accompanied by a CER discount on each project (a sort of environmental integrity levy to compensate for the system's possible non-eligible CERs). At the same time, spot checks on a limited number of projects would reduce the risk of gaming.

3.2.4 *Monitoring & carbon asset creation*

In addition to securing financing and timely commissioning, successful CDM project implementation and CER issuance (and corresponding carbon finance payment to project entities) depend on successfully adhering to the relevant methodologies and monitoring procedures.[30]

Once a project has been registered, many project entities feel that the CDM component is completed. However, experience clearly shows that the bulk of the work associated with CDM projects (and CDM Programmes of Activities[31]) actually takes place after registration, with the monitoring and verification procedures as illustrated in Figure 12. Project implementation, which often takes more time than originally anticipated, can also occur after registration.

The key document in project implementation is the monitoring plan[32], a document which is designed during the development of a project's PDD, prior to registration. The plan specifies the variables that must be monitored,

[28] The CDM is only now— following the December 2009 decision 2/CMP.5 on the CDM taken in Copenhagen— starting to look into developing procedures for considering appeals brought forward by stakeholders directly involved in a CDM project. Such appeals can relate to the performance of DOEs, as well as to decisions taken by the CDM Executive Board.

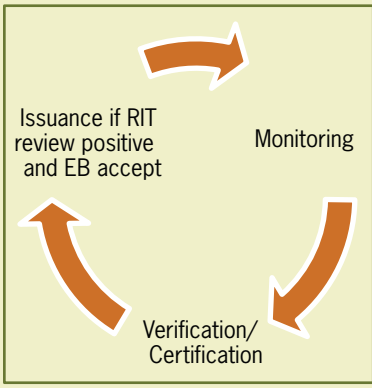
[29] Some (e.g., Schneider 2007) have argued that the independence of DOEs, and with it the confidence in the integrity of their assessments, could be strengthened if the CDM Executive Board, through the UNFCCC secretariat, selected and paid the DOEs. It not clear that such an arrangement would be effective in practice. In other auditing areas, auditors are not typically paid by the regulator.

[30] This is the same for JI.

[31] Programmes of Activities are discussed later in the report.

[32] Paragraph 56 of Annex H of the Marrakesh Accords states that the implementation of the plan is an obligation of a project developer or project operator and a condition for the issuance of CERs. Paragraph 60 of the same Annex further specifies that a project operator be equipped to issue a report detailing how this plan has been implemented and how much emission reduction is generated within the crediting phase at the end of every monitoring period.

FIGURE 12 CDM project implementation cycle



Monitoring and reporting: The project owner carries out monitoring of the project according to the monitoring plan in the registered PDD, reports the monitoring results to the DOE.

Verification and Certification of ERs: The CDM project enters the Verification and Certification stage after the project owner submits the monitoring report. Verification means the periodic independent review and ex-post determination on the registered CDM project made by the DOE applying methods prescribed in the monitoring plan. Certification means the written permits issued by the DOE on the basis of the verified emission reductions. The certification report is issued to the participants of the project, the relevant parties and the EB.

Issuance of CERs: CERs mean the Certified Emission Reductions of greenhouse gases. The certified report is submitted by the DOE to the RIT for review. The RIT makes a recommendation upon which the EB issue CERs.

Legend:
CER: Certified Emission Reduction
DOE: Designated Operational Entity
RIT: Registration and Issuance Team
ER: Emission Reductions
PDD: Project Design Document
EB: Executive Board

the frequency of monitoring, and the manner of quality control.

The main barrier to successful project implementation and a cause for questions during the verification process (and questions and reviews at the stage of requesting CER issuance) stems from the fact that the implementation of the monitoring plan requires support from many members of an organization, but the knowledge and understanding of the benefits of the CDM is often kept to one or two persons in an organization with different responsibilities.

In many projects, the personnel assisting with project registration, and therefore the personnel with knowledge of the CDM and its procedures, are different from those who have responsibilities for implementing the project and the monitoring plan. The importance of adhering exactly to the requirements specified in the PDD's monitoring plan has often been underestimated.

This is illustrated by inaccuracy in terms of calibration, timing, or inconsistencies between the monitoring plan and evidence or procedures assessed by DOEs at verification. Additionally, there is often insufficient training to enable those personnel with responsibilities for collecting key process parameters to do this with the precision and frequency expected from the monitoring plan, which sometimes differs from the typical business-as-usual (BAU) practice.

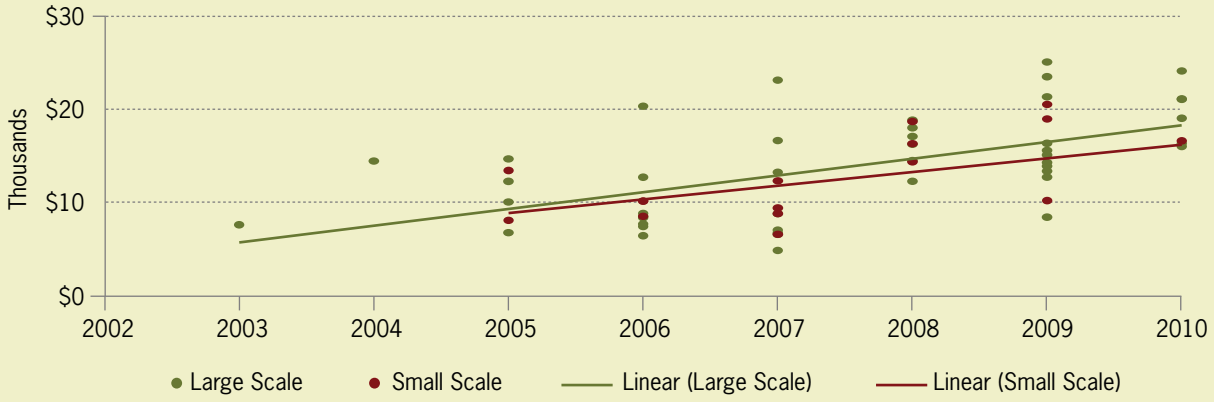
The series of processes to obtain issued CERs starts with the project participants' submission of the monitoring report to the DOE for the verification process. During this process, the DOE will check if the monitoring plan has been fully carried out in accordance with the PDD and the reported emission reduction has been achieved.

The cost of a verification, as experienced by the World Bank, currently amounts to about $20,000, a cost that has been increasing over time (as has the cost of a validation), with little distinction between small and large-scale projects (see Figure 13). This is a recurring cost for every subsequent verification performed on a project.

The typical reasons for the regulator's intervention, in terms of verification correction and/or review, appear to reflect, in part, the lack of awareness about the importance of following the monitoring plan to the letter; they are summarized in Table 5.

Based on a successful verification, the DOE certifies the emission reductions by issuing a certification report and requests the CDM EB to issue the verified amount of CERs (request for CERs issuance). If no concerns are raised by at least three EB members, CERs are issued

FIGURE 13 Cost of CDM verifications (World Bank experience)



Note: Inflation-adjusted (2010 dollars) €/$ exchange rate calculated as spot FX rate on day of transaction

automatically after the review period. In some cases, the CDM EB may put a request for issuance under review. Interestingly, project types are not evenly affected by the CDM review process at issuance, with biomass, N_2O decomposition, biogas, methane recovery and utilization, and hydro power projects having been most affected and delayed by reviews at issuance[33].

Such reviews can lead to one of three scenarios: (i) CERs are issued in the requested amount; (ii) a correction in the volume of emission reduction may be applied; or (iii) in the worst case scenario, the issuance may be rejected altogether. The latter two possibilities have obvious consequences for a project's cash flow.

However, as with review cases at registration, review cases at issuance rarely lead to rejection of issuance. Of all requests for issuance completed to date, 21% have received a request for review, while less than 1% have been rejected. As is the case at the registration stage, the multiple checks to reach issuance are causing delays and impacting project entities' revenues. The World Bank currently estimates that projects *without* a request for review take close to 100 days from the day of submitting a request for issuance to the time of actual CER issuance. And this is the case for every request for issuance, with each project typically making more than one request for issuance[34].

Conclusions and recommendations on monitoring

Improvements in the regulatory process are necessary and many are under consideration. But in view of the higher number of projects that will be entering the issuance process in the next few years, it is urgent to fast-track improvements and enhance efficiencies. Indeed, as illustrated in Figure 14, looking at all the projects that are registered, and those that are currently undergoing validation and will be seeking registration, it is possible to anticipate a huge wave of verifications and requests for issuance in the not too distant future.

[33] For example, for hydro projects there are often discrepancies between the plant load factor (i.e., the actual output of a power plant over a period of time) stipulated in the PDD and verified power generation, which can be due to an unusual rainfall amount. Another common issue relates to discrepancies between the accuracy of meters and calibration frequencies found in the PDD and what is done in practice. There are general problems of compliance with monitoring on the ground.

[34] There is no general rule on the duration of the monitoring/reporting period and the frequency of requesting CER issuance. Typically a single calendar year is perceived as the optimum for World Bank projects. Projects generating large volumes of CERs can also better absorb the transaction costs associated with more frequent verifications and issuances.

TABLE 5 Reasons for verification corrections and/or issuance rejections

Reason	Explanation
Too high uncertainty surrounding sampling data collected for some parameters.	Certain parameters require random sampling for measurement. Sampling is typically required for parameters that cannot be measured continuously through on-line instrumentations for reasons such as impracticality or cost. Common examples are the measurement of gas concentration in residual biomass or exhaust gas of a power generation plant. Inherently, a parameter measured through random sampling involves a certain degree of uncertainty in its results. It is, however, necessary to ensure that the possible error (or uncertainty) in the measurement is small in comparison to the result of the measurement in order for the data to be useful. Therefore a certain confidence level of data needs to be reported, but this level is sometimes not provided.
Calculation method conveyed in the monitoring plan not applied.	Many monitored parameters require a combination of direct data reading and report estimation. This is common in the monitoring of a thermal output in projects that generate heat as a form of energy. Care must be taken when identifying how to calculate thermal output in the monitoring plan since calculation methods vary from project to project.
Monitoring frequency not adhered to.	In general, more frequent data collection is recommended. However, there are situations where data are difficult to obtain. For example, fuel purchase records may consist of daily receipts from various vendors that may not correspond to actual fuel use within the same month. In such situations, it is often best to use annual data, and the lower value between recorded fuel use and fuel purchase should be applied to ensure conservativeness.
Calibration frequency not appropriate.	Several projects were put under review at issuance due to a difference between the frequency of calibration as specified in the monitoring methodology and plan compared to the actual implementation. In many cases, the delayed calibration is insignificant in terms of the total amount of CERs that are altered; however, in some cases, delays in calibration can be significant. A positive development is the EB's recently issued "Guidelines for assessing compliance with the calibration frequency requirements."
Use of accuracy indicators by the equipment manufacturer that do not match the monitoring plan.	The use of accuracy indicators by equipment manufacturers may differ from the monitoring plan, since the monitoring plan must comply with approved methodologies that are often written for more than one technology type.
Missing documentation	Often reflects that CDM know-how is not fully appreciated by multiple employees and that there is a lack of standard monitoring procedures to clearly identify what is required in terms of data collection and what is sufficient evidence.

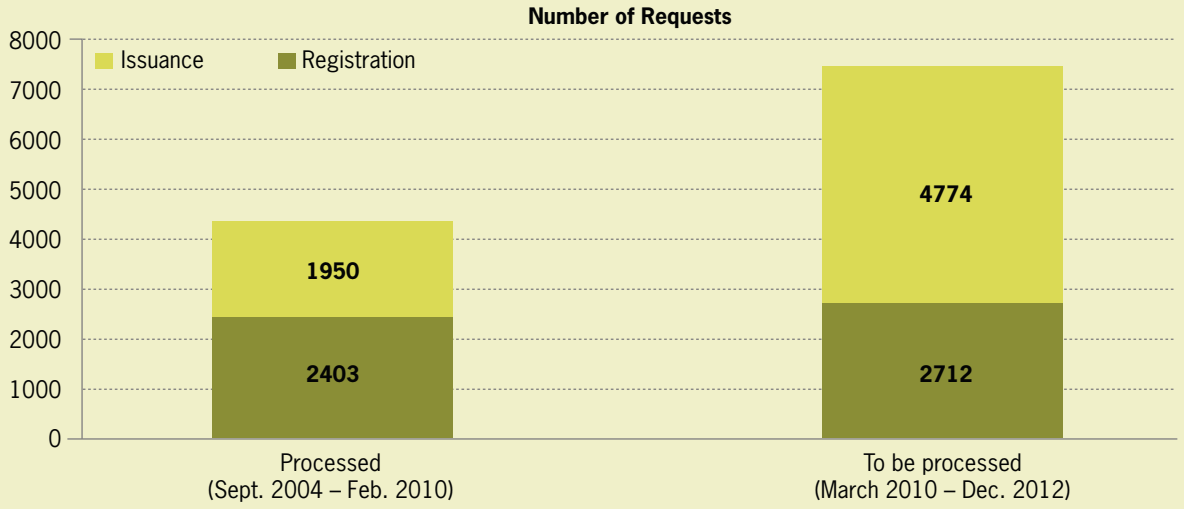
This will test the CDM system and its ability to issue CERs as we approach the end of the Kyoto Protocol's first commitment period. Governments and private entities will be seeking the CERs from their CDM projects to meet their compliance obligations associated with the Kyoto Protocol. Project entities will need the carbon finance revenues to sustain their CDM projects and ensure ongoing GHG reductions. Reducing regulatory timelines and CDM-related costs will require streamlining the project cycle up to, and including issuance. All efforts to enhance clarity and practicality in rules, procedures, and documentation requirements are steps in the right direction.

Recommendations:

To facilitate project implementation and verifications:

- Project entities should carefully integrate their CDM project's monitoring plan into their operational work plan and ensure that relevant staff is familiar with the CDM monitoring requirements. This may require training.
- CDM monitoring requirements specified in methodologies should be reviewed and revised as appropriate to ensure that, to the extent possible, they build on, and are consistent with, actual sector/industry and country practices.

FIGURE 14 Number validations and verifications processed: to date and projected



Source: UNEP RISØ
N.B. "To be processed": includes projects in validation as of March 2010. Issuance figures are conservative and assume only one issuance request per project during the 2010-2012 period.

To facilitate verifications:

- The concept of materiality[35], which is an important auditing concept, should be incorporated into the CDM's guidance on verification. Without such guidance, as is currently the case, all issues revealed during verification—significant or insignificant for the calculation of emission reductions—are treated with the same level of scrutiny. In order to express an opinion on data or information, an auditor needs to form a view on the materiality of all uncertainties. A materiality threshold would provide guidance to DOEs on what constitutes a material discrepancy, so that they can concentrate their work on areas that are more likely to lead to materially misleading errors (i.e., those with material impacts on claimed emission reductions).

To enhance the effectiveness and efficiency of verifications and issuances:

- It is important to look at the effectiveness of the current scrutiny at issuance in terms of its impact on the environment, measured by the detection of non-eligible CERs. According to data on overall CDM issuance requests (Table 6), in the end, only approximately 0.25% of CERs requested for issuance were denied. This suggests that current delays, which are poised to increase with the increased number of expected requests for issuance, and associated costs (to the regulatory body and to the project entity) do not appear to be matched by commensurate environmental benefits. It is thus recommended that to improve the effectiveness and efficiency of the CDM regulatory system:
- The CER issuance process should be streamlined and move towards the automatic issuance of suc-

[35] Materiality is defined in the glossary of the International Accounting Standards Board's "Framework for the Preparation and Presentation of Financial Statements" as: Information is material if its omission or misstatement could influence the economic decisions of users taken on the basis of the financial statements. Materiality depends on the size of the item or error judged in the particular circumstances of its omission or misstatement. Thus, materiality provides a threshold or cutoff point rather than being a primary qualitative characteristic which information must have if it is to be useful.

TABLE 6 **Request for issuance statistics: impact on CERs**

Request for Issuance Statistics 2005–2010		%
CERS that went through request for issuance	398,081,509	100.00%
CER issuance put under full review (by volume; tCO_2e)	14,854,316	3.73%
CER issuance completely rejected (by volume; tCO_2e)	768,203	0.19%
CERs issued but reduced from original request (by volume; tCO_2e)	215,103	0.05%
Total non-eligible tons found by EB at issuance (by volume; tCO_2e)	**983,306**	**0.25%**
Euro value of non-eligible tons at issuance (assumes €9.50)	**9,341,407 Euros**	
CER issuances requested (by # of requests)	1,618	100.00%
CER issuances requested for review (by # of requests)	336	20.77%
CER issuance requests rejected (by # of requests)	**14**	**0.87%**

Note: Only accounts for issuance requests that have completed the review process
Source: IGES Database: April 1, 2010

cessfully verified reductions with random spot checks.

- As per the recommendations for improving the registration process, the capacity of DOEs to carry out high quality verifications should be enhanced through increased interaction with the EB to restore trust in their performance.

3.3 Methodologies: the measuring stick

Methodologies are central to the project-based mechanisms. A methodology clarifies the approved procedures to define project eligibility, to calculate the baseline and project emissions, and to monitor emission reductions from a project activity over time. The development of methodologies is critical in order to expand the reach of the CDM/JI, since each new methodology has the potential to unleash a new path for a different type of project/activity to access carbon finance.

Currently there are over 120 active[36] and approved CDM methodologies, covering a wide variety of project types and technologies. Figure 15 presents the total number of approved methodologies according to the sectoral scope they cover. This is a significant and noteworthy development, considering that the CDM started with an absolute blank slate of methodologies, with the first methodology approved in the fall of 2003. Moreover, both the successful (i.e., approved) and unsuccessful provided rich learning experiences that are shared with all stakeholders.

From the beginning of the World Bank's involvement in carbon finance, the development of methodologies was, and continues to be, an important component of its activities. In fact, 53 CDM approved methodologies, including forestry methodologies, have been submitted for approval by or include contributions from the World Bank; this represents more than 40% of the 120 approved CDM methodologies. Figure 16 shows the many sectors targeted by the World Bank in its methodology submissions, including methodologies for both small- and large-scale projects[37].

Under the CDM (and JI), methodology development occurs through a "bottom-up" process where individual project participants, accompanied by a concrete project example, develop and submit a methodology for approval by the CDM EB[38]. The development of methodologies

[36] The term "active" excludes the approved methodologies that were subsequently subsumed in a new consolidated methodology and later became no longer usable.

[37] The CDM specifies size thresholds for small-scale CDM projects that are to benefit from simplified modalities and procedures (see CDM website http://cdm.unfccc.int/methodologies/SSCmethodologies/index.html).

FIGURE 15 CDM approved methodologies by sectoral scope

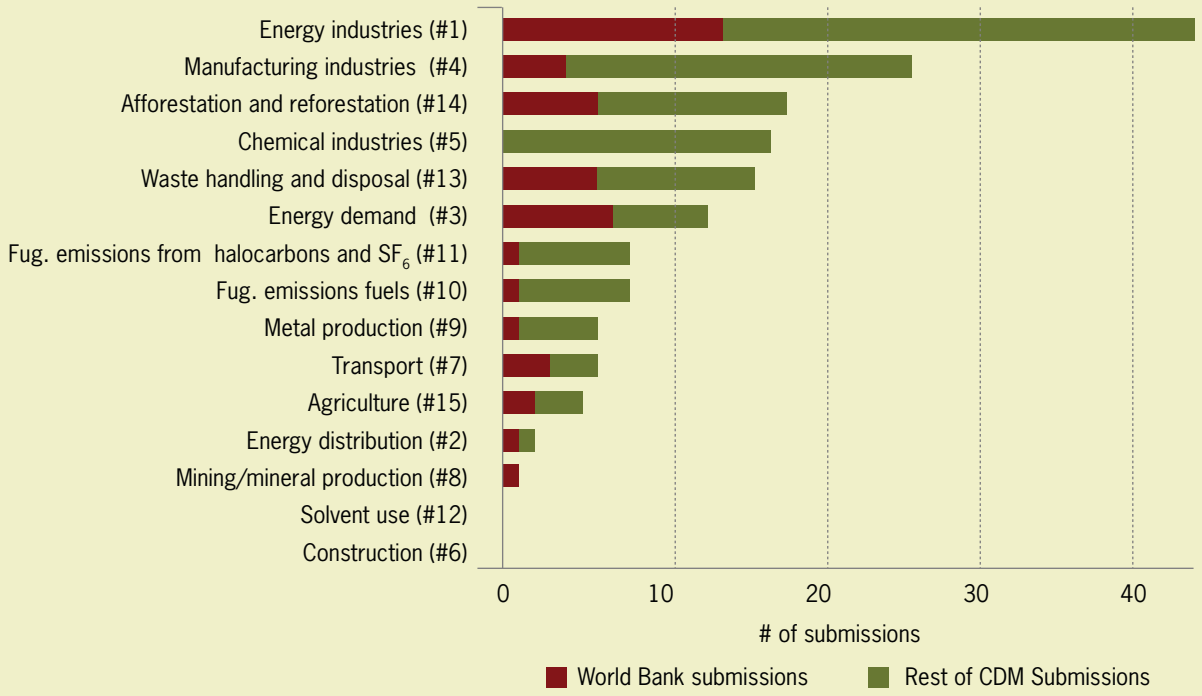
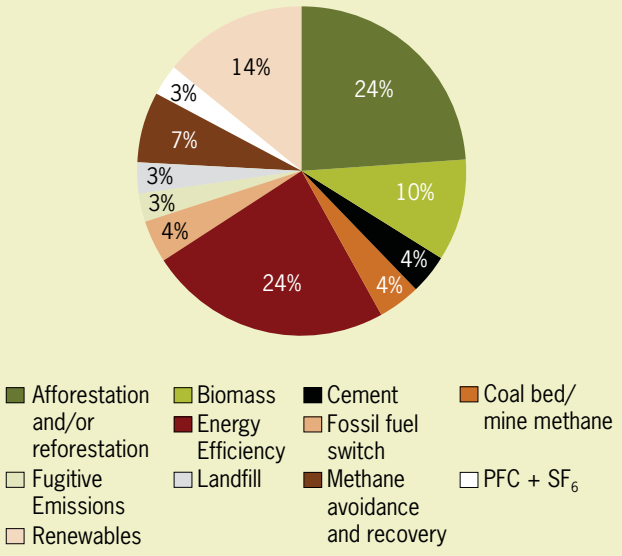


FIGURE 16 Sectors targeted by methodology submissions by the World Bank



can be viewed as a public good since once a methodology is approved it can be used by any other project developer. There are no patents or fees that go to compensate methodology developers. As such, there is no clear first mover advantage for those that champion methodologies, but there are costs and risks. In the World Bank's experience, a new methodology costs approximately $125,000 for both large- and small-scale projects (with higher costs typically experienced for methodologies for afforestation and reforestation), and takes approximately two years to develop from inception to approval. The costs and resource demands (e.g., in terms of staff time) can be high; there is also a 50% risk that the methodology may

[38] In order to ensure that CDM baseline and monitoring methodologies are practical and reflect project realities, methodologies are based on concrete projects and developed directly from practitioners who submit them to the CDM Executive Board (and the Board's Methodology Panel) for its approval. This was to avoid a theoretical top-down approach which may be disconnected with reality on the ground.

be rejected[39] (based on experience of overall methodologies submitted for approval).

Many existing methodologies are still not broadly applicable, limiting the opportunity for greater numbers of projects and associated GHG reductions. There is a handful of clear exceptions, including the two methodologies (large-scale and small-scale) directed at grid-connected electricity generation from renewable sources; together, they have been used by almost 60% of all registered CDM projects. However, out of a total of 70 existing large-scale CDM methodologies and excluding methodologies that were approved within the last year[40], 21 (i.e., 30%) have not yet been used even once. In other words, not even the project developer who submitted the new large-scale methodology has been able to apply it to a project. For small-scale projects, excluding small-scale afforestation and reforestation (AR) and methodologies that are under a year old, approximately 20% have never been used once. Small-scale AR methodologies appear particularly unfavorable with only one methodology having any associated projects out of a total of 6 approved methodologies.

In addition to methodologies that have never been used, the majority of approved methodologies have only been used by one or two projects. The fact that so many methodologies are rarely or never used is certainly an indication of sub-optimal use of limited resources. It largely reflects limitations of the bottom-up approach that, while providing flexibility and opportunities for methodologies of all types of projects to be considered, results in fewer general and broadly applicable methodologies.

In the World Bank's experience, there are four main reasons why a new methodology may become difficult to apply to a broad number of projects:

- There is little incentive for project developers to submit a broadly applicable methodology. Given the CDM's bottom-up approach to methodology development, the costs associated with the methodology development are borne by the project developer. Therefore, the aim of a methodology developer is to simply get the methodology through the CDM approval process in a form which will allow the underlying project to be registered. This is particularly true in the context of the iterative methodology approval process where the conservativeness and stringency of the various elements of a proposed methodology tend to increase with each iteration. More widely applicable methodologies can be more expensive to produce (e.g., demanding more data and justification) and lengthier to get through the approval process, as well as riskier in terms of obtaining final approval.
- As a result of editing by the CDM Methodology Panel and/or the UNFCCC secretariat, a methodology may become difficult to apply, even in some cases, to the underlying project case. The intention of the methodology approval process is to guarantee its environmental credibility. However, methodology editing is typically not checked by practitioners in the field and against field conditions (particularly in LDCs), thereby limiting the applicability of methodologies. The World Bank— and others—has seen how modifications required or made by the CDM regulator can affect the suitability of a methodology for even the underlying project. Consultation with appropriate experts prior to finalizing the text for an approved methodology could assist in increasing the applicability of some methodologies.
- Methodologies, which are typically developed during the concept stage of a project, are not sufficiently flexible to accommodate evolving project designs. In response, the CDM EB created "consolidated methodologies" for some types of projects, some of which have been used extensively.
- Defining what is "conservative enough" is a matter of subjective interpretation. It is important that methodologies be environmentally credible. Perfect accuracy is very often not possible and/or would be too costly, so methodologies need to remain "conservative." This principle is generally well accepted, but it raises the questions of what is sufficiently "conservative" in the

[39] In the last 10 methodology rounds the rejection/withdrawal rate has been closer to 60% indicating it is becoming harder to secure approval for new methodologies.

[40] Excludes AM84,AM85,AM86,AM87

calculation of GHG emission reductions in the face of uncertainty. Many stakeholders, including the World Bank, have noted that the tools that control risks and define uncertainty, such as the application of the concept of materiality, could help reduce the costs involved in submitting broader methodologies by streamlining project assessment and enhancing consistency, transparency, and predictability.

Clear incentives to develop broader and more widely accessible methodologies are missing, slowing down innovation and consequently the implementation of projects that can contribute to climate change mitigation (or sequestration). It is time, as requested by the Parties in the 2009 Copenhagen 2009 decision on the CDM (2/CMP.5), to consider a more top-down approach based on greater standardization of baselines, benchmarks, and default values where appropriate. Such an approach should build on and draw from already approved methodologies.

It is also important to seek a better balance between the need to continuously improve methodologies and the need for regulatory reliability and predictability. Once a methodology has been submitted, it can be revised numerous times. While it is certainly important to correct and improve methodologies, too frequent revisions to methodologies have resulted in increasing uncertainty and time delays in project submissions.

For example, to date, the two most popular methodologies, i.e., the large- and small-scale methodologies for grid-connected electricity generation from renewable sources, have been revised 11 and 15 times, respectively. This means that these methodologies, on average, have been modified several times per year, every year. These revisions can cause difficulties and delays in project PDD preparation, when such changes are significant.

Methodology revisions made to reflect changes in the EB's *interpretation* of rules or guidance are particularly difficult to anticipate, and without a sufficient grace period[41], have significantly affected several projects undergoing validation (considering that a validation period lasts about 12 months). Providing greater reliability is becoming a critical matter for project developers. This could be achieved through predictable and appropriate revision timelines.

Recommendations on methodologies

Looking forward, it will be important to build on current EB efforts and the very rich body of methodology experience to develop practical and simplified methodologies that strike a balance between providing a reasonable assurance of their conservativeness and maintaining incentives to develop CDM projects. Moreover, the experience and lessons from the CDM methodologies on how to determine emission baselines and how to count emission reductions from different types of mitigation and sequestration activities can usefully inform Parties in the development of their own domestic mitigation plans (such as developing countries' Nationally Appropriate Mitigation Actions[42]) and any new market-based mechanism[43].

Recommendations:

- Simplify and broaden the scope of baseline methodologies through greater standardization where pos-

[41] The current grace period is 8 months but the EB can implement changes without grace periods, as was the case at EB53 (March 2010) for top-down (i.e., regulator initiated revision) methodology revisions to ACM0013 and ACM0015. The approved consolidated methodologies for grid connected fossil fuel fired power plants (ACM0013) and for clinker production in cement kilns (ACM0015).

[42] The 2007 Bali Action Plan under the UNFCCC envisages, under clause 1(b)(ii), enhanced national/international action on mitigation of climate change, including, inter alia, consideration of Nationally Appropriate Mitigation Actions by developing country parties in the context of sustainable development, supported and enabled by technology, financing and capacity building, in a measurable, reportable and verifiable manner.

[43] In the context of the recent UNFCCC negotiations on the post-2012 climate regime, there have been proposals for moving beyond the CDM through "sectoral market mechanisms" where credits for emission reductions would be issued once a country reports performance that exceeds an agreed sectoral emission objective, i.e., the baseline. The idea of "sectoral trading mechanisms" is also explored (see for example, the EU Council conclusions on the EU position for the Copenhagen Climate Conference, 21 October 2009). However, to date, the developing countries have not participated actively in these discussions and no decision has been taken on any such new mechanism.

sible and appropriate, such as standardized emission factors in the power sector, benchmarks[44] or default (deemed) values for energy-efficient equipment[45]; these elements can already be found in some of the proposed and approved methodologies.

- Ambitious yet realistic stringency levels of such standardized baselines need to be achieved through an acceptable and pragmatic balance between (i) environmental integrity (and conservativeness) and (ii) environmental effectiveness (i.e., ability to stimulate more GHG-reducing activities).

  UNFCCC Parties' submissions (March 2010) to assist the UNFCCC Subsidiary Body for Scientific and Technological Advice in its task[46] to *recommend modalities and procedures for the development of standardized baselines that are broadly applicable, while providing for a high level of environmental integrity and taking into account national circumstances* offer practical and promising ways forward.
- Mobilize resources to help advance such work and secure the necessary collaboration that would benefit the entire CDM and help extend its reach. For instance, the World Bank's post-2012-focused Carbon Partnership Facility includes, in addition to a carbon fund, a separate carbon asset development fund dedicated to helping advance this type of work. Initial methodology work includes developing a practical methodology for energy efficiency in buildings. This is a challenging sector to tackle as government norms, such as building codes, have low compliance and the sector comprises a large number of stakeholders including the owners of individual homes, multi-occupant and multi-purpose buildings. Despite the huge mitigation potential and the importance of this sector for developing countries' sustainable development and their transition to low carbon growth, this sector has largely been bypassed by the CDM thus far.
- Increase efforts to better engage and develop capacity with host country representatives. This will be essential to ensure workable methodologies based on standardized baselines aggregated at an appropriate sectoral or geographic level, as well as to ensure data availability and compatibility with practical realities.
- Work, together with practitioners and industry/sector specialists, to ensure that methodologies and particularly monitoring requirements build on and are consistent with existing industry/sector practices, standards and/or reporting guidelines and are tailored to contexts on the ground. The EB's recent efforts to assess and improve the applicability of some methodologies, through co-operation with industrial associations or working groups representing multiple stakeholder interests are a step in the right direction.
- Enhance predictability for methodology revisions. Providing for periodic reviews and revisions of methodologies is critical to maintaining environmental credibility of methodologies. However, the process, timing, and triggers to initiate such reviews should be clear at the outset.

3.4 Additionality: ensuring environmental integrity

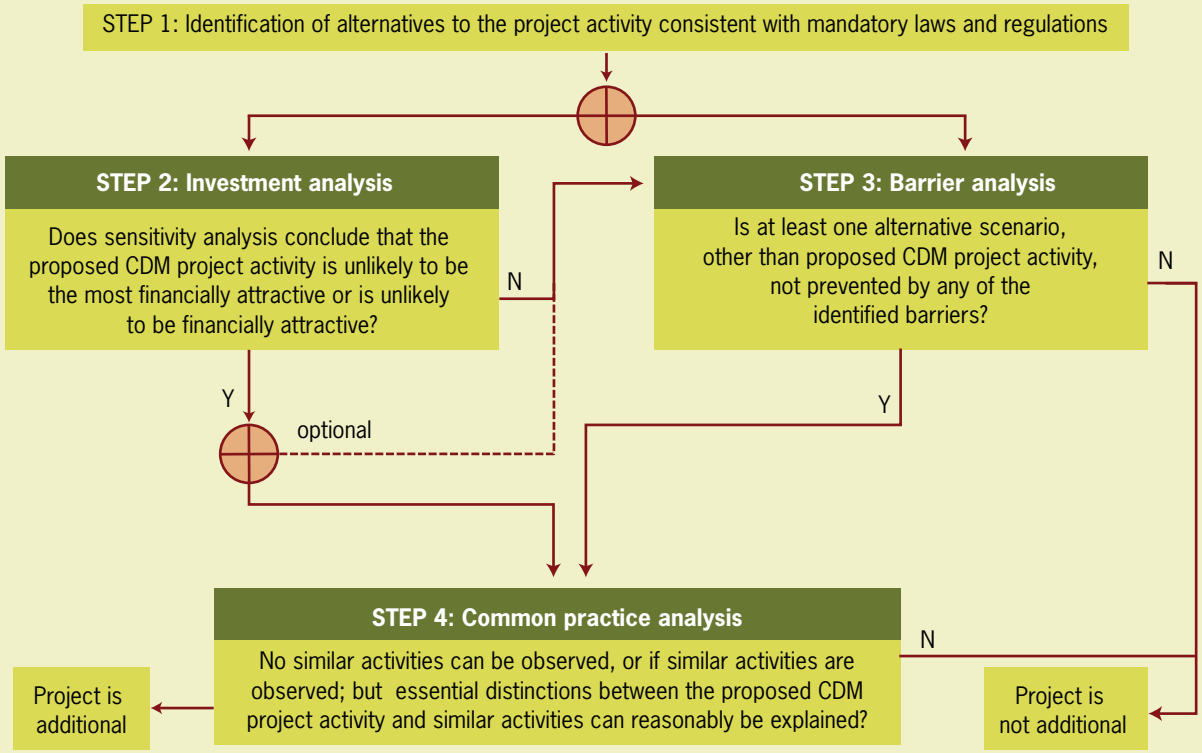
Environmental integrity is essential for the overall climate regime, as emission reduction/sequestration credits are used to meet compliance with emission commitments and effectively offset the emissions of Annex I countries. Economic efficiency is also essential, as capital is scarce and needs to be allocated where there is real environmental value. Confidence in environmental integrity is also critical for the carbon market to ensure credibility of the carbon assets being traded. In the context of the CDM (and JI), environmental integrity is preserved through the concept of additionality.

[44] For example, the World Business Council for Sustainable Development Cement Sustainability Initiative (CSI), along with the consulting group Ecofys, has developed a sector-based benchmarking CDM methodology based on benchmarks for plant performance derived from the CSI's global cement database on CO_2 and energy performance. The methodology is currently under review by the CDM EB.

[45] For example, the approved small-scale methodology for efficient lighting (AMS.II.J), based on the World Bank's methodology submission, is based on the use of conservatively-defined deemed (stipulated) energy savings associated with each compact fluorescent lamp (CFL) replacing an inefficient incandescent lamp.

[46] As requested by the December 2009 Copenhagen 2/CMP.5 decision on the CDM (FCCC/KP/CMP/2009/L.10).

FIGURE 17 The tool for the determination and assessment of additionality



Source: CDM Rulebook

The Kyoto Protocol stipulates that CDM projects must result in "*reductions in emissions that are additional to any that would occur in the absence of the certified project activity* [i.e., the CDM project]" and that JI projects provide "*a reduction in emissions...that is additional to any that would otherwise occur.*" The challenge in proving additionality lies therefore in determining the scenario that represents "what would have occurred otherwise", something that is counterfactual and cannot, by definition, be verified. Providing confidence in the environmental integrity of any GHG market-based instrument is essential. However, proving "additionality" under the CDM has proven challenging to implement and to evaluate objectively in practice.

The literature typically refers to two broad design approaches to evaluating additionality and the closely linked process of determining baselines: (i) project-specific; and (ii) standardized (often called 'performance standards', or 'multi-project'). Under the CDM, a project-specific approach has been pursued. The CDM Executive Board issued a "Tool for the determination and assessment of additionality"[47] (so-called "Additionality Tool") to serve as guidance to demonstrate (for project entities) and to assess (for DOEs and the CDM EB) a project's additionality.

The Additionality Tool (Figure 17) is an effort to establish a consistent approach across different projects.

[47] The Executive Board has periodically modified and updated the Tool. At the time of writing this report, version 5.2 of the Tool (approved at EB 39) was being used.

The Tool requires project entities to explain how and why the project is additional, and therefore not the baseline scenario, by applying a combination of several tests. Essentially, a project has to demonstrate that either (i) it is less profitable than the most attractive alternative or a benchmark (investment analysis); and/or (ii) it must overcome prohibitive barriers (barrier analysis). It must also demonstrate that it is (iii) not "common practice". Evidence must be provided to prove the validity of a baseline scenario and clarify why the proposed project is not itself the baseline scenario.

Despite the development of the Additionality Tool, demonstrating a project's additionality has been very challenging and continues to be a subject of debate between project entities and CDM regulators as well as among stakeholders[48]. This is illustrated by the fact that additionality is the overwhelming reason for denying the registration of a proposed project. More than 70% of project rejections have been justified on the grounds of additionality (IGES 2010).

In theory, from an investment perspective it should be fairly straightforward to distinguish between non-additional (i.e., "economic") and additional ("non-economic") projects by applying a financial screening criterion (such as an x% internal rate of return). In effect, over time, there has been increased reliance on the use of investment analysis (over the barrier analysis) within the Additionality Tool, as it is perceived to be more objective given its quantitative nature. However, the investment analysis is the single most frequent reason for denying CDM registration.

Within the investment analysis, the definition of financial benchmark is causing the most problems when assessing additionality, as it is inherently dependent upon underlying assumptions. In the World Bank's experience, it has been common to see project entities genuinely puzzled by the repeated (and time consuming) questions on the assumptions used for determining their financial benchmark.

Despite efforts by CDM EB to provide additional guidance to clarify requirements for defining financial benchmarks, this has not translated into fewer projects being put under review. The majority of projects that appear to be affected by closer financial benchmark scrutiny include:

- Renewable projects such as wind, hydro, biomass (without CH_4), where it is likely that the CDM's economic impact on the internal rate of return is small (i.e., between 1–3%) and where there are links with sectoral policies, in particular the setting of differentiated tariffs.
- End of pipe projects such as waste gas or heat utilization projects, where a waste product has a financial value that could make the project viable even without the CDM.
- Industrial sector projects such as cement production, where the production process improvement results in increased profitability even without the CDM.

The two other aspects of additionality demonstration that are often questioned by the CDM regulators are: (i) the prior consideration of the CDM (i.e., providing evidence that the CDM was not a simple afterthought to seek more revenues); and (ii) the links with government sectoral policies that provide incentives to either GHG-intensive or low GHG-intensive technologies (or so called "E policy" under the CDM. See Annex 5).

Projects that have the least difficulties in demonstrating additionality are the gas capture types of project (e.g., capture of industrial gases and landfill gases) where there is no valuable by-product associated with the capture of the gas. In other words, without the revenue stream of the CDM, the project proponent would have no economic incentive to capture the waste gas. The projects that provide valuable by-products, in addition to GHG reductions, such as energy savings or power are often vital to host countries' sustainable development, but demonstrating their additionality can be more challenging under the current CDM additionality approach.

CDM supporters and critics alike agree that determining additionality on a project-by-project basis to assess the individual investment decisions is inherently qualitative and a matter of judgment[49]. As described by Schneider (2007), "The fundamental challenge is that the question as to whether a project would also be implemented with-

[48] For example, see Schneider (2007) and Michaelowa and Purohit (2007) and Wara and Victor (2008)
[49] Ibid.

out the CDM is hypothetical and counter-factual—it can never be proven with absolute certainty." The World Bank's experience also confirms the constant challenge of demonstrating additionality on a project-by-project basis, considering the broad spectrum of specific policy, and the regulatory and economic circumstances in host countries that need to be taken into account. Moreover, project entities of different types, such as companies listed on stock markets, government agencies, or small-scale operations in LDCs, use different approaches when they make investment decisions depending on the specific country and sector context, the type and scale of activity, and access to financing. In the case of investment analyses, appraisal criteria used by different entities may include, for example, net present value (NPV), payback period, return on average capital employed, and impact on operating cash flows and budgets, all complemented by different approaches for risk assessment and sensitivity analysis, and/or other company-specific performance criteria. All these factors make the task of assessing a specific project's additionality based on investment analysis very challenging from a global perspective[50], and thus constantly subject to questioning.

The assessment of the project-by-project additionality contributes to a high CDM regulatory risk, which is often perceived as a significant hurdle for project developers. Project ideas are not scarce, but their financing is. The CDM regulatory risk can make it very difficult to use the expected CDM revenues as indicators of a project's financial viability to help convince financiers and lenders and thus enable leveraging of the necessary underlying finance. The CDM regulatory risks are in fact having the largest impact on those projects that depend most on carbon revenues for their financial viability. Changes are needed to solve this problematic implication of the current additionality approach.

Recommendations for demonstration and assessment of additionality

It cannot be emphasized enough that environmental integrity is essential for the CDM, the climate regime, as well as the carbon market. It is urgent to make changes to ensure that the concept of additionality is implemented in a more practical, workable, and transparent manner. As a first step, it is encouraging that in Copenhagen in 2009, the Parties to the Kyoto Protocol are aware of the need for improvements, as evidenced in the call towards *"the enhancement of objectivity and transparency in the approaches for demonstration and assessment of additionality and selection of the baseline scenario..."*

It is critical to review the implementation of the concept of additionality to reconcile (i) the reality that good and effective climate-reducing projects need also to be technically and financially solid, with (ii) the need to ensure environmental integrity. This means moving away from the current additionality assessment focused on individual investment decisions, and towards objective and more easily verifiable technical criteria wherever possible, including through standardized baselines accompanied by automatic additionality for activities meeting clear criteria and/or implemented in clearly specified geographic regions and under other circumstances. Where appropriate, such baselines could be developed to combine the baseline and additionality assessment in an environmentally ambitious way while also providing much needed objectivity and predictability. There is one such precedent in the approved methodology for energy-efficient refrigerators[51]. Such a move would also help streamline project approval procedures (validation and registration). Decisions on standardized baselines accompanied by automatic additionality need to be accompanied by a clear, transparent, and predictable review process to ensure that the determination of what is additional evolves over time with practical realities.

In its recent submission to the CDM EB on recommendations for simplified modalities for demonstrating additionality of small-scale renewable energy and energy

[50] See for example, the World Bank Response to the EB call for Public inputs at its 53rd meeting regarding the draft "Tool to calculate the weighted average cost of capital (WACC)", April 23, 2010. (www.carbonfinance.org)

[51] The approved methodology (AM0070) for the manufacturing of energy-efficient refrigerators uses the same threshold level for the additionality test and the determination of baseline emissions.

efficiency projects (April 2010), the World Bank proposed a flow chart-based, yes/no assessment that projects could use to prove automatic additionality (the submission is included in Annex 4). The suggestion is to base the assessment on widely published documentation or publicly available country-specific or sector-specific national level information and data available in the host country.

If done well, such improved additionality rules will help streamline the approval process and help maintain interest in the CDM as an environmentally credible and workable carbon finance mechanism that can work in tandem with other instruments and policies to help developing countries meet their sustainable development objectives and move towards low carbon growth.

3.5 The particular case of Joint Implementation

The JI project cycle and the key concepts of methodology and additionality are comparable to the CDM, but there are important distinctions between these two Kyoto project-based mechanisms:

- JI projects are implemented in "capped environments" where host countries' emissions obligation, determined by their respective Assigned Amount under the Kyoto Protocol, serves as a means of securing environmental integrity. Any transfer of the emission reductions (ERUs) from a JI project needs to be reflected in an equivalent deduction of the same host country's Assigned Amount Units (AAU) to maintain the cap. This situation provides an incentive to the host country to ensure that there is no exaggeration of the emission crediting, and thus lessens the risk that emission reductions from individual projects would be inflated.
- The Marrakesh Accords provide for 2 tracks for JI projects: Under JI Track 1, projects are approved at the national level by the relevant host country JI authority ("designated focal point"), following national guidelines. This provides greater opportunity for flexibility according to different national circumstances. Under JI Track 2, the project approval process is overseen by an international regulatory body called the Joint Implementation Supervisory Committee (JISC). Box 3 outlines the main differences between Track 1 and Track 2 as well as the limited use so far of the regulatory flexibility.

In the global JI pipeline, there are 98 finally determined JI projects under Track 1 and 16 under Track 2 (UNEP RISØ 2010). There are 174 more projects in the JI pipeline (under Track 2). The World Bank JI experience is based on a portfolio that includes 16 projects located in 8 JI host countries, covering diverse technologies such as district heating, wind power, gas flaring reduction, steel mill rehabilitation, forestry, and biomass. Half of these projects have been finally determined to date. Section 4 provides an overview of the geographic and technology distribution of JI projects.

This experience can also be characterized as one of early involvement in JI. Soon after the Kyoto Protocol, many

JI Track 1 & Track 2

JI Track 1: Under the Track 1 process, the determination of the eligibility of the project, as well as the monitoring and verification of emission reductions, is subject to national rules and procedures only. Parties can use Track 1 if they meet the six eligibility criteria outlined in the Marrakesh Accords.

JI Track 2: Modalities and procedures for JI Track 2 were launched by the Joint Implementation Supervisory Committee (JISC) in October 2006. Track 2 can be used when the host country does not comply with all the eligibility requirements of the Kyoto Protocol for JI. It consists of (i) a verification procedure (i.e., determination and verification) by the Independent Entity accredited (AIE) by the JISC, and (ii) subsequent reviews by the JISC. Thus, the JI Track 2 to some extent mirrors the CDM procedures. This "CDM-like" procedure does not, however, require JI projects to follow approved CDM methodologies and/or submit new methodologies.

For both Tracks 1 and 2, the host country is responsible for issuing and transferring the ERUs.

Source: JI Rulebook, www.jirulebook.org

BOX 3

BOX 4

Expectations and experience with "early-mover" JI projects

Originally, the World Bank, as well as others, anticipated that JI projects would be more straightforward to develop and execute because of the safeguard provided by the overall national emissions cap of the JI countries.

However, the Marrakesh Accords did not provide for a prompt start for JI, as it did for CDM. This meant that, unlike the CDM which could generate CERs prior to 2008, JI credits—Emission Reduction Units (ERUs)—could only be generated during the Kyoto Protocol's commitment period starting in 2008. But projections indicated that the emissions of several Central & Eastern European countries would amount to less than their Assigned Amount for the 2008–2012 commitment period. This "AAU surplus" could be used to reward pre-2008 emission reductions from JI projects.

This prompted the World Bank and others to work with JI host countries and develop "early-mover" JI projects. For example, the World Bank's PCF signed the first JI Emission Reductions Purchase Agreement (ERPA) with Latvia in 2000.

Early-mover JI projects (i.e., their project documentation, the determination of the baseline and additionality, the monitoring protocols, and the ex-ante calculations of emission reductions) were therefore based on *expected* JI rules and guidelines, which in reality took longer to develop and put in place than had been originally foreseen.

However, early movers were not directly accepted under Track 2 by the JI Supervisory Committee (JISC). The JISC, established in October 2006, opted to largely build on the body of CDM procedural and methodology experience. It deliberated on the merits of recognizing the early JI movers, but in the end decided *not* to accept the (*ad hoc)* project documentation provided by the early-mover JI projects as being equivalent to the project document templates and guidance developed by the JISC. This turned out to be challenging and overburdening for many early-mover JI projects, as re-doing the documentation was far from a simple copy-paste exercise. Such retrofitting can be very costly and bring additional risks, as arguments, assumptions, and methodologies used to prepare the original documentation did not fit neatly with the Track 2 requirements and required re-determination of the early project by the AIEs.

The World Bank PCF aimed to experiment with both Track 1 and Track 2. However, in the end and after looking at all possibilities, it concluded that it was either not feasible, or too costly or too risky to select the Track 2 procedure. Furthermore, some host countries (e.g., Czech Republic, Hungary, Poland, and Romania) supported their early movers under Track 1 by accepting available documentation and determination reports without any modifications. Thus, after having examined the options and implications, all PCF JI projects have followed Track 1.

of the Central and Eastern European countries became attractive because they had significant emission reduction potential, given CO_2-intensive energy and industrial sectors. These countries also had, in general more capacity and data and their enabling environment seemed to satisfy investors and project developers. Box 4 outlines our experience with early-mover JI projects.

JI insights

In reality, the situation for JI projects turned out to be much more complex than originally anticipated. There are a number of insights emerging from the JI experience, which reflect the particularities of this project-based mechanism in the context of overall national emission caps and the greater role and responsibilities given to national authorities (compared to the CDM).

1. *Interplay between EU ETS & JI*

Many of the Central and Eastern European countries that were originally expected to host JI projects subsequently joined the European Union. With the adoption and implementation of the EU Emissions Trading Scheme (EU ETS), the most promising sectors for JI activities in the EU Member States became covered by the EU ETS. Although JI and the EU ETS can be complementary, the interplay between the two mechanisms has proven to be challenging, particularly regarding the need to ensure no double-counting of emission reductions. Indeed, EU

The Hungary Pannongreen Biomass Project: A JI project alongside the EU ETS

The Pannonpower Group has owned and operated the Pécs power plant since 1962, and until the early 2000s operated four combined heat and power (CHP) units using locally-mined coal. Pannonpower faced major investment requirements to meet the tightening limits on SO_2 emissions (from 2005) while also needing to extend the life of the plant. Pannonpower evaluated a wide range of alternatives including different mixes of fuels and technologies. Without carbon finance, the baseline study indicated that the most financially attractive alternatives would have been either (i) the continued operation based on coal with a scrubber; or (ii) a fuel switch to natural gas. The option of a fuel switch to biomass came a distant third.

Without the Government's support for renewable energy and the carbon revenues from JI (through the ERPA signed in 2003 with the World Bank PCF for the sale of 1.2 million tons of CO_2e reductions starting in 2008), the company would not have developed the Pannongreen biomass project to replace one of the coal-fired units. The renewable biomass is supplied to the JI project from firewood, woodchips, sawdust, and agricultural byproducts harvested in forestry operations that fulfill the requirements of sustainable forestry management in Hungary.

Today, with the help from carbon finance, Pannongreen is one of the largest renewable energy facilities in Central Europe and has significantly increased Hungary's renewable electricity generation.

As an "early mover", the project was finally determined as a Track 1 JI project based on Hungarian JI guidelines. The Pannongreen project was developed before Hungary's accession to the EU and the finalization of the EU ETS. The Hungarian authorities included the project in a JI reserve of their country's National Allocation Plan (NAP) for Phase 2 (2008–2012) of the EU ETS. A portion of the EU allowances, which are backed up by AAUs, was thus set aside, allowing the Pannongreen Biomass JI project to earn ERUs alongside Pannonpower's commitments under the EU ETS.

BOX 5

Member States can include in their National Allocation Plans (NAP) a JI Reserve, which was originally expected to be the mechanism to secure the credits associated with the reductions from early-mover JI projects. However, in the end, the NAP, which requires the approval of the European Commission, did not guarantee that all early JI projects would be specified in the respective country's JI reserve, or that there was sufficient allocation to cover all emission reductions generated by the early JI projects. In fact, through the political NAP approval process, some early projects within the World Bank portfolio ended up being omitted from the JI reserves. In some of these cases, it was possible to agree on AAU transfers as replacements for the expected ERUs.

It must be noted that while the prospects for JI were reduced, for many otherwise potential JI projects, the EU ETS offered a more efficient mechanism based on carbon assets (EU allowances) with lower risk and thus valued at a higher price than JI credits (Emission Reduction Units). For others, however, such as projects in demand-side energy efficiency which are not covered under the EU ETS, challenges emerged. The link between these projects' emission reductions and the emissions from the power sector (covered by the EU ETS) caused concerns about double-counting.

Despite these difficulties, there are some JI projects where the interplay between the EU ETS and JI seems to have reached a good balance (see example in Box 5).

2. *Delay in the development of guidelines*

The development of the Track 2 JI guidance and procedures by JISC naturally took some time. This is still an ongoing process as JISC is seeking to respond to the lessons learned from the experience of practitioners and regulators (e.g., the development of a JI Determination and Verification Manual). As noted in Box 3, in parallel, JI Track 1 offered the host countries the opportunity to develop their own guidelines for the approval of JI Track 1 projects. Due to the lack of capacity and/or political will, the development of national JI Track 1 procedures was much lengthier than

expected, but are now in place in many host countries (e.g., Ukraine, Romania, Poland).

In the meantime, in the face of regulatory uncertainty, JI AIEs typically referred to the CDM guidelines and methodologies, even though the JI modalities and procedures under the Marrakesh Accords made no reference to any precedence to be given to decisions made under the CDM. This may have undermined the flexibility of the (fundamentally different) JI mechanism where emission reductions are generated in a capped environment. Furthermore, rather general Track 1 guidelines eventually emerged in several host countries and referred directly or indirectly to Track 2 guidance, thereby providing little basis to stimulate innovation (e.g., new approaches and methodologies) under JI Track 1. The lengthy regulatory development for both JI tracks also delayed the adoption of a programmatic approach, with the JISC adopting Programmes of Activities procedures (as under the CDM) only in 2009. This programmatic approach may provide opportunities for a number of smaller GHG mitigation projects, while minimizing the transaction costs, but there is little time before the end of 2012 to stimulate significant activity.

3. *Host country responsibilities & regulatory risk*

JI provides for a greater role for national authorities and, with it, creates substantial requirements for the host government in terms of capacity and institutions. It was originally expected that under JI Track 1, the host governments would have clear incentives to develop their own guidelines for the approval of JI projects that would provide for flexibility, simplicity, and expediency, as national authorities are much more aware of their country's circumstances.

However, JI experience to date shows that it takes time and resources to build national systems, institutions, and capacities as governments must develop rules to account for and manage these new national assets, including domestic procedures and guidelines for project approval and issuance and transfer of ERUs. Some countries initially had limited resources to do so and decided to mostly rely on the regulatory work of the JISC. In others, such as Russia, the development of JI approval procedures was not considered a priority and became a serious bottleneck for investors engaged in early-mover projects. At the time of drafting this report, Russia—the country expected to have the largest JI potential—had not yet issued any Letter of Approval for JI projects, despite having hosted JI activities for several years, although this is poised to change soon[52]. Other countries, such as Ukraine, were rather efficient in their development of national JI Track 1 guidelines.

What many had not foreseen is that JI projects are associated with an extra host country risk compared to the CDM, because host governments develop their own JI guidelines and are responsible for the issuance and transfer of ERUs. This makes JI vulnerable (or at least perceived as such) to political changes in these countries. In addition, the different requirements and approaches adopted by each JI host country make it more complex for project developers seeking to navigate different countries.

A key insight from the JI experience is that institution building, setting up systems, and developing regulatory frameworks to manage emission assets take time and require support for capacity building. Capacity then needs to be sustained to limit host country regulatory risks and to enable host countries to be effective in attracting carbon finance activities that help meet their development priorities.

[52] The issuance of Russia's first Letter of Approval is imminent. The second set of rules was approved by the Russian government at the beginning of 2010 and the first tender for project proposals was closed in March 2010. The first approvals are expected to be issued in May 2010. However, the rules for issuance and transfer of ERUs remain unknown.

4 Experience on the Ground

As the World Bank's World Development Report 2010 on Development and Climate Change (WDR 2010) puts it, "Climate change policy is not a simple choice between a high-growth, high-carbon world and a low growth, low carbon world—a simple question of whether to grow or to preserve the planet."

The Kyoto mechanisms are one means of contributing to both the world's need to mitigate global emissions of GHGs and host countries' aspirations for low carbon development. The CDM, in particular, has generated substantial flows supporting climate-friendly projects, including many intrinsically linked to sustainable development, such as clean energy and forestry projects. It has been a rich "learning-by-doing" experience with tremendous capacity built around the integration of GHG considerations in decision-making processes and focused efforts to monitor and measure the performance of project activities over time. The system is not perfect, and changes are needed, but it has accomplished a lot. It has achieved a solid foundation of technical and regulatory capacity that has been built around practical project experience. Many projects have been enabled by carbon finance.

The CDM and JI project-based approach has sparked the imagination of both local and international entrepreneurs to seize opportunities to offset GHG emissions and mitigate climate change. In a variety of different cases, the Kyoto mechanisms have succeeded in launching project ideas and attracting capital. The world needs to build on and amplify these gains. Such scaling-up will require putting the conditions in place so that many more of these activities on the ground can be stimulated by the market mechanisms. Below are four examples of such carbon finance projects within the World Bank's carbon finance portfolio:

- **Transforming solid waste management:** Carbon finance is providing critical incentives across the developing world to recover otherwise released methane gas. It is also helping municipality authorities and landfill managers around the world to apply state-of-the art technology to produce electricity using landfill gas. One cannot over-emphasize the importance of this sector for sustainable development at a time when urbanization is accelerating at a fast pace.
- **Use of renewable energy in the iron and steel industry in Brazil:** Carbon finance was critical in supporting the Brazil Plantar Project, consisting of three CDM projects covering the supply chain, in becoming the only one producing pig iron entirely from renewable plantations. It is a sustainable development model that authorities now seek to replicate in Brazil.
- **Micro projects in Africa and LDCs:** Carbon finance can make the difference to overcome the first investment barrier and finance local energy efficiency programs. Through the CDM, it has been possible to reach micro-level end-use energy-efficient activities targeted at households. Energy efficient lighting programs stimulated by the CDM are taking place in many developing countries, including Senegal, Rwanda, and Bangladesh. Micro-scale activities aimed at improving access to energy for cooking and heating, such as the Nepal Biogas project, are other CDM examples that can be replicated.
- **Forestry:** Carbon finance, as being demonstrated by the BioCarbon Fund, can help reforest degraded

lands, rehabilitate poor soil conditions, and improve environmental conditions as a whole; socioeconomic conditions are also usually improved through a variety of means including incomes from planting and maintenance work, as well as from by-products of the reforestation activities or timber. The Facilitating Reforestation for Guangxi Watershed Management in Pearl River project in China, the Moldova Soil Conservation project, and the Uganda Nile Basin Reforestation project piloted the CDM in the forestry sector; they are now serving as a basis for replication in their countries and can be used for replication elsewhere.

Still, the Kyoto mechanisms have not reached all sectors, regions, and countries in the same way, with some largely being by-passed. This section provides insights into the experience on the ground and seeks to identify key areas of success and the challenges that remain.

4.1 Building and sustaining capacity: a necessary condition

The WDR 2010 assesses that "there is scope for developing countries to shift to lower-carbon trajectories without compromising development, but this varies across countries and will depend on the extent of financial and technical assistance from high-income countries." This certainly applies to carbon finance and the experience with the Kyoto mechanisms.

The Kyoto mechanisms generated interest and enthusiasm as well as achievements, but nowhere was implementation particularly easy. Learning-by-doing has meant developing knowledge and capacity to test and implement. As noted earlier, one of the key factors for successful carbon finance projects has been committed champions with the capacity to implement and follow through with projects. Conversely, weak capacity is a key reason for having abandoned project ideas. At the government level, capacity to create enabling environments and clear regulatory frameworks to attract carbon finance is critical. As the world looks towards the post-2012 period and considers ways to stimulate greater amounts of GHG mitigation in a way that supports host countries' transition to low carbon growth, it is important to appreciate all that has been built over the past decade.

Indeed, in the early days of the carbon market, limited knowledge of and experience with the mechanisms was a real problem for most developing countries and economies in transition. It prevented many countries from being effective players in this emerging market. To help overcome the lack of experience and capacity, many governments and organizations[53] have engaged actively in capacity building to assist host countries in participating effectively in the carbon market.

A critical and significant component of the World Bank carbon finance activities has consisted in providing capacity building and technical assistance to its client countries. The aim has been to contribute to the elaboration of a more equitable market mechanism that benefits all countries with carbon mitigation potential. Over the years, the World Bank has carried out several capacity building programs aimed at supporting CDM/JI host countries' efforts to develop an enabling environment for project-based carbon transactions (Annex 3 outlines the main carbon finance development programs over the past decade).

Capacity development in general is not static; it needs to be sustained and to evolve. This is also true for carbon finance capacity development. Carbon finance capacity development approaches and programs have evolved over the years as a reflection of the (i) evolving circumstances of the international regulatory framework, (ii) the growing knowledge base on carbon market instruments, (iii) the evolving capacity needs, and (iv) the increased level of engagement from CDM/JI host countries.

Key areas targeted by the World Bank's capacity development work since the very inception of the Kyoto's flexibility mechanisms include:

[53] For example UNEP's CD4CDM program at the global level or CAF's Latin American Carbon Program (PLAC) at a regional level.

- Supporting strategic assessments and analytical work at the national and sectoral level, aimed at raising awareness across stakeholder groups, reaching out to relevant decision-makers, and facilitating engagement of the private sector in project identification and development;
- Strengthening institutional arrangements at the national level, including support for the establishment of Designated National Authorities/focal points or CDM/JI promotion offices;
- Assisting in CDM/JI project portfolio identification and development, in particular in sectors bypassed by the market due to methodological challenges;
- Fostering market development through a variety of global and regional knowledge sharing fora and business development platforms, such as the annual Carbon Expo[54], the World Bank's flagship event for carbon market stakeholders.

Moreover, the World Bank established, alongside its carbon funds, a Host Country Committee (HCC, comprised of 61 members), a formal network of national carbon finance focal points comprising representatives of countries hosting project activities of one or more of the World Bank administered carbon funds. The role of the HCC has included providing advice and recommendations to the World Bank's carbon funds on issues related to project selection criteria and project portfolio development; regulatory and methodological aspects arising from the evolving regulatory framework of the UNFCCC; collaboration aimed at streamlining processes of the CDM/JI project development and implementation cycle; and development and improvement of vehicles for capacity development, knowledge exchange, and information outreach.

The capacity building efforts of the World Bank and others have helped achieve significant progress in terms of helping CDM/JI host countries enter the project-based carbon market segment. Several countries in Asia and Latin America successfully established key conditions needed for attracting and utilizing carbon finance. However, considerable effort is still needed in some countries and regions that have not yet benefited much from the carbon market.

Lessons learned from accumulated experience in providing capacity building assistance include:

- In many countries across regions, basic awareness, infrastructure, and practitioner networks have been created in terms of carbon finance, particularly for the purposes of the Kyoto mechanisms. However, there is still a need for such support in some regions, especially in Sub-Saharan Africa and Central Asia. Such support needs to be customized so that countries come up to speed as soon as possible while laying the foundations for the use of carbon market instruments as they continue to evolve.
- In order for smaller developing countries to benefit from the carbon market, it is essential to focus capacity development efforts in priority sectors, involve corresponding key sector stakeholders, and foster the adoption of programmatic approaches to tap into dispersed, small-scale GHG emission reduction options. Support in activities such as development of sector baselines, creating a reliable information base, and strengthening adequate institutional arrangements, continues to be crucial.
- As substantial scaling-up of mitigation activities is likely to be one of the key considerations of a post-2012 climate change regime, it is increasingly important to also focus on capacity building programs that advance large-scale mitigation, including through programmatic approaches. The need to reach out to distinct practitioner and stakeholder groups in host countries has grown significantly.
- With discussions and expectations of changes in the climate regime in the post-2012 period, developing countries face challenges to access relevant knowledge, and translate such knowledge into relevant actions. In many respects, this situation resembles the early stages of the carbon market, with the following differences: (i) today, there is a group of advanced developing countries with practical know-how in carbon finance

[54] The annual Carbon Expo is jointly organized by the World Bank, the International Emissions Trading Association (IETA) and Koelnmesse. www.carbonexpo.com

from which other countries can learn; (ii) these countries host national and/or regional organizations with deep technical expertise, which can serve as knowledge hubs and partners; and (iii) many innovations in carbon finance originate in developing countries, making peer-to-peer learning, and south-south, as well as (two-way) north-south, exchanges an essential element of future capacity building initiatives. This should provide an enhanced foundation for any transition towards a scaled-up use of carbon finance and carbon markets to assist host countries in a shift to low carbon development.

- Along that line, as carbon finance capacity building programs expand in terms of scope and reach, it is important to move implementation from a retail face-to-face approach to a more efficient wholesaling approach where capacity building programs can be delivered through means such as virtual platforms and regional hubs/organizations. This is important for efficacy in the use of limited resources, sustainability of capacity interventions, and for extending the reach of still needed capacity development support.

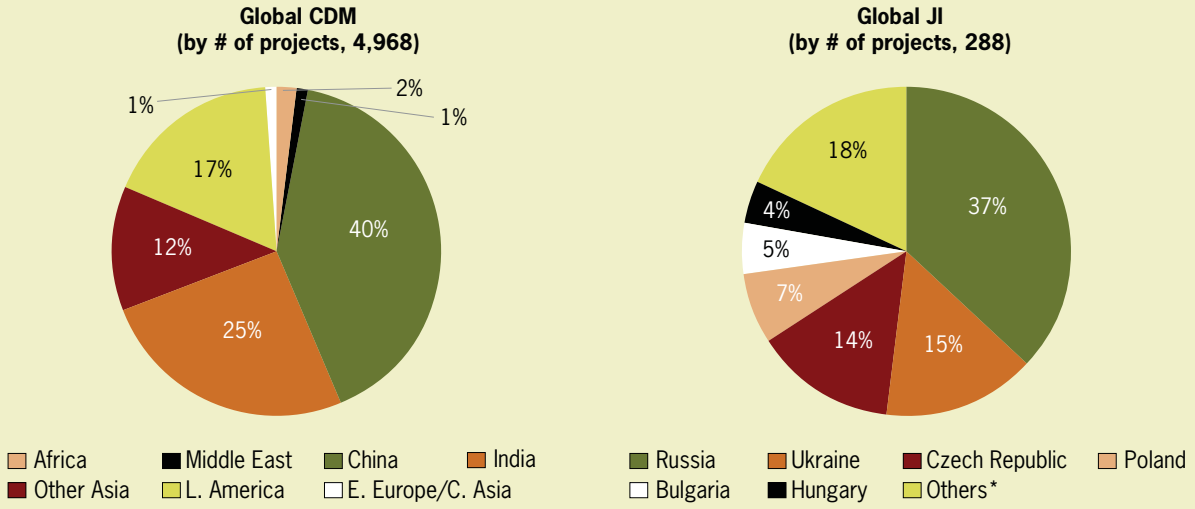
4.2 Geographic reach: broad but uneven

The CDM and JI have reached many countries around the world in terms of institutions, with 139 countries having established CDM Designated National Authorities and 35 countries with JI national focal points (including both Annex I and non-Annex I countries). In terms of projects, 77 countries are hosting at least one CDM project and 15 countries are hosting at least one JI project. The distribution of CDM and JI projects has varied significantly between countries, as shown in Figure 18.

In terms of number of projects, the World Bank portfolio has achieved a better geographic diversification, than the global CDM experience. Of course, the distributions change when considering emission volumes, with China taking the lion's share due to larger project sizes, including the World Bank's 2 HFC-23 projects (see Figure 19)

What emerges from the global CDM experience is the notable dominance of China, whose share is proportionally larger than its share in overall GHG emissions from non-Annex I countries (see Figure 20). China's success can be attributed to various factors, including a GHG-

FIGURE 18 Geographic distribution of global CDM and JI



*Others include Lithuania, Estonia, Romania, Latvia, Lithuania, Slovakia, Germany, France, Sweden & New Zealand
Source: UNEP RISØ March 2010 CDM and JI Databases

intensive electricity grid as well as a large growing economy that offers opportunities for emission reductions. There are also many large projects, which are better suited for the CDM, as transaction costs can be spread over larger volumes of emission reductions. But CDM activities in China have not only consisted of such large projects; in fact, the Chinese CDM experience is very diverse in terms of size (with many small-scale projects) and sectors. An important factor to highlight is the capacity developed in China to facilitate CDM activities.

FIGURE 19 Geographic distribution of World Bank CDM and JI projects

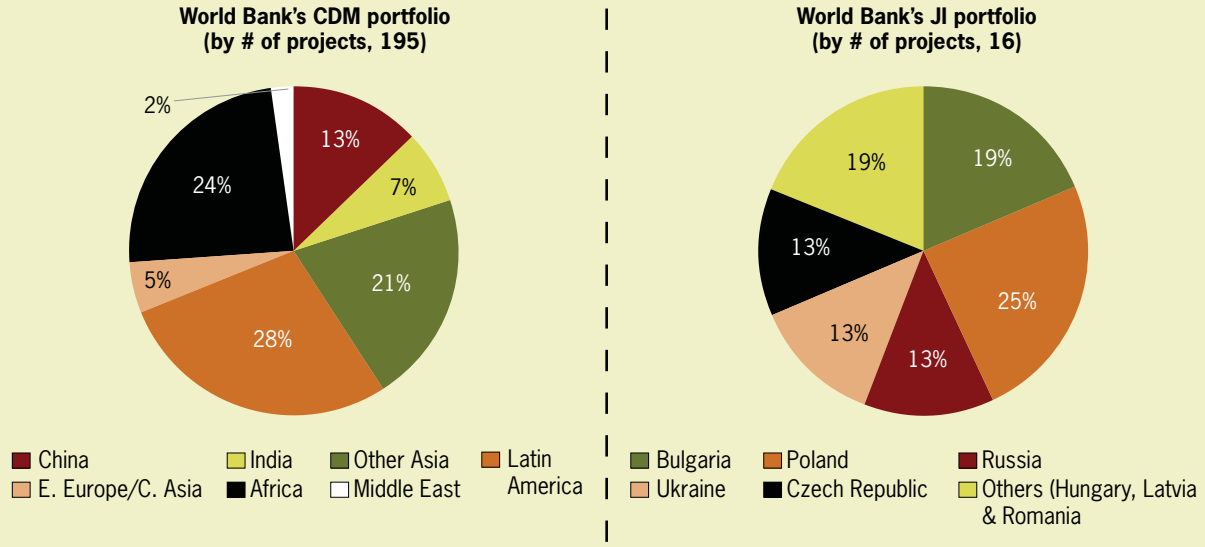
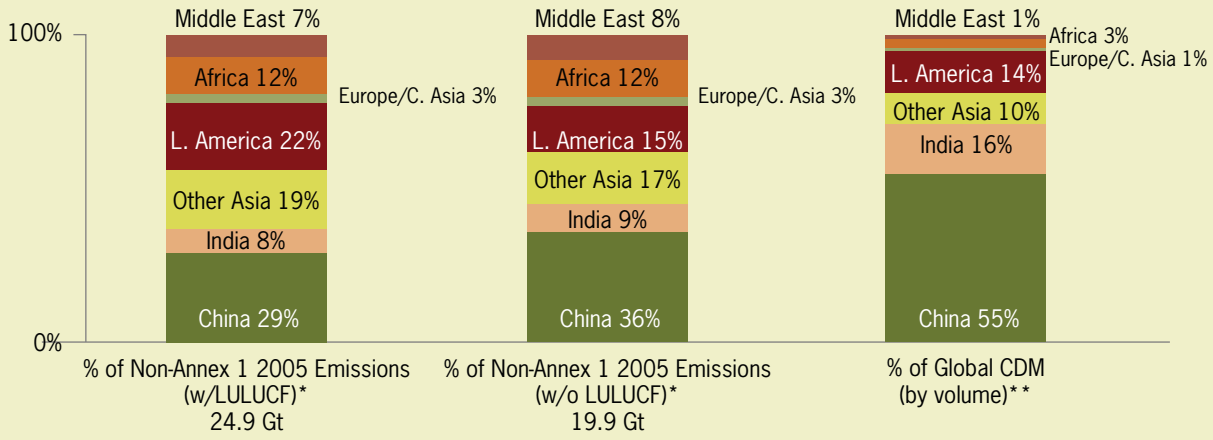


FIGURE 20 Comparison of GHG emissions and global CDM portfolio shares by region



*CAIT, World Resource Institute 2005 data; GDP% out of $23.4 trillion USD
**UNEP RISØ March 2010 CDM Database – Global CDM volume of ERs generated before end of 2012 without risk/delay adjustment 3.2Gt

China was not the first out of the gate in the CDM race (Latin American countries were the initial hosts of CDM projects). However, early on, as in many other countries, the World Bank engaged with Chinese authorities on carbon finance by providing technical assistance. China made a cautious start in the CDM, systematically evaluating the World Bank's proposals and conducting a major study on the implications of the CDM for China (finalized in 2003). This study followed the Chinese Premier's announcement at the 2002 Johannesburg World Summit on Sustainable Development that China would participate in carbon markets.

The Chinese strategic and systematic approach to CDM has been striking. A distinct feature of the Chinese approach to the CDM has been the hands-on role of the Designated National Authority (DNA) in the entire project process. In the initial years, the DNA would often organize industry/sectoral workshops to introduce companies to CDM methodologies and opportunities, and to the World Bank. The World Bank was encouraged to work with a shortlist of companies to bring forward projects, based on their financial status, etc. In 2003, the Chinese government asked the World Bank to consider projects in 3 different areas: energy efficiency, coal mine methane, and run-of-river hydro. Gradually, China engaged with the World Bank's various carbon funds, including the PCF, BioCF, and CDCF. As a last step, the DNA reviewed the PDD and proposed term sheets as a condition of issuing Letters of Approval, often employing its own experts to review the assumptions and sectoral coefficients. The Chinese authorities' capacity development efforts and its overall CDM support structure can be credited for contributing to the country's overall impressive project implementation capacity.

The China's policy framework evolved over 2004 and 2005. Interim guidelines for CDM eligibility were issued first, and then HFC-23 projects provided the opportunity for considering CDM taxes (especially for industrial gas projects). The World Bank supported China in developing of the China CDM Fund, and in establishing tax thresholds that were later included in the revised (October 2005) guidelines that still prevail.

The world's and the World Bank's carbon finance activities extended beyond China. Other large players (India, Brazil, etc.) emerged as CDM leaders. However, it is clear that there is potential to extend the mechanisms' reach.

Each CDM/JI project has its own specificities, but some general trends, observations, and insights have been gained from the World Bank's operational experience spanning the various regions of the developing world. Table 7 gathers the World Bank carbon finance specialists' insights of the key opportunities and challenges for carbon finance project activities in different regions.

While Africa, and least developed countries (LDCs) in general, represent a very small share of the global CDM pipeline, it is worth noting that Africa is hosting more than 20% of the World Bank's CDM projects[55]. The following section examines in greater detail the challenges facing LDCs which constrain their potential to benefit more fully from the Kyoto mechanisms.

4.2.1 *Why isn't there more activity in least developed countries (LDCs)?*

The potential role of carbon finance in LDCs must be considered in the context of these countries' specific situations and needs. Provided rules are changed, the CDM could contribute to broader sustainable development in poor countries, especially in Sub-Saharan Africa, given the huge energy deficit in the region. Africa has the lowest electrification rate of all regions with only about a quarter of households having access to electricity. In Africa alone, more than 500 million people lack access to electricity, with rural electricity access rates as low as 2%[56]. In the absence of new policies, the number is expected to rise. To meet their lighting and other basic energy needs, many households continue to depend on fossil fuel-based sources such as kerosene, or traditional biomass such as firewood (which often has serious impacts on health, eco-

[55] However, projects in Africa tend to be, on average, of much smaller size than in other parts of the world, as discussed in the section on Least Developed Countries, making the continent's contribution to the World Bank's expected volume of emission reductions relatively small.
[56] 2008. Lighting Africa—Annual Report

TABLE 7 **Regional summary table**

	Representation in global CDM pipeline and portfolio (unless otherwise noted)	Representation in WB pipeline and portfolio (CDM unless otherwise noted)	Key opportunities	Key challenges	General Comments/ observations
All Latin America	838 projects 17%	54 psrojects 28%	Large countries have been a success (Mexico, Brazil, Peru) largely because of access to external capital resources for investment		Project entities tend to be more technically advanced and have interest in CDM and have data available
Brazil	350 projects 7%	11 projects 6%		An increasingly clean energy grid is a challenge to set baselines for reductions from energy projects	
All East Asia & Pacific	2,590 projects 53%	49 projects 25%	Strong capacity at host country & PE levels	Even with strong data collection capacity continued difficulty to obtain reliable data	
China	1,961 projects 40%	26 projects 13%	GHG intensive grids leads to opportunities for reductions; strong data collection capacities	Language proves a challenge for DOEs and investors	
All South East Asia	1,276 projects 26%	32 projects 16%	Opportunities for a few large programs that could be registered before 2012	High risk environment	The government of India considers carbon markets to be private sector driven and made little effort to build capacity of the Public Sector Undertakings (PSUs).
India	1,251 projects 25%	14 projects 7%	Access to external capital resources for investment	Public sector projects in India are slow to develop	
All Africa	120 projects 2%	46 projects 24%	Energy efficiency, rural electrification w/ renewables (on & off grid) Large scale PoAs to reduce gas flaring in oil producing countries Forestry sector	Lack of underlying financing for projects; work in countries is expensive raising transaction costs; limited biomass and hydro in the region	Technical and institutional capacity. Complexity of the CDM process, and its stricter requirements make some of the carbon finance interventions unattractive.
Eastern Europe/ Central Asia	288 JI projects 100% 30 CDM projects <1%	16 JI projects 100% 11 CDM projects 5%	Heterogeneous climate policy & priorities as well as established national institutional; GIS & programmatic JI	Interplay with EU ETS; sometimes slow establishment and unpredictable implementation of national JI procedures	The status of Belarus and Kazakhstan under the Kyoto Protocol and the role of Turkey in any future agreements remains unclear. They could make a sizeable new contribution to supply.

Box 6

Bangladesh Solar Homes Systems (SHS) project

The IDCOL Shakti SHS project helps poor, rural households not connected to the grid to access renewable solar electricity.

The target 200,000 households have no electricity and use kerosene and batteries charged from small generators to electrify their houses. With the help of carbon finance, IDCOL has introduced micro financing to allow poorer households to purchase solar panels. The SHS-generated electricity supports increased economic activity in rural businesses and enables use of technologies such as television, computers, and radios.

nomic productivity and the environment). Energy poverty is also directly linked to economic poverty as lack of access to energy stunts economic growth and productivity. In fact, in their assessment of the potential for low carbon energy projects for development, de Gouvello et al. (2008) concluded that "Sub-Saharan Africa has an unprecedented opportunity: choosing a cleaner development pathway via low carbon energy alternatives that can reduce GHG emissions and at the same time meet current suppressed energy demand and future needs more efficiently and affordably."

This is also true for other LDCs. For example, the Solar Home Systems project in Bangladesh (see Box 6) is an example of how carbon finance is contributing to the diffusion of clean technologies, and expanding energy access for the poor.

More than two-thirds of the population in Sub-Saharan Africa depend on natural resources for their sustenance and livelihoods, and nearly 70% of carbon emissions come from land use degradation. Thus, improving long-term land productivity, enhancing land and water management, as well as reducing the loss of vegetative cover, and deforestation and forest degradation, are all important priorities for Africa that can bring not just mitigation benefits, but also help address adaptation and development goals[57].

At the time of the Marrakesh Accords in 2001, many expected that the so-called simplified modalities and procedures for small-scale CDM (SSC) projects would lower the CDM-related transaction costs and ensure such projects would not be at a disadvantage. Although the CDM has seen the registration of many SSC projects[58]—with most SSC projects in the category of renewable electricity generation for a grid—few have been implemented in LDCs. The CDM-related transaction costs have proven to be insensitive to the size of the project and have actually been increasing over time (see Section 3).

In order to gain economies of scale, project developers also typically favor markets with larger potential for projects and those with enabling environments. In this sense, it is important to note that the projects underlying carbon finance transactions are investments which are sensitive to—and facilitated by—the local investment climate, governance, legal frameworks, and opportunities to access capital at reasonable cost.

LDCs, who have smaller economies and often less attractive enabling environments, have not seen a lot of CDM activity within their borders. While the aim of a market instrument is to achieve a given objective in the most cost-effective manner, many have raised concerns regarding the strikingly uneven geographic distribution of CDM projects around the developing world. For example, the UNEP RISØ data indicate that there are only 55 projects in the entire CDM pipeline located in an LDC country (i.e., approximately 0.9% of the total). The World Bank project pipeline includes a better representation, with 31 CDM projects in LDCs, representing about 17% of the World Bank's total project pipeline, largely thanks to focused mandates and efforts of the Community Development Carbon Fund (CDCF) and the BioCarbon Fund (BioCF), and the overall importance of Africa and LDCs in World Bank operations. The same type of picture emerges when looking at Africa as an entire continent: approximately 2% of all projects in the CDM pipeline are located in Africa, which contrasts with the World Bank's carbon finance pipeline where projects in Africa represent about 20% of all projects[59].

[57] Development and Climate Change: A Strategic Framework for the World Bank Group, 2008

[58] At the time of drafting this report, over 900 SSC projects, representing 44% of all registered CDM projects, had been registered by the CDM Executive Board (http://cdm.unfccc.int).

[59] If shares are attributed according to project size, the projects in Africa represent about 11% of the overall emission reductions expected

Addressing CDM barriers facing LDCs: lessons from the Community Development Carbon Fund (CDCF)

The CDCF experience successfully demonstrates the viability of a co-benefit approach to carbon finance by linking climate change mitigation tangibly to the poverty reduction and the development agenda. The CDCF had ambitious geographic distribution objectives which are on track to be exceeded. The original objective was to place at least 25% of the Fund's resources in the poorest ("priority") countries. As of March 2010, 52% of the projects (in value) were located in priority countries. Out of 33 projects in its portfolio, the CDCF has 11 projects in LDCs (about 20% of the worldwide total) of which 2 are registered, and 9 projects in Sub-Saharan Africa (out of a world total of 61, excluding South Africa). The Fund also gave priority to small-scale projects, a target also on track to be achieved with 25 projects in that category.

However, this success is accompanied by significant challenges in developing the carbon assets. For instance, only 39% of CDCF projects are registered by the CDM EB as of March 2010. This illustrates that sourcing projects and gaining regulatory approval has proven to be much more difficult than anticipated.

Three key lessons can be drawn from the CDCF experience:

- Without significant reform in the CDM regulatory process, a large number of small-scale carbon finance projects in LDCs is unlikely to happen. Transaction costs and delays have to be dramatically cut to make small-scale projects viable.
- Managing the requirements of the CDM process, both for project validation and monitoring of emission reductions, requires substantial capacity building efforts and technical assistance support to project entities.
- New CDM methodologies or approaches are needed for LDCs, taking into account their need for growth in energy services, given the state of significant suppressed energy demand.

BOX 7

A look at the various steps in a CDM project cycle suggests that the performance of LDC projects—even after they enter the CDM pipeline—unfortunately still lags behind that of CDM projects located in other parts of the world. Longer delays for implementation of projects are common and key CDM milestones (i.e., registration and issuance of CERs) tend to take longer to reach in LDCs,[60] which contributes to relatively higher transaction costs and often loss of revenue for project entities[61]. The following statistics (updated as of March 2010) illustrate the situation:

- Only 15 (0.73%) of the CDM's registered projects are hosted by LDCs. Because they tend to be smaller, these registered projects are expected to generate only 0.25% of all credits by 2012.
- Only 1 project in an LDC (a micro hydro project in Bhutan) has issued CERs for a total of 474 tCO_2e, representing 0.00012% of all CERs issued to date.
- There are 38 projects under validation in LDCs (out of a total of 2,712). These 38 LDC projects, added to the 15 registered projects and 2 submitted for registration, would represent just over 1% of the total CDM. These 55 projects, if all registered and performing as planned, are expected to generate less than 1% of all CERs by 2012.
- When looking at Africa as a whole, 8 projects have issued CERs, totaling 5.6 $MtCO_2e$ (or about 1.5% of all CERs issued to date). These CERs are issued from projects located in Egypt, Morocco, and South Africa.

(according to PDDs) from projects in the World Bank pipeline. This reflects the typically smaller size of projects in Africa compared to the projects in more advanced economies, and in particular China.

[60] It must be noted that these critical milestones have not yet been reached by the majority of projects in the CDM pipeline (UNEP RISØ). Figures on registration and issuance will evolve as more projects currently in validation reach registration and move to issuing CERs.

[61] The assessment of "loss of revenue" is related to the registration date, as CERs can only be generated once a project is registered by the CDM Executive Board. It is in this sense that there is a "loss of revenue" when the registration of a project gets delayed.

Key Insights

Throughout the World Bank's work in pursuing and developing CDM projects in LDCs, and particularly through the experience gained through the CDCF (see Box 7), it

is possible to identify several factors that can help explain the challenges facing LDCs in terms of attracting CDM investments. Some of these factors, which are in addition to the typically smaller size of the economy, lower consumption of energy, and thus smaller size of carbon finance projects, are related to conditions inherent in the country and affect their respective attractiveness to investors and CDM project developers:

- **Good governance and enabling environment.** Numerous studies[62] have pointed to the importance of good governance and an enabling environment when evaluating a country's ability to attract new investments. This is also relevant to carbon finance and the CDM. Seeking to attract more CDM projects may well involve governments examining their own policies and enabling environment.
- **CDM capacity and awareness in host countries/ CDM procedures not adapted to LDC realities.** Factors such as the time required to obtain a CDM letter of approval from the host country CDM DNA; and the awareness and familiarity of government entities and private stakeholders with the CDM, are important considerations for investors and project developers. CDM demands a minimum level of capacity within the private sector company or public entity to handle all its requirements. When existing resources are already stretched or insufficient for the core business, it is often difficult to find a champion to manage the CDM with its intricate processes and requirements in a timely manner. Many line ministries that could be instrumental in helping promote and facilitate CDM projects are often unaware of the possibilities offered by carbon finance. Extending carbon finance capacity development efforts beyond DNAs and a few key experts within environment ministries will be a key element to fostering greater CDM activity in LDCs.

  It often takes longer to obtain data and documentation required for the validation and registration of a CDM project in LDCs than in other parts of the world. This is also often due to the nature of the data and documentation requested by the CDM, which may not be readily available in LDCs. Changes are needed to reflect the realities on the ground in LDCs and so create a fairer playing field for them.
- **Availability and costs of CDM consultants and Designated Operational Entities.** The development of PDDs is often done by consultants who are familiar with the language, procedures and rules of the CDM[63]. There are, however, few CDM consultants in Africa, thereby often increasing the cost associated with producing PDDs. Few DOEs have staff located in Africa, and travel within Africa can be time consuming and costly, which can also contribute to increasing the time required for validations and verifications. Moreover, DOE pricing is typically not directly related to the size of a project, but rather to the perceived complexity (and risk) of a project. This often appears to be greater for projects in LDCs where data are not always readily available, and business practices and documentation often differ from that in more industrialized economies.

  There is a need to seek to enhance awareness and engage private sector participation through training to build up service providers in Africa that could stimulate the private sector's ability to access carbon finance.

The above factors pertain mostly to the situation in LDCs that differs from that in bigger CDM markets. In our view, some technical and procedural decisions (or absence thereof) in the CDM may have had a disproportionate negative impact on the LDCs' ability to attract CDM flows. Four are highlighted below:

- **Onerous CDM procedures and requirements not adapted to LDC realities.** Methodologies and documentation requirements (e.g., the data require-

[62] See, for example the Doing Business website: http://www.doingbusiness.org/. Unfortunately, the majority of the countries with the lowest ranking are LDCs.

[63] In many cases, it can be argued that the CDM, with its language, methodologies and processes, has become overly complicated and not easily accessible to many potentially interested project entities.

ments and documents often requested to demonstrate the additionality of a project, as well as monitoring requirements) are often geared toward the most advanced developing countries and do not work well for smaller projects with less capacity, less data, and for less sophisticated project entities with less formalized processes. It is clear that current requirements and procedures (and associated transaction costs) are significant obstacles to CDM project activities in LDCs. It is essential to reflect circumstances on the ground and work towards streamlining methodologies and expediting registration procedures in order to enhance the attractiveness of LDCs in the CDM.

In context, it is worth noting the Community-focused Micro-Scale Scheme being developed by the Gold Standard[64] where eligible project activities are deemed additional, *without* any further requirements to demonstrate additionality. This Gold Standard scheme is worth a close examination, as it may offer a unique window of opportunity and a way forward for community-based micro-scale projects. Similarly, the World Bank also recommended in its April 2010 submission to the EB, automatic additionality for small-scale renewable energy and energy efficiency projects (see Annex 4).

- **Grid Emission Factors and inadequate reflection of reality of suppressed energy demand.** Baselines often rely on historical experience. In the case of LDCs, emission baseline calculations do not take into account latent demand for energy that exists and are thus under-estimated, diminishing the potential for GHG reductions. Instead, they tend to assume the continued supply of low/poor quality energy services as these countries develop. The issue of suppressed demand is not new and its recognition is reflected in the 2001 Marrakesh Accords, which explicitly allow for baselines to account for emissions "above current levels due to specific circumstances of host parties." However, the debate continues on how to determine suppressed demand and therefore how to measure it[65].

  Addressing barriers to CDM projects in LDCs should include developing more appropriate and practical grid emission factors (EFs), to account for the large suppressed demand reflected in fossil fuel-based off-grid electricity and significant imports from electricity systems in neighboring countries, that are not reflected in the grid emission factors. Such improvements would lead to a more realistic (higher) emission baseline, providing a larger potential to reduce emissions. This could help stimulate interest in energy projects, not only on the supply side, but also on the demand side (e.g., transfer and/or diffusion of energy-efficient technologies and equipment).

- **Treatment of projects that replace non-renewable biomass.** The CDM EB made the conservative decision to *not* base the baseline on non-renewable biomass[66] (typically fuel wood) but rather on other fossil fuels (kerosene/LPG), because non-renewable biomass is considered ineligible for crediting under the Marrakesh Accords. This led to a drastic decrease in the emission factor for these types of projects and resulted in essentially cutting in half their emission reduction potential[67], thereby jeopardizing their financial viability. This decision affects in particular projects that introduce new renewable energy end-user technologies, such as biogas stoves and solar cookers, to replace the use of non-renewable biomass for cooking. It has disproportionately affected Sub-Saharan Africa and

[64] Gold Standard presentation on "Making Carbon Finance Work for the Poor—the Gold Standard Example", Africa Carbon Forum, Nairobi, March 5, 2010.

[65] See, for example, presentation at COP 9 Side Event (Suppressed demand: extending CDM potential into least developed countries) by A. Michaelowa and Dang Hong Hanh on "Challenges in determination of suppressed demand", Milan, December 3, 2003 (http://www.southsouthnorth.org/)

[66] At its 37th meeting in 2007, the CDM EB ruled that for the small-scale methodology AMS.I.E. (Switch from Non-Renewable Biomass for Thermal Applications by the User), the emission factor for the baseline would be that of the projected fossil fuel likely to be used by similar consumers, such as kerosene or liquefied petroleum gas (LPG), and *not* the emission factor of non-renewable biomass which is significantly greater.

[67] The World Bank made a submission (dated April 16, 2007) to the call for public input by the CDM Executive Board on proposals for methodologies for small-scale CDM project activities that propose the switch from non-renewable biomass to renewable biomass (it can be downloaded from: www.carbonfinance.org)

projects in poor communities across LDCs where fuel wood, very often from non-renewable sources, tends to be used.

There may be some hope of revisiting this decision by the CDM EB with the recent recognition of REDD (Reduced Emissions from Deforestation and Degradation) in the post-Kyoto context, which may stimulate a revision of the modalities and procedures related to the land use sector to enable the eligibility of non-renewable biomass.

- **Treatment of forestry projects and exclusion of agriculture under the CDM.** 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 GHG potential and extremely relevant for 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[68] to the potential of the agriculture sector as an important contributor to climate change mitigation, the future may look brighter for these types of projects, to the potential benefit of LDCs.

4.3 Sector coverage: diverse with untapped opportunities

4.3.1 *Overview*

The climate challenge demands that we act differently by moving towards the development and diffusion of GHG-friendly technologies and processes. There are plenty of opportunities to increase efficiencies and to lower the world's high-GHG intensity. For example, existing technologies and best practices could reduce energy consumption in industry and the power sector by 20–30%, shrinking carbon footprints without sacrificing growth (WDR 2010). Many mitigation actions—meaning changes to reduce emissions of greenhouse gases—have significant co-benefits in public health, energy security, environmental sustainability, and financial savings.

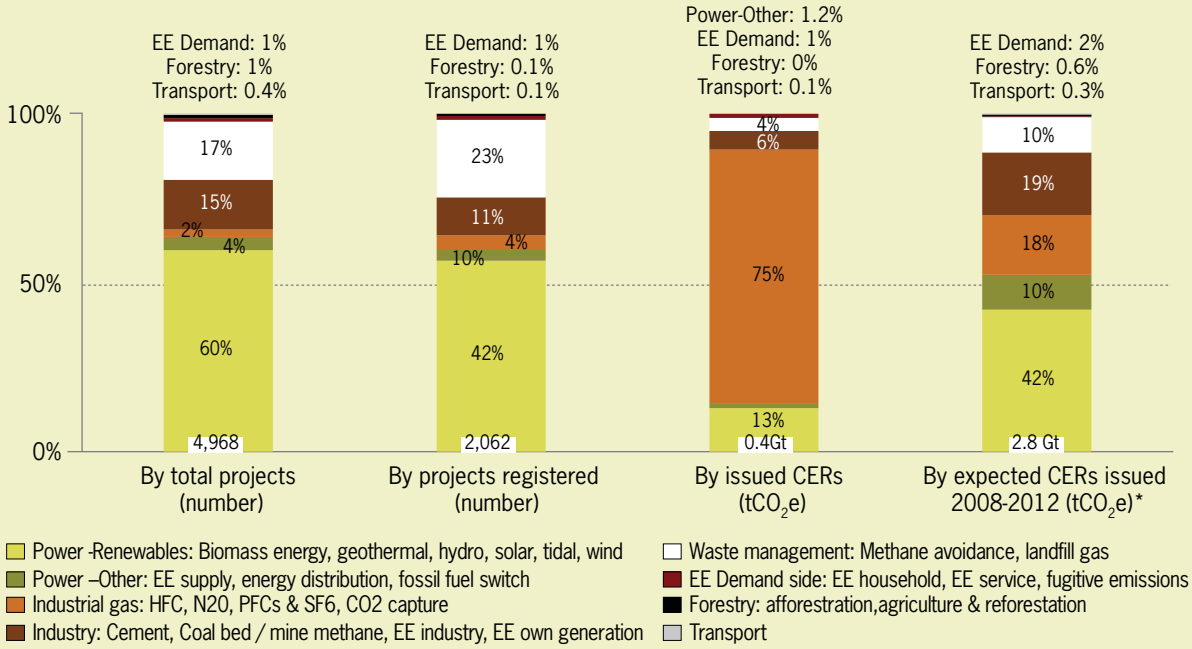
To date, the renewable energy sector, which is a key focus for many countries' low carbon development, has attracted the largest number of CDM projects (see Figure 21). This is true for both the entire CDM pipeline and in the context of the set of already registered projects. Waste management and industry are the two other most "popular" sectors. However, the picture changes when looking at the volume of emission reductions achieved by the CDM per sector. This is due largely to differences among projects with respect to (i) their size; (ii) the yearly emission reductions they can generate; and (iii) different GHGs global warming potential, i.e., the global warming effect of a GHG over a time horizon of 100 years in mass relation to carbon dioxide. Indeed, the volume of CERs issued to date is largest for industrial gas projects that represent a relatively small share of the total *number* of projects, but have high GWPs leading to high volumes of emission reductions per project. These projects were also among the fastest to be implemented and start requesting CER issuance as a result of the financial significance of their CER revenue. This dominance is expected to dissipate at the end of the commitment period, when other projects move to requesting the issuance of their respective CERs.

The sector coverage of JI (Figure 22) differs from that of the CDM, with renewable energy occupying a smaller share of the total, though still significant. This may be due to power sector installations being covered under the EU ETS and thus limiting JI opportunities in many countries (as discussed earlier). The shares of fugitive emissions (e.g., from gas flaring reduction projects) is larger and is expected to deliver a large share of the JI's ERUs.

The technology composition of the World Bank portfolio (CDM and JI combined) is more diversified, with markedly larger shares of projects in the forestry sector

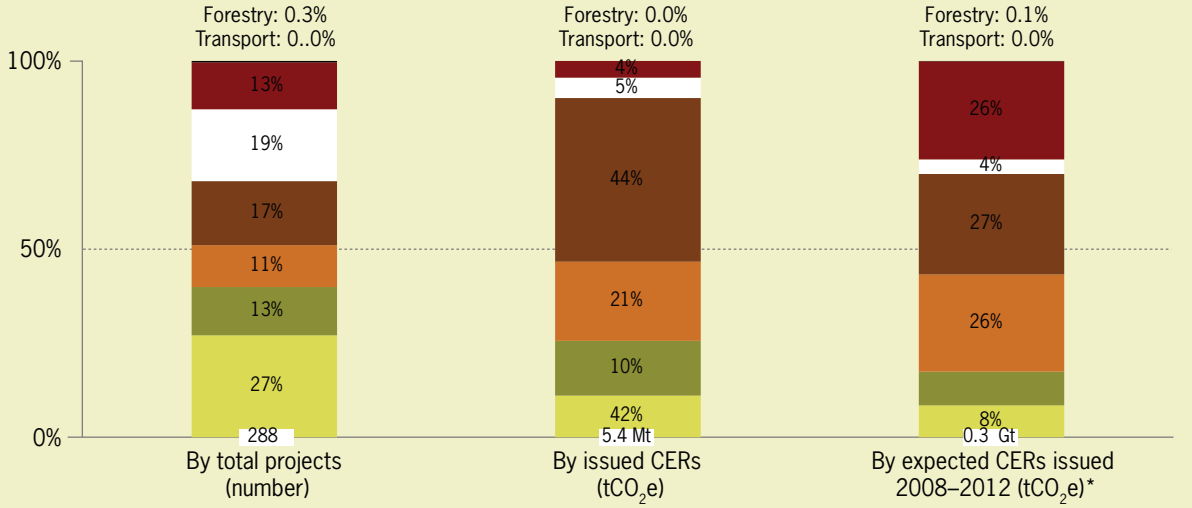
[68] See for example, the agenda and presentations made at the March 3–5, 2010 Africa Carbon Forum in Kenya (http://africacarbonforum.com/2009/english/index.htm)

FIGURE 21 Technology distribution of CDM (until March 2010) – global CDM



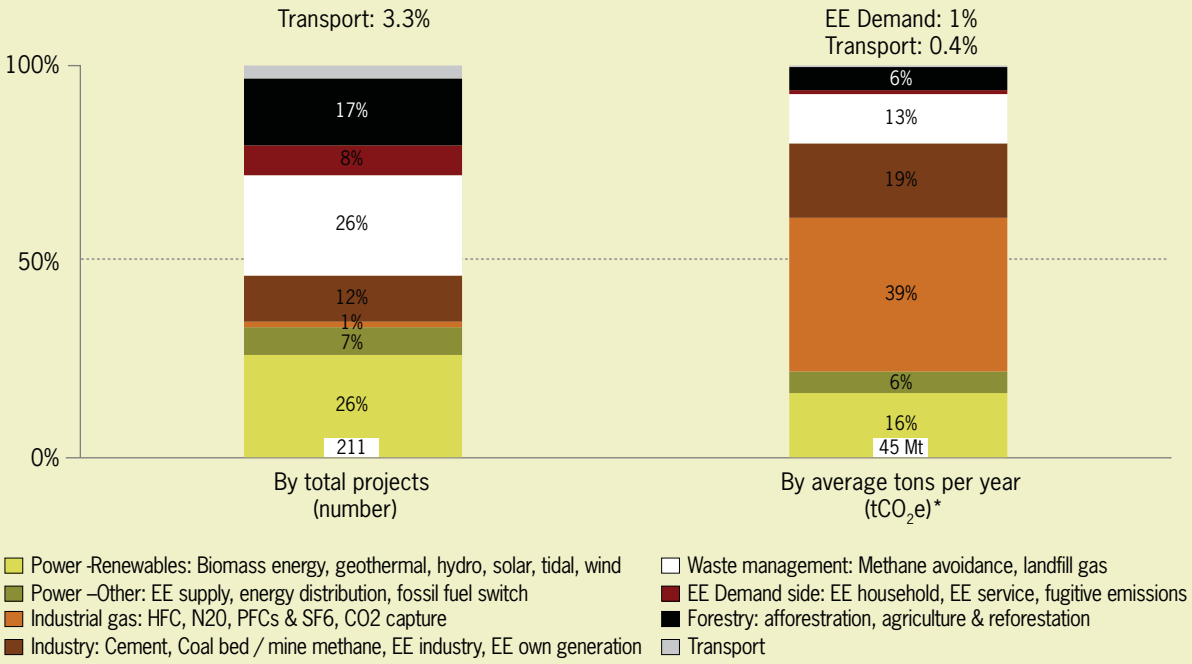
*2008–2012 CERs are not risk adjusted and represent full PDD volumes. As of March 2010 UNEP RISØ estimates ~1.036 Gt CO_2e to be delivered from CDM

FIGURE 22 Technology distribution of JI (until March 2010) – global JI



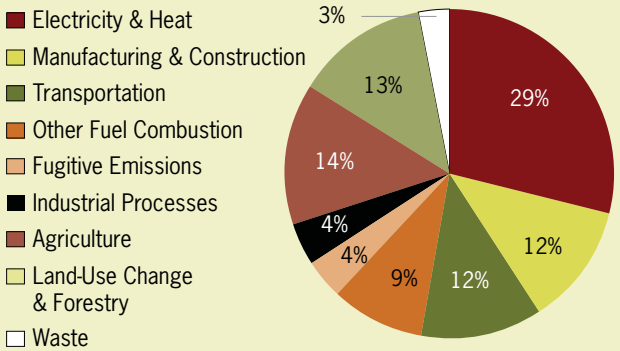
*2008–2012 CERs are not risk adjusted and represent full PDD volumes. As of March 2010 UNEP RISØ estimates ~0.3 Gt CO_2e to be delivered from JI

FIGURE 23 Technology distribution of World Bank portfolio (by technology type)



*2008–2012 CERs are not risk adjusted and represent full PDD volumes. As of March 2010 UNEP RISØ estimates ~1.036 G + CO_2e be delivered from CDM

FIGURE 24 Global GHG emissions by sector (2005 data)



Source: CAIT, World Resources Institute 2005 data. Includes land use change

and in the demand-side energy efficiency sector, again attributed to dedicated efforts on projects that directly benefit the poorest communities (see Figure 23). In terms of expected emission reductions, the industrial gases and the industry sector projects are expected to generate the most.

A look at the sectoral distribution of GHG emissions in developing countries (Figure 24) provides a perspective of the potential for emission reductions in these countries. But it must be recognized, once again, that the CDM's inability to reach the full mitigation potential across sectors is related, at least in part, to the demand for CERs (which is dependant on the ambition of emission commitments). It is also very clear that many investments, especially large capital investments, require greater clarity and certainty of longer-term carbon finance revenue streams. Moreover, it may simply be that

all sectors are not equally well suited for a project-based mechanism. For instance, in some sectors, and for some types of activities, other measures, such as regulation or standards, may be equally or more effective in stimulating GHG-reducing activities. There are also some sectors where methodologies may not be suitable or where the design and implementation of projects is more complex, possibly requiring larger scale programmatic approaches. In the case of forestry, it is clear that the current unfavorable regulatory framework is affecting its potential under the CDM (discussed below). Insights on key sectors, and how the CDM was able, or not, to reach them is outlined below.

Industrial gases

While at the outset, many expected the CDM to mainly target GHG reductions in sectors that contribute most to global emissions of GHGs (see Figure 24), the carbon price logically directed the CDM first to the projects with the lowest abatement costs. In market context, the lowest abatement cost naturally translates into projects that result in high emission reduction with manageable cost, ease of management, a fast path to commissioning, and simpler methodological requirements. The "lowest-hanging fruit" turned out to be non-CO_2 GHGs with high global warming potential, such as HFCs[69] and N_2O (commonly called "industrial gases"). Apart from the higher volume of emission reductions, these projects were also in well-established sectors that had the financial and technical ability to undertake projects in a nascent carbon market and to work with the emerging CDM rules. As the baseline is clear and the methodologies and additionality fairly straightforward, and because it is simpler to develop a CDM project at single-point sources, eliminating 'end-of-pipe' industrial gases allowed the CDM to generate early volumes consistent with the scale of demand, build market confidence, and lower the initial cost of CER supply. (See Box 8).

There have been critics of this early dominance of industrial gases. However, from a market point of view, eliminating industrial gases provided a cost-effective starting point. Furthermore, in the absence of the CDM (or any regulation), there would be no incentive for their elimination, making these the closest to "black-and-white" cases of additionality. The majority (i.e., about 75%) of CERs issued to date are for industrial gas projects (see Figure 21). The World Bank, through Tranche 1 of its Umbrella Carbon Facility (UCF), was one of the first market players to unlock this CDM sector by signing 2 ERPAs for HFC-23 projects located in China[70]. These large deals dramatically affect the technology composition of the World Bank`s carbon finance portfolio as shown in Figure 23. However, the CDM market is naturally dynamic and continues to search for the next level of "low-hanging fruit." This is reflected in the industrial gas sector's decrease in expected share of issued CERs by the end of 2012 as compared to their current share of issuance (see Figure 21).

Methane avoidance and waste gases

Reduction in emission of methane (CH_4) closely follows industrial gases in attractiveness for the carbon market. In fact the CDM is helping countries find a more sustainable solution to their growing waste management challenges. Sometimes referred to as the "methane kick", given the higher GWP of methane (the landfill gas) compared to CO_2, the CDM provides a value to capturing landfill gas. The captured landfill gas, which would otherwise be vented into the atmosphere, can instead be flared and transformed into CO_2 (with much reduced GHG impact on the atmosphere) or used for power generation. The coal mining sector, waste gas recovery and use (for power generation or other useful energy needs) also have

[69] For example, the GWP of HFC-23, an unwanted by-product in the production of HCFC-22 is 11,700.

[70] These transactions were accompanied by the Chinese authorities' establishment of the China CDM Fund, funded through levies on projects' CERs including a 65% levy of CER revenue from HFC-23 projects. Questions and answers are posted on the World Bank carbon finance website: http://wbcarbonfinance.org/docs/HFC23_q-and-a_12-18-05.pdf

BOX 8

The CDM and HFC-23 projects

Some refer to the CDM's impact on HFC-23 projects as a sign that the market signal works and ensures that limited capital to mitigate emissions gets the "biggest bang for the buck" (in terms of GHG reductions) wherever possible. Others see it as an unfortunate waste of CDM resources.

The bulk of HFC-23 generation comes as a by-product of the production of HCFC-22[1], which is used primarily as a refrigerant and as a feedstock for manufacturing synthetic polymers. By mitigating the HFC-23 waste stream under the CDM, plant operators can gain significant revenues from the sale of CERs, due to the high GWP of HFC-23[2].

There are many critics of the early dominance of industrial gases, in particular HFC-23 (and N_2O), in the CDM. Pointing out the cost-effective nature of HFC-23 destruction and the high profit margins for HFC-23 reduction in the CDM market, critics argue that this has been a wasteful use of the CDM, when it would have been cheaper to simply give the factories the money to install the equipment to destroy the gas. They also worried about potential perverse incentives. Michael Wara, in his 2007 article published in *Nature*, writes: "HFC 23 emitters can earn almost twice as much from the CDM credits as they can from selling refrigerant gases—by any measure a major distortion of the market."

Others (e.g., MacWhinney 2007 and IETA) argued that profit margins are not the issue. What is critical for the CDM is that projects lead to an additional benefit to the global environment. Without a value for the reduced emissions, which the CDM brings, the reality is that facility owners have no incentive to reduce HFC-23 emissions. Without the CDM, and given the lack of regulations in host countries, it is likely that these potent gases would still be vented into the atmosphere. These types of end-of-pipe projects are seen as the closest to clear-cut additionality in the CDM.

The issue of perverse incentives, i.e., facility owners having a potential incentive to set-up an HCFC-22 facility with the main purpose of destroying its HFC-23 by-product, is misguided as new HFC-23 facilities are not eligible for CDM credits under the approved methodology. Schneider 2007 also concludes that "despite the public criticism, it is unlikely that there are any perverse incentives to increase HCFC-22 production under the current rules of the CDM."

[1] HCFC-22 is an ozone-depleting substance (ODS) as well as a GHG with a GWP of 1,700 and it is controlled under the Montreal Protocol. HFC-23 is not an ODS, but a GHG and is controlled under the Kyoto Protocol.
[2] HFC-23 has 11,700 times the Global Warming Potential of CO_2, with a long lifetime of 260 years.

benefited from the CDM incentive to stimulate productive uses of otherwise released methane. In major carbon-intensive manufacturing industries (iron and steel, cement, chemicals), the CDM incentive attracted the attention of plant managers and catalyzed the uptake of commercially proven technologies to capture waste heat and waste gases and to increase efficiency.

Energy extracting industries

Energy extracting industries also have provided significant potential for the recovery of waste energy for productive use, such as the use of previously flared petroleum and refinery gas or coal mine methane for power generation and other useful energy or feedstock needs. In addition, a significant amount of methane can be recovered from leaks during operation and storage, in particular in oil and gas upstream and transportation segments. Despite the highly capital intensive nature of these industries, carbon finance is creating an important additional incentive for investment in the difficult regulatory and market contexts of developing countries. The scope of CDM projects in these sectors could be significantly improved by enlarging the scope of methodologies to cover different activities and by adjusting methodologies' monitoring provisions, relying on the established practical industrial processes for the monitoring.

Renewable energy

CDM has played a very important role in stimulating renewable energy (RE) projects. In fact, an examination of the global CDM pipeline of nearly 5,000 projects shows that the majority of projects (i.e., 60%) are renewable energy projects, mainly hydro, wind and biomass projects. Large hydro and wind projects typically have a long construction period, affect large numbers of local stakeholders, and involve large investments, of which CDM revenue is a very small component concerned with their additionality and sustainability. Nevertheless, these projects are typically easier from the carbon market perspective than dealing with small or micro scale, community-level, renewable energy projects involving higher transaction and development costs and usually not pursued out of purely commercial interest. The complex CDM rules around public funding[71] further hamper small, RE-based, rural development projects. Most of these projects require extensive grant financing and capacity building support to be conceptualized and commissioned, before they can even enter the CDM pipeline, but then they struggle to prove their additionality (due to the existence of public funding).

Transportation

The transport sector comprises nearly a quarter of global GHG emissions today, and these emissions are expected to increase exponentially over time with urbanization. To date, the CDM has not been able to make significant inroads into the transport sector, apart from its limited success in supporting *technology shift* types of projects (e.g., commercial vehicle retrofits and low emission vehicles) that actually tend to result in rather small, short-term improvements. The current additionality approach makes it difficult to establish the additionality of projects that have large investments, and environmental and social benefits that are much greater than their GHG impact. The truly long-term transformative activities—mass transit system development, transit-oriented development, modal shift incentive schemes, non-motorized transport infrastructure investment—are essentially locked out of the CDM. Moreover, the GHG impact of these projects depends on the behavior of users, which is typically very difficult to assess, thus complicating the quantification of GHG emissions. To reach this critical sector with the CDM, a new more practical approach to methodologies and additionality will be required.

Energy efficiency

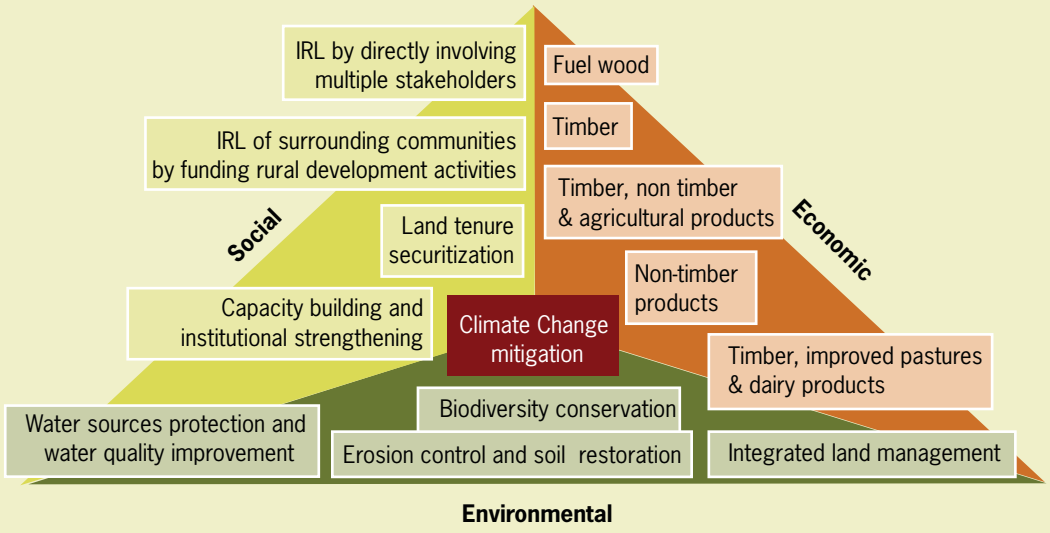
Energy efficiency initiatives reduce GHG emissions through energy savings and, on the basis of a life-cycle cost assessment, appear to provide low pay-back periods. This situation often invites intensive questioning on the part of DOEs and the CDM EB. However, it is well-known that, despite their inherent attractiveness, they are not implemented in practice due to the range of documented barriers not captured in technology cost-curve analyses. The CDM can help remove some of these barriers (e.g., see Figueres and Philips, 2007; and IEA 2007). Typical demand-side energy efficiency initiatives generally involve a large number of micro, dispersed opportunities and multiple stakeholders requiring complex implementation arrangements, which can now be encouraged using the CDM programmatic approach. These demand-side energy efficiency projects have many synergies with developing countries' development objectives. In fact, the World Bank is pursuing several energy-efficient lighting projects in some of the poorest countries, e.g., Bangladesh, Rwanda, and Senegal. Energy efficiency is also important for the larger countries whose growth and development potential may be hampered by energy shortages and/or costly energy imports.

4.3.2 *The special case of forestry*

Even though land use changes account for about 20% of global GHG, more than the entire global transportation

[71] Including rules to ensure that CDM does not divert official development assistance (ODA) funds.

FIGURE 25 Multiple benefits delivered by BioCF projects



IRL: Improved rural livelihoods

sector (IPCC 2007[72]), the land-use sector is vastly underrepresented in the CDM, although better represented in the World Bank portfolio, as a result of the BioCF.

The history of the CDM afforestation and reforestation (A/R)—the only two land-use activities currently eligible under the CDM—started two years later (2003) than other sectors. These two years were devoted to defining rules and an extra year to the design and approval of the first A/R methodology. Five years have passed since then and important achievements have been made: 14 approved CDM methodologies covering a wide range of baselines and project scenarios are available, including six for small-scale projects and two large-scale consolidated methodologies. The CDM A/R Working Group (reporting to the CDM EB) published 14 tools/guidelines to facilitate methodology application, and some organizations have also published useful tools and guidebooks that contribute to improving and spreading knowledge on forestry carbon. In addition, 15 DOEs are accredited for validating A/R projects and 14 for verification. The number of projects in the global A/R pipeline is also accelerating, with 11 projects registered in 2009, compared to none in 2008 or 2007 and one project registered in 2006.

Project entities, DOEs and A/R-WG, have been learning together how to effectively apply the A/R CDM rules. For example, most (68%) World Bank BioCarbon Fund (BioCF) projects[73] entered the portfolio between 2004 and 2005 when no methodology for GHG accounting existed. Some pioneer projects provided field based experience for the development of 7 approved CDM methodologies. These projects also provided feedback from the field on the application of the CDM rules, which helped the CDM EB to develop procedures, guidance, clarifications, and tools to facilitate the application of meth-

[72] Intergovernmental Panel on Climate Change, 2007. *Climate change 2007: the physical science basis. Contribution of working group 1 to the fourth assessment report of the Intergovernmental Panel on Climate Change.* www.ipcc.ch/publications_and_data/publications_ipcc_fourth_assessment_report_wg1_report_the_physical_science_basis.htm

[73] The World Bank forestry projects are part of the BioCF portfolio, except for two projects that are part of the PCF.

odologies and rules. New projects could build on this experience and introduce simplifications.

Well-designed projects can significantly contribute to the sustainable development of impoverished rural areas and these contributions can be done in different ways. Projects have a wide range of benefits including greenhouse gas reductions, soil conditioning, and erosion control. Figure 25 illustrates the range of sustainable development benefits A/R projects can deliver. Some projects have been designed to deliver many of these benefits at once, while others have focused on a smaller sub-set.

A key feature of A/R-CDM is its potential for tackling mitigation as well as adaptation to climate change. Many of the benefits delivered by BioCF A/R projects contribute to strengthening the natural and socio-economic capital of rural people, thus improving their capacity to cope with adverse events and reducing their vulnerability. The A/R activities regenerate severely degraded and remote lands where special planting techniques may need to be employed. The rural economy of impoverished communities is therefore stimulated with timber and other revenues. Adaptation to adverse conditions is also achieved by improving the soil condition and water retention capacities, and helping prevent soil erosion. In addition, A/R activities are promoting integrated land management, with a number of projects promoting alternative activities such as improved agriculture, intensive pasture management practices, agro forestry and fuel wood plantations.

Another prominent feature of forestry carbon finance is its potential to remove land tenure related barriers. Clear land tenure and carbon rights are requirements of A/R-CDM. In four BioCF projects in Kenya, Madagascar, Niger, and Ethiopia, communities have been granted land tenure rights through ERPA contracts and benefit-sharing systems. In addition, in other projects, communities that are afforesting / reforesting State lands have been granted with usufructuary rights[74] to the land, including tradable rights to carbon.

The A/R CDM is making a significant contribution to improving forestry practices and forestry monitoring. Project developers have to systematically measure biomass increments and projects' emissions and ensure a high quality of data collection, storage, and management. Entities of multi-stakeholder projects have to create forestry capacities which usually include the introduction of a culture of long-term land use planning.

Realizing the CDM's potential is impaired by CDM technical challenges associated with demonstrating compliance with the CDM land-related rules, i.e., land eligibility, legal land tenure, project boundaries, and control over the land. Demonstrating land eligibility is costly and demands specialized knowledge and technology as well as specialized studies of land use patterns and/or ecology. The BioCF projects that have submitted their land eligibility assessment to validation scrutiny are mainly located on degraded lands. Challenges related to low capacities have delayed the assessment of these projects. The CDM legal land tenure requirement is also an obstacle, as it is usually a time-consuming process that requires the support of national and local institutions.

Another technical challenge is the amount of information and the level of detail required by a CDM A/R methodology. Despite substantial progress in developing simplified methodologies, this remains an issue, especially when using native species and accounting for emission leakage, as growth data for native species are scarce and may involve lengthy and costly evaluations.

CDM A/R activities face particular financial and market challenges linked to the temporary nature[75] of forestry carbon credits under the CDM. According to this rule, the verification of sequestered carbon can only occur once every five years, complicating the viability of projects as carbon finance payments are performance-based. Some projects, like those involving poor farmers cannot wait for five years to compensate stakeholders for their land use change.

The other side of the problem with temporary crediting is the replacement liability placed on the buyers purchasing a forestry credit. Indeed, according to the prevailing CDM rules, forestry credits need to be replaced with other temporary or permanent credits prior to their expiration. In the current uncertainty surrounding the

[74] Rights that provide for the use of property that belongs to another.
[75] The CDM temporary credits (tCERs) were put in place to address the non-permanence risk associated with forestry projects.

post-2012 climate regime, acquiring a temporary credit plus a replacement credit is not an obviously attractive proposition compared to buying a permanent credit.

The establishment of Programmes of Activities (PoA) under the CDM has been a positive development for CDM A/R, as they are more compatible with the dynamic of farmers' land use decisions. The BioCF is currently validating the first forestry PoA. PoAs allow the flexibility to add lands whenever they are identified and are ready to be planted, as long as additionality and eligibility criteria are met. Simplified A/R methodologies will be essential for a greater uptake of forestry PoAs.

Although there have been challenges, the window for forestry carbon credits has opened up. The outlook on the supply side is good; developments in the regulated and voluntary market frameworks have been positive, and, building on the experience already gained, some countries are scaling up the forestry CDM through new projects or PoAs. However, more positive market signals are necessary to boost the demand for these credits. Such a boost could then lead to significant environmental, social, and economic benefits, particularly for rural communities. A study of BioCF lessons learned from A/R CDM is under preparation; it aims to shed light on the challenges that project developers have encountered in achieving effective project preparation and implementation, and also on opportunities that the CDM has brought to the forestry sector.

5 The Benefits of Carbon Finance

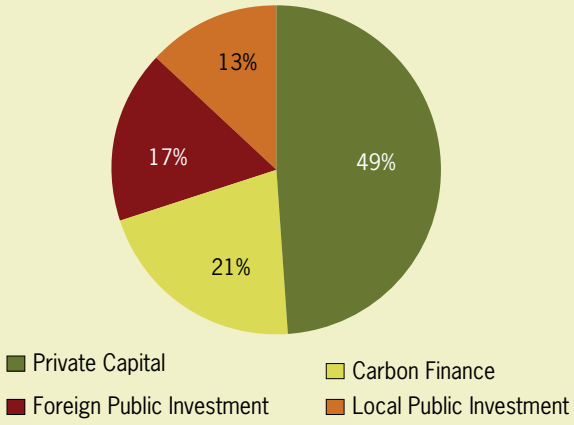
Has the experience with the Kyoto mechanisms been easy? We would say "No." Are there improvements to be made? "Of course." Has it been worth it? Yes, most definitely, because we have seen the benefits. While the benefits of specific project activities and capacity building have already been mentioned, this section describes in more detail some of the key benefits of the carbon finance experience over the past decade and discusses how they could be further enhanced.

5.1 An important catalyst of development finance

One of the successes, and a key feature of carbon finance, is that it can both complement and leverage other financial resources to unlock low carbon investment in host countries. Carbon finance revenues enhance the overall financial viability of climate friendly projects and, as performance-based payments, create positive incentives for good management and operational practices to sustain emission reductions over time. Carbon finance revenues can also leverage upfront capital for underlying investments and provide incentives to overcome social inertia, low awareness, transaction costs, and financing of Programmes of Activities. Experience so far suggests that carbon finance, alone or in combination with other policy and finance instruments, has made a difference in favor of climate action and catalyzed the shift of much larger amounts of (essentially private) financial and investment flows to low carbon development (see Figure 26).

It is estimated that over 2002–09, forward contracts of about 2.2 billion CERs have been agreed for a cumulative value of approximately US$25.6 billion, benefiting some US$106 billion in underlying low carbon investment, or an average leverage ratio of 1 to 4.6.[76] More generally, it is estimated that projects that entered the global CDM pipeline over 2002–09 represent an overall climate-friendly investment of more than US$150 billion (two-thirds of which is in renewable energy).[77] As a comparison, sustainable energy investment in developing countries totaled approximately US$120 billion over

FIGURE 26 Origin of capital financing in World Bank CDM projects



[76] Market data source: *State and Trends of the Carbon Market 2010, The World Bank, Washington, DC; leveraging ratio compiled using data from State and Trends of the Carbon Market 2009.*

[77] UNEP RISØ CDM/JI Pipeline Analysis and Database, March 1st 2010.

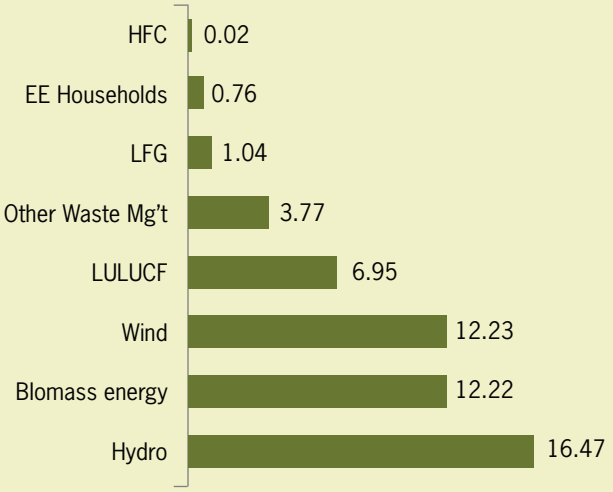
2002–09.[78] In addition, projects that entered the JI pipeline over 2006–09 are estimated to have stimulated about US$18 billion in underlying climate-friendly investment (predominantly in energy efficiency).[79]

There is great variability in the ratio of the underlying upfront investment required for a CDM project activity or a Programme of Activities to the net present value of its expected future carbon revenues (see Figure 27).

It is not surprising that this ratio depends on project type (which can be more or less capital-intensive) and the size of carbon revenues. Carbon revenues, in turn, result from: (i) the volume of credits generated, which are highly dependent on the GHG intensity of the baseline (from which emission reductions are calculated); (ii) the length of the purchasing period (in the ERPA), which tends to be short given persisting post-2012 regulatory uncertainty; and (iii) the price, influenced by the overall market trends and by the project performance risk (which so far has reduced by two-thirds expectations of CERs from CDM projects).[80] Figure 28 shows the historical trend in CER market prices. The drop in transaction volume experienced in 2009 can largely be attributed to (i) the economic downturn and its dampening effect on European emissions and lower demand for CERs; (ii) the emergence of AAUs in the market, satisfying the appetite of several buyers for more secure assets in large volumes; and (iii) the closing window for new CDM projects as the end of the first commitment period approaches. For a complete market update, please see *State and Trends of the Carbon Market 2010* published by the World Bank in May 2010.

For a number of low carbon investments that have relatively low upfront capital requirements and for which the net present value of carbon revenues represents a relatively large share of the investment, carbon finance can make a critical difference in facilitating their implementation and operation. This is, for example, the case in solid waste management (as discussed earlier), where carbon revenues can improve the internal rate of return (IRR) of investment by more than 50%, while their net present value compares to the underlying investment. With such numbers, there exists tremendous potential for carbon finance to mobilize capital for projects with immediate development and climate benefits. Additional resources of carbon finance can improve the financial sustainability of solid waste management policy reforms and investment programs and scale up adoption of more sustainable practices. Carbon finance can also provide enough incentives to over-

FIGURE 27 Ratio of Investment to net present value of ERPA in the World Bank CDM portfolio



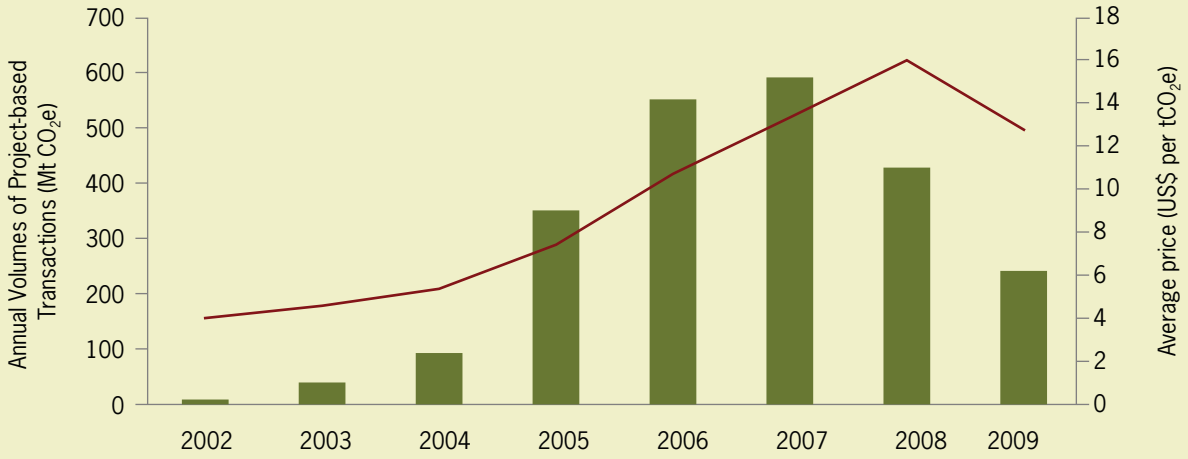
Source: The nominal value of teh ERPA is discounted at 10% per year, assuming all future payments occur in a period of five years.

[78] Source: Bloomberg New Energy Finance. Estimates of clean energy investments that benefit from CDM tend to be higher than actual sustainable energy investment in developing countries since many CDM projects are often neither operational, nor commissioned, nor even at financial closure at the time of contracting. These operational milestones are expected to be achieved later.

[79] This estimate follows Seres and Haites' approach to quantify investment behind CDM projects, i.e., by multiplying the amount of expected annual emission reductions from active projects in the pipeline for a specific technology by the capital intensity of this technology. See: S. Seres and E. Haites (2008). *Analysis of Technology Transfer in CDM projects*. UNFCCC, Bonn. Technology-specific capital intensity estimates are calculated as the ratio of the sum of underlying upfront investment for all project activities or Programmes of Activities for a given technology to the sum of their expected annual emission reductions, using data for projects with a signed ERPA within the World Bank portfolio.

[80] Potential CER supply by the end of 2012 stands at about 2.8 billion (nominal PDD value for all active projects in the pipeline) while risk-adjusted deliveries by the same date are 1.0 billion CERs. Source: UNEP RISØ *CDM/JI Pipeline Analysis and Database*, March 1st 2010.

FIGURE 28 Average price and volumes transacted in primary project-based Kyoto flexibility mechanisms



come social inertia, low awareness, and transaction costs to accelerate the diffusion of more energy-efficient equipment or renewable energy sources in rural areas (e.g., compact fluorescent lamps, cooking stoves, or biodigesters).

In general, more capital-intensive technologies (like many investments in renewable energy for instance) are very often limited by financing constraints[81], with many developing countries in particular having limited access to long-term and affordable capital. In such circumstances, the impact of carbon finance is typically smaller (improvement of IRR by only a few percentage points). As a result, carbon finance alone, as an *incremental* financing mechanism, cannot overcome, in the current environment, the powerful financing barrier to low carbon growth so often found in developing countries. However, this does not mean that carbon finance has no impact; it can make a positive contribution by enhancing the project revenues, thus helping to lower the cost of borrowing. Carbon finance may not be the best tool for the testing of pre-commercial/high-risk/ capital-intensive new technologies, but it can be a powerful tool in cases of relatively low-risk investments in proven climate-friendly technologies by making them more attractive and profitable, and thus enhancing their chances (over carbon-intensive alternatives) of being developed and remaining operational, which is critical for sustaining emission reductions over time.

Still, the leveraging potential of carbon finance has not yet been fully explored and must be further exploited to mobilize, along with other instruments, both climate and development finance on a larger scale to support low carbon development. While some challenges to leveraging greater climate financing are beyond the immediate scope of carbon finance (e.g., creating an enabling environment, providing appropriate economic and regulatory incentives, and strengthening the capacity of public, private and financial sectors), some are specific to the carbon finance mechanisms. These challenges include:

- **Chronic uncertainties about future demand for emission reductions (ERs).** Uncertainties about the future demand for ERs are limiting post-2012 carbon market activity and discouraging the development

[81] For a discussion on constraints to financing, see for example, Kossoy (2010).

[82] The number of new projects entering the CDM pipeline has continuously declined over the past year, and now stands at about 80 new projects per month. The window of opportunity to develop new projects, have them registered by the CDM Executive Board, and generate CERs by the end of 2012 has started to close.

of new projects[82]. These uncertainties relate to the allowed amount of credits that can be used to meet compliance obligations, eligible mechanisms or standards, and rules on eligible credits. This makes it also extremely difficult to estimate the future price of emission reductions and the amount of additional carbon finance resources that could flow to projects. Except for the European Union (EU) and New Zealand, adoption of a countrywide emission trading scheme (ETS)—which creates a demand for emission reductions from covered installations—has been further delayed in other Annex I countries (Australia, Japan, and the USA). In addition, rules governing the use of offsets under Phase III (2013–20) of the EU Emissions Trading Scheme (EU ETS)—so far the engine of the carbon market worldwide—have not yet been clarified, leaving question marks as to what type of emission credits will be eligible (e.g., countries of origin and technologies) and thereby making buyers even more conservative. As more domestic initiatives may emerge, harmonizing offset rules would help to ensure a minimum compatibility and fungibility of ERs across regimes and maximize the benefits of hopefully growing demand[83].

- **Complex and fast-changing rules, capacity bottlenecks, and regulatory inefficiencies.** These issues (discussed earlier) have resulted in year-long delays and instability, with financial implications for projects.
- **Lack of upfront financing.** Carbon finance does not (fully) address the need for upfront financing of low carbon investment, as most often payment for credits occurs on delivery, once the project is operational. Some advance payments (for emission reductions to be achieved later) have been seen in the market (up to 10–25 % of the value of the carbon transaction)—including for several World Bank carbon finance transactions; however, 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. The Brazil Plantar project is an example of a pioneering transaction that enabled front-loading of carbon finance revenues to permit a commercial loan for the project (see Box 9).

A number of actions can help maximize the transformational impact of carbon finance, notably by enhancing long-term carbon finance revenues, leveraging carbon finance, and making it fit better into public and private sector investment decision-making. These include:

- **Policy and regulation.** Two of the major challenges to the expansion of the carbon market relate to lack of certainty and ambition, on both the demand for and the supply of emission reductions. Bringing longer-term clarity to the demand for and eligibility of carbon credits will allow the tenor of ERPAs to be extended as well as provide a long-term price signal to the market. In addition, in order to increase the likelihood of achieving ambitious GHG reductions commensurate with meeting the ultimate objective of the UNFCCC (i.e., the stabilization of GHG concentrations in the atmosphere), cost-effectiveness is an important consideration to which offsets from developing countries can contribute. A long-term, predictable, and appropriate price signal can only be provided with signs of robust demand, which will hopefully stimulate a vibrant market and offer developing countries a meaningful opportunity to support their low carbon development priorities. Without these signs, the carbon market could unfortunately face serious risks of losing momentum.

  In turn, building a substantial and credible supply of offsets will require improving regulatory efficiency and effectiveness of the project-based mechanisms (as discussed earlier).
- **Capacity.** Building an enabling environment for low carbon investment and facilitating the expansion of domestic financial markets around carbon finance opportunities would enhance carbon finance's reach.
- **Risk-management products specific to carbon finance.** Risks and uncertainties can deter potential carbon asset buyers and investors in underlying low

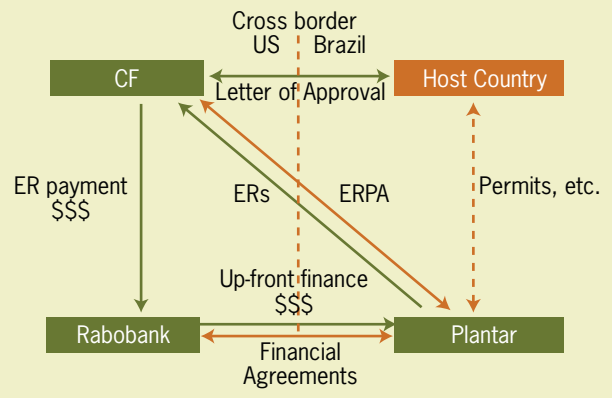
[83] For more information on carbon market trends, please see Kossoy and Ambrosi 2010.

Box 9

Plantar project in Brazil: pioneering structured finance around carbon revenues

The Plantar project consists of the substitution of coal in the pig-iron industry, and was financed through a loan with a commercial bank (Rabobank). The nominal value of the ERPA contract between the World Bank (as trustee of the PCF) and the project sponsors (Plantar) was anticipated by the commercial lender to Plantar, who is both recipient of the loan and seller of the emission reductions. The financing was structured in a way that the expected payment for the verified emission reductions[1] (in this case made by the PCF) would perfectly match the loan's amortization schedule while the loan's repayment would be made directly by the Word Bank to Rabobank. The anticipated sources of revenue streams provided by emission reductions in the project, the absence of currency convertibility and transferability risks, and the intangibility of those emission reductions led the transaction to be rated by the lender as "credit-risk free". This eliminated the lender's obligation to obtain any insurance. Therefore, the project became bankable, and the loan became attractive to the lender. In addition, the credit risk mitigation also resulted in a reduction in the overall risk perception by the lender, which could provide attractive loan terms to Plantar.

Plantar structured finance arrangement



[1] The Plantar project receives payment on the basis of verified emission reductions (VERs). The CDM regulatory risks (i.e., risks of converting verified emission reductions to CDM-approved certified emission reductions) are thus borne by the PCF. This is an important risk-sharing feature of the ERPA.

carbon projects, thereby dampening carbon finance potential. These comprise, for instance, regulatory risks linked to project and program eligibility and procedures, technology risks (the first of its kind), and a riskier business environment. There is a need to expand to the sellers the application of risk management tools (e.g., insurance), which so far have been largely available for the buyers' benefit (notably derivatives), and may help maximize the value of credits and enhance the impact of carbon finance on low carbon investment.

- **Structure financing to turn carbon into finance.** Solutions need to be explored to frontload anticipated carbon revenues into upfront finance, such as bonds or other structures to monetize future carbon receivables, or piloting innovative use and combination of instruments building on synergies, each addressing specific barriers, risks, or needs. To illustrate this, box 10 showcases an innovative example from India, where a combination of several dedicated environmental sources of funding to support programs with multiple benefits are maximizing effective use of resources, their leverage of public and private domestic investments, and their impact on climate action.

5.2 Greenhouse gas mitigation & sustainable development

The Kyoto Protocol's CDM Article (article 12) was groundbreaking in establishing a market-based mechanism focused on project activities implemented in developing countries. With only the limited experience from the pilot phase on Activities Implemented Jointly (AIJ)[84]

[84] The 1992 Framework Convention on Climate Change provides for Annex I Parties to implement policies and measures jointly with other Parties. In order to build experience and "learn by doing," COP 1 (Berlin, March/April, 1995) launched a pilot phase of activities implemented jointly, under which Annex I Parties may implement projects in other countries that reduce emissions of greenhouse gases or enhance their removal through sinks.

BOX 10

Building on synergies between the Global Environment Facility, Montreal Protocol & carbon finance to scale-up climate action

The India Chiller Energy Efficiency Project (CEEP) will improve the energy efficiency of building chillers (a major source of power demand) and accelerate phasing out of ozone-depleting substances by helping to overcome the limited availability of upfront resources necessary to replace and upgrade older CFC-based chillers by more efficient non-CFC-using ones.

The objective of the CEEP is to replace a total of 370 chillers (out of a total market size of about 1,200 chillers), over a period of 3 years, with an average incentive of 20%, leading to an estimated (direct and indirect) 13 $MtCO_2e$ reduction in GHG emissions over 20 years. It draws on an innovative combination of the Global Environment Facility (GEF), Montreal Protocol resources (providing an upfront subsidy for early adopters of new chiller technology), and carbon revenues (contributing to a revolving fund to support replacement of additional chillers), further complemented by public and private capital.

This project illustrates how a limited upfront provision (less than 10%) of highly concessional resources (mostly from GEF) can potentially mobilize a much larger amount of resources (total cost of replacement estimated at $90 million) to achieve a greater transformational impact (targeting more than 25% of chillers), by building on synergies and maximizing the effectiveness of resources through increasing their leverage. A similar project operates in the Philippines, while Indonesia has also expressed interest.

and virtually no infrastructure upon which to build, the Kyoto Protocol, as noted earlier, established the CDM with the dual objectives of (i) assisting developing countries (non-Annex I Parties) in achieving sustainable development; and (ii) assisting the industrialized countries (the Annex I countries) in achieving compliance with their emissions commitments through emission reductions from CDM projects.

The Kyoto Protocol also stipulates that Annex I countries shall meet their emission commitments while also promoting sustainable development.

Mitigating climate change

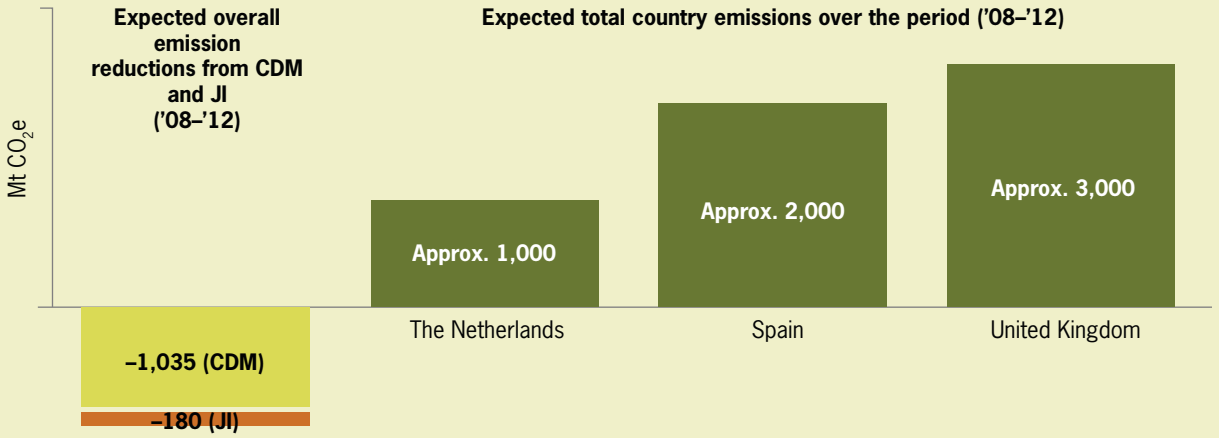
Data suggest that the mechanisms are on track to generate emission reductions to assist Annex I countries in meeting their emissions obligations under the Kyoto Protocol. UNEP RISØ estimates that by December 31, 2012, the CDM projects are expected to generate reductions of 1,036 $MtCO_2e$ (based on the discounted estimated emission reductions outlined in the PDDs, to reflect the probability of lower emission reductions resulting from the scrutiny and delays in the CDM approval process)[85]. RISØ estimates that an additional 180 million tons of CO_2e will be reduced by JI over the 5-year commitment period. As of March 2010, 391 million credits have been issued by CDM and JI projects combined.

To appreciate the significance of the 1.2 Gigatons (Gt) CO_2e expected to be reduced by the project-based mechanisms, it is useful to put this figure into perspective through a comparison with industrialized countries' emissions. For example, according to its Fifth National Communications, the Netherlands is expected to emit approximately 1 Gt of CO_2e during the Kyoto Protocol's first commitment period[86] (see Figure 29). Another

[85] RISØ estimated (in March 2010) the 2008–2012 CDM CER issuance by discounting the expected volumes indicated in the PDDs of projects in the registered CDM pipeline. It takes the 2,836 million CERs from all projects in the CDM pipeline projected for 2012 and multiplies them with the 96.5% issuance success. The future CDM projects which are currently under validation are multiplied with the 18.3% chance of a negative DOE validation (or termination) and the 6.1% chance of being rejected by the EB. The total expected CERs in 2012 are then adjusted to take into account time lags (to reach registration). The resulting total expected (i.e., discounted) CERs to be issued by the end of 2012 is 1,036 Million CERs. See http://cdmpipeline.org/

[86] Note that these estimates do not fully capture the impact of the economic downturn and path to recovery. Projections do not include the use of sinks and flexibility mechanisms. 2008–2012 data are taken from multiplying the annual amount released in the Fifth National Communications by five to estimate the cumulative amount of emissions over 2008–2012.

FIGURE 29 Contribution of CDM & JI towards meeting GHG commitments: comparison with selected countries' emissions[87]



basis of comparison is the targets that have been agreed by the Parties that have ratified the Kyoto Protocol (i.e., excluding the U.S.), amounting to an overall reduction of about 4% below 1990 levels, representing an approximate reduction of 2.6 Gt over the 5-year commitment period, assuming emissions stay stable over that period[88].

By design, market-based instruments are meant to help achieve an environmental objective cost effectively. While it is not possible to assess this fully without comparing with the abatement costs of other options, evidence suggests that the Kyoto mechanisms are achieving their aim of cost effective mitigation of global greenhouse gases. As shown in Figure 30, the primary CER (pCER) [89] prices have been lower than the EU allowance (EUA) price (used for compliance in the EU ETS). Of course, the two commodities (i.e., pCERs and EUAs) are not fully comparable, as pCERs, which are issued *ex-post*—after the project has been registered, performed as planned and CERs have been issued—involve greater risks (e.g., the project may not perform well) than the secure EUAs (which are allocated or auctioned *ex-ante*). Nonetheless, the CDM is thus working to assist in meeting the Kyoto Protocol emissions commitments at a lower cost. Indeed, if the World Bank's experiences are assumed to be representative of others in the CDM & JI market, many Annex I buyers are meeting a portion of their GHG emissions obligations at less than €10 per ton, a cost lower than they would be able to achieve through either the purchase of tradable allowances (EUAs), and likely lower than what could be achieved through internal investment decisions, or through national policies and measures.[90]

Contributing to sustainable development

Under the 2001 Marrakesh Accords, it is the responsibility of the respective host country to determine whether

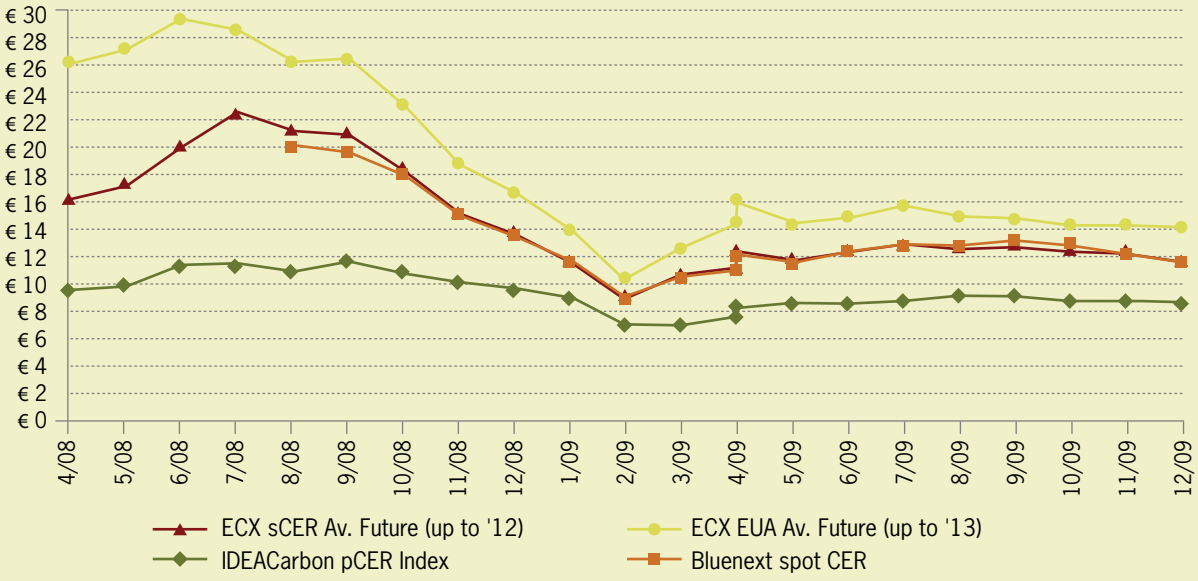
[87] 2008–2012 data taken from multiplying the annual GHG amount released in the Fifth National Communications by five to estimate the cumulative amount of emissions over 2008–2012.

[88] This is a simplified assumption, as in many countries, emissions have increased, thus also increasing the volume of emission reductions needed to meet their obligation.

[89] A primary market transaction is a transaction between the original owner (or issuer) of the carbon asset and a buyer. A secondary market transaction is a transaction where the seller is not the original owner (or issuer) of the carbon asset.

[90] For instance, the Swiss Climate Cent Foundation reports that the cost of reducing CO_2 through purchases of CDM credits is cheaper than mitigation in Switzerland "by a factor of around 5". (http:/kima-rappen.ch/en/foundation/)

FIGURE 30 Average monthly prices of CER, pCER & EUAs



Source: State and Trends of the Carbon Markets, 2010

a given proposed CDM project will assist it in meeting its sustainable development objectives. Each project submitted to the CDM Executive Board must first have obtained the approval of the respective host country's CDM DNA.

While there is no internationally agreed metric to assess sustainable development benefits, it is the experience of the World Bank that there are significant developmental co-benefits associated with CDM (as well as JI) projects, which should not be overlooked.

It is undeniable that participation in the mechanisms has raised overall awareness about low carbon solutions and leveraged capital for climate-friendly projects in many host countries. The CDM has also provided opportunities to support basic development needs and broader socio-economic co-benefits such as:

- Improving energy access and energy services (e.g., projects that contribute to rural electrification and projects that enhance energy services such as the Bangladesh Solar Homes Systems project, highlighted in Box 6, and the Senegal Efficient Lighting in Rural Areas Program[91]);
- Developing local natural resources (e.g., the recently registered Félou run-of-river hydropower project which will deliver clean power, 62 MW, to Mali, Mauritania and Senegal);
- Providing solutions for solid waste management, a problem for many developing countries with rapidly increasing urbanization rates (e.g., the Alexandria Landfill project, see Box 11);
- Reducing both local air and water pollution, thus generating health benefits (e.g. the Thailand Sapthip Wastewater Management project improving the local air quality and human health. The closed anaerobic

[91] The Senegalese program is part of the World Bank CDCF portfolio. The program will distribute 1.5 million compact fluorescent light bulbs (CFL) in newly electrified rural communities. This is undertaken in connection with a nationwide rural electrification plan that aims to increase electricity access in Senegal's rural areas from 16% to 50% by 2012.

treatment proposed also limits bad odor and possible health hazards caused by the methane that is released).

- Generating employment (e.g. the Bangladesh Kiln Efficiency in brick-making project which is providing full-time employment and higher salaries, along with safer working conditions)
- improving livelihoods (e.g., the Ethiopia Humbo Assisted Natural Regeneration project, which is managed by seven community cooperative societies)

Moreover, many CDM (as well as JI) projects have played an important role in contributing to technology transfer (e.g., in industrial projects) and, even more, to technology diffusion (e.g., in efficient lighting and biogas programs), which is critical to broadening the reach of low carbon efforts. The CDM and JI projects have also seen significant benefits at the grass-root level of building capacity and local empowerment of vulnerable groups.

Different types of carbon finance projects, e.g., projects of different technologies, different sizes and implemented in different circumstances, can all lead to positive sustainable development outcomes. It is also important to recognize that there is not one single approach to contribute to host countries' sustainable development. The World Bank's CDCF's particular experience in ensuring that carbon finance projects support host countries' sustainable development is highlighted in Box 12.

BOX 11

Providing solutions for solid waste management

The World Bank's Alexandria Landfill project includes two municipal waste landfills in Alexandria, Egypt that are part of the global waste management system initiated by the Alexandria Governorate. The comprehensive waste management system was initiated in 2000 and is intended to improve the quality of life for the city's 5 million residents.

The project's objective is to maximize the capture of landfill gas (LFG) from the two new landfill sites. In addition to reducing the potential local impacts of odors and explosion or fire hazard associated with landfill gas, the project is aimed at reducing the fugitive emissions of methane (CH_4), a powerful greenhouse gas. The global waste management system implemented for Alexandria, which is the first of its kind in this region, makes numerous positive contributions to sustainable development. Developmental benefits include the full spectrum of waste management activities from street cleaning to collection and treatment of all the household and commercial waste generated in the city.

Box 12

Community Development Carbon Fund

The Community Development Carbon Fund (CDCF): assessment of community benefits and sustainable development[1]

The World Bank has gained significant experience in developing carbon mitigation projects in the poorest countries. The CDCF was created in 2003 as a public private partnership aimed at extending the reach of the carbon market to poorer developing countries, particularly the least developed countries (LDCs). The CDCF also intended to give preference to small-scale activities that improve the quality of life of communities. It has a "learning-by-doing" objective of disseminating its practical experience. It has capital of $128.6 million.

A unique feature of the CDCF is its dual objective of achieving emission reductions and simultaneously delivering measurable social, environmental, and economic benefits to local communities. These benefits can be *intrinsic* to the project, when they are part and parcel of the project itself (e.g., village or neighborhood electrification) or *extrinsic*. When there are limited intrinsic benefits or no identifiable benefits integral to the project, an additional Community Benefits Plan (CBP) is put together (like provision of computers for schools, or construction of health clinics), and financed out of a premium in the emission reduction unit price (through a "community development package"). While many CDCF projects are still in early stages of implementation, key findings from the assessment of their community benefits and sustainable development are as follows:

- The community benefits provided by CDCF projects often include a range of activities, but the key community benefit outcomes can be categorized as: (i) improved local infrastructure such as roads, health clinics, etc; (ii) improved access to energy for heating and/or cooking; (iii) improved livelihood and employment opportunities; and (iv) improved access to electricity and/or energy-efficient lighting.
- The level of community dialogue and participation in projects with direct benefits tends to be high when they are embedded in ongoing programs that are based on principles of community empowerment. In projects with indirect extrinsic benefits that require the preparation of an additional CBP, the participatory process tends to be stronger when the consultation process involves a range of key stakeholders including local government administrations and is linked to broader local development priorities.
- Most of the projects are targeted towards communities that lack essential services such as electricity or basic health care and have relatively low per capita incomes (typically less than $1,135 per year). However, there is a lot of heterogeneity and inequality within communities. In some CDCF projects, such as the solar power project in Bangladesh and the biogas project in Nepal, the poorest households are unable to access the technology as the upfront investment required is relatively high.
- Most projects demonstrate strong attention to operation and maintenance of investments, but the level of institutional sustainability varies considerably across the CDCF portfolio. Cost-effectiveness of CDCF projects also tends to vary and depends on the extent to which additional resources are leveraged for the CBP.

[1] Source: The Community Development Carbon Fund (CDCF): Assessment of Community Benefits and Sustainable Development (2009). http://siteresources.worldbank.org/INTCARBONFINANCE/Resources/CDCF_paper_final_with_cover.pdf

6 The Need to Scale-Up

While the urgent need to scale-up mitigation efforts is widely accepted, the key question is: "How can scaling-up be achieved?" In a study commissioned by the World Bank, Figueres et al. (2005) warned that "unless the impact of the CDM can go beyond stand-alone project activities and be used to spur broad climate-friendly policies and measures, the CDM will not promote the much-needed transformation in the energy trends of developing countries." Successful approaches are expected to include a combination of policy-based and technological interventions to be defined by country-specific circumstances and capacities.

Strategically, aggregated programs could become good vehicles to scale-up system, subsector, or sector-wide mitigation efforts. Aggregation is widely practiced in investment-focused programs by financial institutions in the form of credit lines, and by government agencies as sector-specific funds or budgetary allocations. Natural aggregators can be mandated by law (e.g., public agencies), by stakeholders (e.g., industry associations), or by institutional goals (e.g., non-governmental organizations, the private sector).

The World Bank has been actively exploring various scaling-up opportunities, such as:

1. Technology-specific interventions, (e.g., compact fluorescent lamp (CFL) market transformation activities and energy agency-led programs to help achieve national geothermal development targets)
2. GHG-specific interventions, (e.g., programs by rural development agencies to accelerate deployment of household biodigesters to capture and utilize methane emissions from animal waste)
3. Industry-specific interventions, (e.g., reduction of gas flaring by the petroleum industry, led by public private partnerships)
4. System-wide interventions (e.g., coordinated city-wide GHG mitigation activities across waste, transport, and energy end-use sectors, led by municipalities[92])

Programmes of Activities (PoAs) under the CDM is opening the door for programmatic approaches to GHG mitigation activities in developing countries, while Green Investment Schemes (GIS) may be an efficient means for programmatic approaches in countries with emissions obligations.

6.1 Programmes of Activities

The concept of programmatic CDM was developed in response to calls for simplifying project preparation and registration procedures (particularly for dispersed energy efficiency micro activities) and expanding the scale of CDM project activities. Many felt that the CDM was not achieving its full potential and several concepts, such as policy CDM and methodologies that use national standards to create programs, were proposed. The roots of the PoAs under the CDM can be traced to a decision of the first session of the Conference of Parties/Meeting of Parties (COP/MOP 1), held in Montreal in November 2005, stipulating that "local/regional/national policies or

[92] See the World Bank's "City-Wide Approach to Carbon Finance" 2010.

Box 13

Overview of Programmes of Activities (PoAs) under the CDM

According to the CDM EB guidelines from July 2007[1], a CDM PoA is defined as a *"voluntary coordinated action by a private or public entity which implements any voluntary or mandatory policy/measure or stated goal (i.e., incentive schemes and voluntary programmes), which leads to GHG emission reduction…"*

A PoA provides the organizational, financial, and methodological framework for the emission reductions to occur.

The emission reductions are attained at the level of "CDM programme activities" (CPAs). A PoA is expected to be a replication of the same or similar discrete projects (as per eligibility criteria defined in the PoA). A PoA can cover multiple countries, if each country approves the programme. The PoA and the first CPAs under a PoA are validated by the DOE and subsequent CPAs can be added to the registered PoA at any time, on the basis of a DOE's desk review, with no additional registration fees. Emission reductions resulting from each CPA are verified and certified by the DOE.

The private or public entity that coordinates the PoA is referred to as a coordinating/managing entity. Broadly, four types of CPAs are possible: single measure in single location; multiple measures in single location; single measure in multiple locations; and multiple measures in multiple locations.

[1] EB 32, Annex 38 and 39

standards cannot be considered as CDM project activities, but project activities under a PoA can be registered as a single CDM project activity."

It took some time after the December 2005 decision to finalize definitions, procedures, and guidelines[93] for PoAs (see Box 13), and although uncertainties and lack of clarity remain, several project developers and stakeholders, including the World Bank, are working to put the concept of PoAs into practice.

From September 2008 to May 2009, 5 PoAs were submitted for validation. From May 2009 to March 2010, 32 PoAs were submitted for validation, and the first two PoAs were registered in July and December 2009, respectively: an efficient lighting program in Mexico, and an animal waste management program in Brazil. The first PoA in Africa, in Uganda (a PoA within the World Bank portfolio), was registered with corrections by the CDM EB in April 2010 (see Box 14).

Challenges and opportunities

The first two years of the CDM PoA history (i.e., 2006–2008) were focused entirely on defining the concept of PoAs and establishing a workable set of guidelines and procedures. CDM rules for PoAs have also been developed using the "learning-by-doing" approach, but in this case a large part of the "learning" was through the participatory process of inviting public inputs. It is still too early to identify factors that influence the chances of success of a program, in terms of the cost-effective reduction of emissions from numerous underlying project activities. However, it is possible to identify key stakeholders that influence the program design and its successful implementation.

CDM Executive Board. The EB, as the regulator responsible for providing guidelines to develop PoAs and for ensuring environmental integrity by reviewing PoA and CPA submissions, is also the key actor in engendering confidence in the PoA approach by responding to requests and inputs from the stakeholders. In the context of PoAs, the EB is also entering into a role that differs somewhat from its current approach for the "regular" CDM projects: once the EB approves the registration of a PoA, it becomes an *indirect* regulator, where it is expected to observe the automatic registration of the underlying CPAs by the

[93] See EB 32, Annex 38 and 39; and EB 47, Annex 29, 30, 31 and 32.

DOEs and may randomly review the registered CPAs. This shift has resulted in the creation of a "liability" clause (see Box 15) that holds a DOE responsible for CERs generated from the so-called "erroneous inclusion" of an ineligible CPA being registered as part of a PoA.

DOE. For PoAs, the DOEs have enhanced responsibilities and associated liability, as noted in Box 15. Most DOEs are uncomfortable with the vague definition of "error" and the open-ended timeline for accounting for it. The liability, or the requirement to transfer all CERs issued to an "erroneously" included CPA, is triggered only if a detailed review process, following a request by any one member of the EB or the host country DNA, finds the CPA to be ineligible. The EB finds this justified as the CPA only passes through one level of scrutiny—that of the DOE—before being registered. DOEs seek to mitigate this liability risk by entering into a risk-sharing arrangement with the project entity, which can be virtually impossible for most public sector entities.

DNA. The DNA also has increased responsibility as PoA rules expect the DNA to randomly review CPAs in their countries that are automatically registered by the DOE, and inform the EB in case they identify any ineli-

Box 14

The Uganda Municipal Composting Programme of Activities

The World Bank Uganda Composting PoA is an innovative municipal composting programme based on the harnessing of carbon finance for addressing the significant environmental challenge associated with solid waste management. It initially covers 9 cities, with the possibility of expansion to at least another dozen municipalities within the country. The PoA is coordinated and managed by the Uganda National Environment Management Authority. The project has significant sustainable development benefits, including a positive health impact and a well-managed dump that can be sustained by the revenues generated from the sale of compost and emission reductions.

Box 15

The CDM PoA "liability" clause

The most significant—and most debated—implication of the CDM PoA guidance and the largest barrier to PoA development to date has to do with the liability imposed on a DOE. As per PoA guidelines, documentation for the PoA and the *first* CPA is validated by a DOE before review and registration of the PoA by the CDM EB. For *subsequent* CPAs, the DOE is *solely* responsible for scrutinizing the relevant documentation before uploading it on the UNFCCC website for *automatic registration*. Removal of the additional scrutiny for each CPA by the host country, general stakeholders, the Secretariat, and the CDM Executive Board was intended to reduce costs, time lag, and efforts, and generally facilitate registration, as the underlying CPAs are expected to fully adhere to the eligibility criteria of the PoA.

However, as an additional check, to prevent *erroneous inclusion* of a CPA (and the associated risk of erroneous CERs), strict liability has been placed on the DOE: if a case of erroneous inclusion is established, the DOE is required to transfer a quantity of CERs equal to the issued CERs for the incorrect CPA to the UNFCCC.

But there is a lack of clarity on the definition of "erroneous." The possibility of reviewing and recovering CERs from any (or all) previously registered CPA (essentially causing an open-ended liability for DOEs); the process for detection of error; and limited recourse for a DOE to appeal regarding an alleged case of "erroneous inclusion" have together created a marked lack of interest among DOEs to undertake validation of CDM PoAs, due to the potential liability risks they would face (DOEs have reported that their insurance would not cover such open-ended liability). Those DOEs accepting to undertake the validation of CDM PoAs, carefully evaluate and seek to mitigate their risks by only accepting validation contracts for the PoA and the first CPA. DOEs that have been approached for validation of subsequent CPAs are unwilling to conduct a desk review-based validation, and insist on a full validation, with a site visit, costing as much as validations for any regular stand-alone CDM project activity, thus eroding the originally expected cost savings for the registration of PoAs and all underlying CPAs.

gible CPAs. Based on the DNA input, the EB can then undertake a full review of the CPAs and the PoA. The DNA also authorizes the entity to coordinate or manage the program. Assessment of the appropriateness of the coordinating entity is emerging as a concern for many DNAs, as the PoA sets the framework that would impact the development of future project activities for the same technology.

Coordinating Entity. One of the biggest questions under the CDM programmatic approach is how to identify or create an entity or organization, called a Coordinating/Managing Entity (C/ME), to effectively manage the PoA.

In effect, a PoA can be considered the overarching framework for generating emission reductions. The success of the framework depends on:

- The PoA's legal, financial, and management design, including the integration of future CDM revenue streams in the PoA's financing mechanisms, such as subsidies[94]; and,
- The administrative and technical capacity of the PoA operator (i.e., the C/ME).

The all-encompassing requirements from the *ideal* C/ME are rarely fulfilled by any single entity. Technical institutions may lack the financial and legal capacity, and financial institutions, vice versa, may lack the technical capacity. Interestingly, knowledge of the CDM processes is emerging (at least in the World Bank experience) as one of the key capacity constraints in a large proportion of the institutions. Fulfilling the CDM-specific requirements, from baseline assessment to monitoring, is proving to be a significant additional cost. This has led to the emergence of new business models, in the context of CDM, that involve retainer-based or outsourced program support functions and other such options to ensure effective operation of the program.

[94] The challenge remains how to fully integrate a future uncertain source of revenue stream into the financial design of a large programme that requires upfront expenditures (e.g., payment of subsidies for the purchase of energy-efficient equipment).

Insights for scaling-up mitigation through programmatic approaches

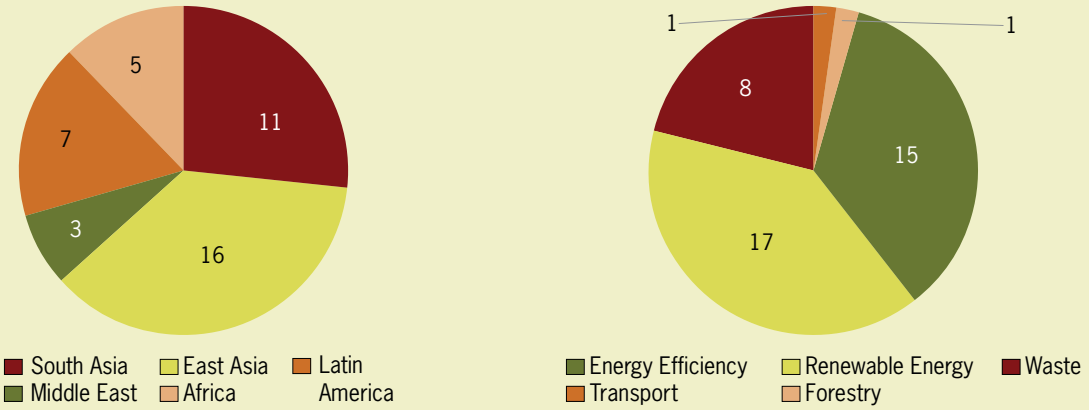
The programmatic approach has the potential to enable the scaling-up of mitigation efforts. This, of course, continues to depend on regulatory signals and the ability of the CDM EB and the DOEs to assess and ensure environmental integrity without requiring excessive cost and effort. Simplification of methodological requirements and assessment of additionality would have the strongest impact on the ability of stakeholders to develop and implement PoAs.

In early discussions, a PoA was perceived by many as primarily a tool for promoting CDM in less-developed regions and for widely dispersed micro-scale activities and for end-use energy efficiency or renewable energy activities. This perception has revealed to be largely true, as a majority of the PoAs developed in the past year focus on the distribution of cooking stoves, efficient light bulbs, biogas plants, and solar water heaters. Supply-side projects are few and far between, with only two large-scale hydro PoAs and three PoAs in improving energy efficiency in electricity distribution systems. It was expected that the transport sector would receive a significant boost from the programmatic approach; however, complex methodologies, the involvement of multiple institutions, and modest emission reduction volumes continue to limit the development of PoAs in this sector. Forestry is another sector that should lend itself well to this approach; however, issues similar to the transport sector are currently hindering further development.

As of March 24, 2010, 42 PoAs (Figure 31) have been published on the UNFCCC website, out of which 3 have already been registered and the remainder are in the process of validation. Forty PoAs are based on small-scale methodologies, with 12 having a rural community focus, dominated by cooking stoves and biogas programs. However, it is still early in the testing phase, as only few of these programmes, thus far, are reported to have been able to finalize their design and secure the financing to move forward.

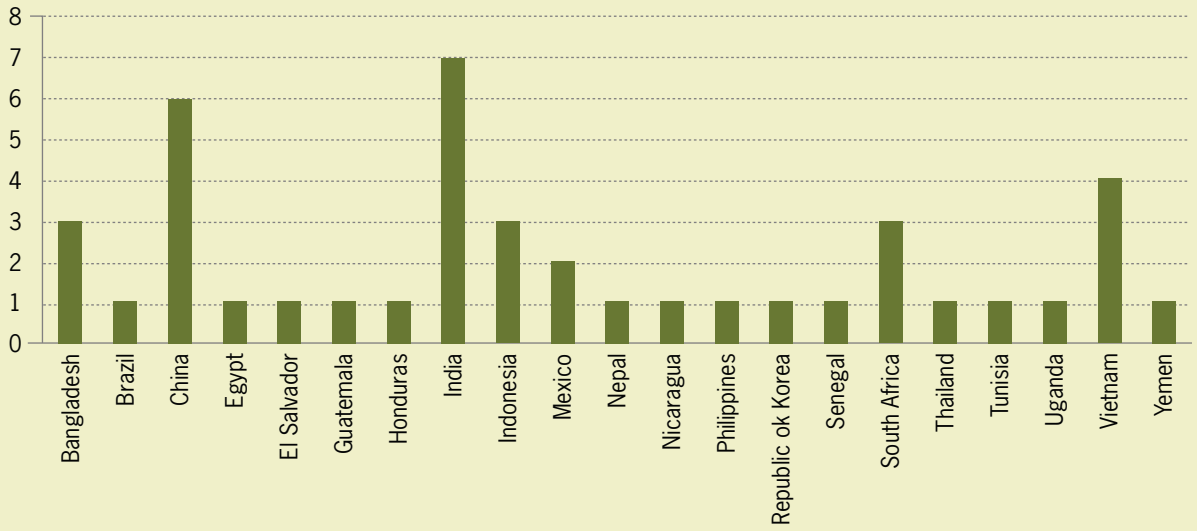
Among all PoAs in the CDM pipeline, India leads with 7, followed by China with 6, Vietnam 4 and Ban-

FIGURE 31 Distribution of CDM PoAs (by technology and region) – by number of projects



Source: UNFCCC CDM website (March 24, 2010).

FIGURE 32 Distribution of PoAs by host country



Source: UNFCCC website (March 24, 2010)

gladesh, Indonesia and South Africa with 3 PoAs each. In total, 21 host countries are involved, of which 4 are LDCs (see Figure 32). The World Bank is helping develop 12 PoAs in 12 different countries across all regions. This includes the first PoA developed and registered in Africa (in Uganda), as well as the first PoAs in large-scale renewable energy, supply-side energy efficiency, and in the transport and forestry sectors.

PoAs, even within the same sector and using the same technology, are different as they are modified to suit coun-

try-specific circumstances, the capacity of the coordinating entity, and the appropriate incentive mechanism. C/MEs are utilizing the programmatic approach to achieve a myriad of objectives. There are private sector based PoAs that are promoting advance sales by encouraging customers to make new purchases or replacement purchases, with CDM revenue off-setting the extra cost. These PoAs are using CER revenue to promote EE and RE technologies among urban and rural households that in a business-as-usual scenario would have negligible incentive to adopt these technologies. Government agencies are making use of CDM financial incentives to encourage sub-national agencies to reduce emissions by implementing energy efficiency.

A key factor to ensure sustainability of PoAs is the ability of CER revenue to support and fund the operation of the programme itself. The PoA framework in many ways is a promotional framework that does not generate ERs itself but (i) brings in project activities (i.e., the CPAs) that do so, (ii) supports them through the CDM process, (iii) maintains CDM specific information for each of the activities, and (iv) enables receipt of carbon credits. Such PoA activity is beyond the typical sales and marketing mandate of private companies and beyond the typical policy or program implementation budgets of government agencies. A portion of CER revenue is used to support the activities unique to CDM operations. In fact, it is reported[95] that the share of CER revenue typically retained by C/MEs to cover CDM PoA-specific costs, ranges from 2 to 30%. This share depends on a range of issues, from technology to location of CPAs to CDM methodological complexity and often onerous requirements (such as the purchase of monitoring equipment solely for CDM purposes, conducting adequate samplings, development and maintenance of databases). If CDM requirements were simplified and related costs were lower, these entities could use more of the CER revenues to implement the PoA more broadly. Such rationalization and simplification would not only reduce the unnecessary upfront financial burden on the PoAs, it would also reduce the operating costs of CDM maintenance (e.g., the validation costs for each subsequent CPA, which remain high) and thus enhance the financial viability of a greater number of PoAs.

While it is too early to fully derive lessons from the implementation of the CDM programmatic approach, the approach definitely exhibits the potential to be an effective tool for scaling up GHG mitigation activities and reducing CDM transaction costs. PoAs have generated interest from government and private sector entities alike, as they provide the opportunity to achieve economies of scale, reach a wider group of stakeholders in an organized manner, and achieve emission reductions in sectors and activities that require aggregation over time and across widely dispersed populations.

The CDM regulatory system (i.e., the CDM EB and its support structure) can effectively support and encourage the PoA approach by considering alternative, but streamlined approaches to ensure the high quality and credibility of the validation and verification process, and, therefore, the resulting emission reduction. Development of POAs will provide significant sector-specific experience and best practices, which can be used to further improve the programmatic approach.

Effective and efficient scaling-up through PoAs will need changes to the methodology approaches adopted thus far. Indeed mitigation efforts need to move from measuring each ton of GHG emission reduction of a single project to estimating, with appropriate justification and confidence, the total GHG impact of a PoA. A simplified programmatic approach will encourage the involvement of a larger number of stakeholders and support the scaling-up of sector, sub-sector and system-wide emission reduction efforts. But if PoAs are to reach their potential and become a vehicle for scaling-up and possibly even a testing ground for broader, sector-based mitigation, then projects of larger size such as individual hydro schemes or mini co-generation schemes must also

[95] For example, such information was reported at the Regional Workshop on Programme of Activities under the CDM organized by the World Bank in partnership with the Thailand GHG Management Organization held in Bangkok, Thailand in September 2009. (http://siteresources.worldbank.org/INTCARFINASS/Resources/PoAworkshopBkkAgenda22Sep09final.pdf)

become eligible and become priorities—along with micro activities such as cooking stoves or solar home systems.

6.2 Green Investment Schemes (GIS)

Green Investment Schemes have emerged as potential vehicles for progammatic approaches in countries with emissions obligations: the countries with economies in transition (also the typical JI host countries).

The emissions commitments adopted under the Kyoto Protocol include recognition of the special circumstances of countries with economies in transition (EITs), namely the sharp economic recession with the associated decrease in their GHG emissions that followed the fall of the Soviet bloc. These countries were thus allocated Assigned Amounts for the duration of the Kyoto Protocol's first commitment period amounting to more than their emission levels at the time of the adoption of the Kyoto Protocol in December 1997. The argument was that the emission commitment level *surplus* would allow these countries' emissions to grow as their economies recovered. However, as their GHG emissions have not risen as rapidly as anticipated, most transition economies have the possibility to sell—or possibly bank for subsequent compliance needs[96]—their surplus AAUs. As such headroom was created by economic collapse rather than through climate change mitigation actions, some buyers, particularly Annex I governments, have been wary of using AAUs (referred to sometimes as "hot air") for Kyoto compliance due to political sensitivities and possible reputational risks. Thus, a new approach, Green Investment Schemes (GIS), was suggested by host countries to provide AAU transactions linked with a positive environmental impact. For instance, Russia made a political statement as early as 2000 (COP6), on its intention to invest revenues from the sale of AAUs into climate-friendly projects.

Blyth and Baron (2003)[97] described GIS *as a way of promoting the environmental efficacy of transactions that involve surplus assigned amount units (AAUs) from countries (...) with economies in transition. GIS involve the earmarking of funds generated from the sale of AAUs for use in environmentally-related projects. The GIS is set up by the seller countries, and operates as a domestic scheme within their climate policy framework, with operational details to be agreed on a bilateral basis between buyer and seller nations*.

In practice, both AAU sellers and buyers have an incentive to ensure that AAU revenues are reinvested in environmentally beneficial activities, typically reducing GHG emissions. Relevant activity selection, monitoring, reporting, verification and/or auditing instruments need to be built into GIS to ensure successful and credible "greening." There is no universally accepted definition for "greening" as GIS are not internationally regulated. Both "soft" and "hard" greening terms have been used but are meaningful only when a detailed definition is provided. "Soft greening" is generally viewed as a GIS wherein AAU revenues are allocated to environmental and/or climate-friendly "greening activities" that may not directly result in GHG emission reductions relative to the volume of AAUs transacted (e.g., capacity building efforts, or development of climate change awareness programs). "Hard greening" usually refers to a GIS with "greening activities" that directly result in measurable emission reductions.

GIS offer an important benefit over JI, through stronger financial leverage and timing flexibility. Under GIS, all or part of the AAUs sold can be immediately transferred to the buyer and "greening" can occur later with the progressive implementation of "greening" activities, typically through a programmatic approach, in accordance with the bilateral agreement between buyer and seller. Revenues from an AAU/GIS transaction can also be received upfront and ahead of the investments, thus providing the host country with greater possibility for leveraging and complementing carbon revenues with

[96] The possibility of banking depends on an international agreement being reached on a post-2012 climate regime based on AAUs. See Tuerk et al. (2010) for further discussion.

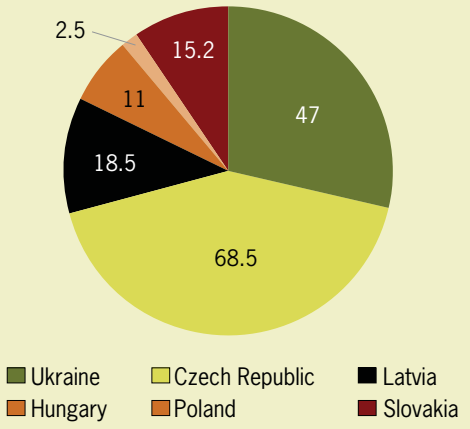
[97] Blyth, William and Richard Baron, 2003, "Green Investment Schemes: Options and Issues", IEA and OECD Information Paper prepared by the IEA Secretariat at the request of the Annex I Expert Group on the United Nations Framework Convention on Climate Change.

other financial resources. The "greening" investments, programs, and project activities do not need to take place prior to 2012, providing more time to implement "greening activities", possibly well beyond 2012.

The World Bank has been developing GIS actively since 2003, initially in the form of technical assistance to several countries (e.g., Bulgaria, Latvia, and Ukraine). Its assistance includes analytical assessment and recommendations on the possible design, regulatory framework, and financial and implementation structure, while highlighting the possible challenges and constraints of selected countries[98]. These efforts significantly contributed to the design of potential and, as of now, partially implemented GIS structures. The World Bank has also engaged in the development of actual AAU/GIS transactions, but has not yet concluded any at the time of writing.

The AAU transactions may play a critical role in a few Annex I countries' compliance with their Kyoto Protocol emissions commitments (e.g., Japan and Spain). At the same time, the overall risk of negative impacts on the CDM and JI markets (i.e., by crowding out CDM and JI) is significantly mitigated by the fact that the EU ETS does not allow the use of AAUs by private companies for compliance.

FIGURE 33 AAU primary transactions up to December 2009 by country (162.7 Mt)



Source: State & Trends of the Carbon Market 2010, The World Bank

Largely thanks to GIS, the AAU has recently started becoming a growing segment of the carbon market, with several transactions completed (see Figure 33) in the past 2 years. Several buyers are increasingly seeking sizable and predictable volumes of Kyoto-compliant carbon assets at attractive prices. In response, several host countries have accomplished significant progress in developing GIS, with the extent of actual "greening" to be verified later once activities are implemented. In 2009 alone, the AAU market grew more than seven times to US$2 billion (€1.5 billion) with 155 $MtCO_2e$ transacted[99], and the vast majority of these transactions reported as GIS. Looking ahead, governments have announced their intent to sell about 1.8 billion AAUs through GIS (largely from Ukraine and Poland), which is significantly greater than projected AAU demand[100]. Estimating future trends in the AAU market is complicated by uncertainties regarding the rules for the bankability of AAUs from the first Kyoto commitment period to a subsequent commitment period, i.e., whether the surplus AAUs can be used for compliance in a still undefined post-2012 international climate change regime.

Some of the key insights and lessons learned from the GIS experience to date can be summarized as follows:

- **GIS imply a much larger role for host countries and require significant implementation capacity.** Even more than for JI Track 1, the GIS experience to date shows that setting up legal frameworks, national systems and institutions for GIS are a time- and resource-intensive task. Governments must develop rules to account for and manage these new national assets and also develop "greening" programs and oversee their implementation, including the relevant administrative, regulatory, and institutional frame-

[98] See World Bank (2004), Options for designing Green Investment Schemes for Bulgaria; World Bank (2006), Options for designing Green Investment Scheme under the Kyoto Protocol, World Bank (2007) Latvia GIS Options Study.

[99] This includes one secondary transaction (15 MtCO2e) with Slovakia. For more discussion, please see the "State and Trend of the Carbon Market 2010," the World Bank.

[100] Ibid.

works. They must also pass relevant legislation. Furthermore, efficient and transparent implementation of GIS activities requires significant institutional and operational capacities that may not be readily available in host countries and need to be strengthened or newly created. For instance, operational and practical procedures, and documentation are still partly missing. Development of these can be challenging: definitions, perceptions, and requirements for "greening" can vary within the host country and among the buyers. Appropriate and transparent treatment of the revenues generated is also an important issue for the GIS host countries to manage.

- **Timing flexibility of "greening" activities can complicate the legal structure of AAU purchase agreements.** Purchase agreements may be complicated by a combination of upfront payment and transfer of AAUs on the one hand, and a longer ex-post "greening period" on the other, especially as far as enforcement of "greening" activities is concerned. Despite these hurdles, there are strong incentives and active attempts to develop such agreements that would provide a satisfactory level of comfort and responsibility-sharing to minimize any reputational risks, both for sellers and buyers of AAUs.
- **The success of GIS is contingent on careful consideration of program design and disbursement arrangements to ensure efficient implementation of "greening activities."** Several of the proposed GIS activities have consisted of energy efficiency programs of significant scale and reach. However, successful implementation and disbursement modalities may be challenging and time consuming, in particular in cases where the individual project activities targeted by the larger program may be quite small. It is therefore important that application procedures (to gain access to GIS finance) be streamlined and that the level of GIS support be sufficiently high to ensure an attractive financial incentive to implement the desired energy efficiency projects, and thus secure the success of the GIS.
- **Heterogeneity of "greening" definitions leads to difficulties in defining a price of a "greened" AAU.** Due to the specificity of individual transactions, there is no publicly available comparable price information of AAUs transacted under GIS. As a result, pricing of AAUs is challenging and opaque. Typically, AAUs transacted are perhaps better described as "AAUs to be greened."
- **GIS offer fertile ground to test programmatic/sector-wide approaches for GHG mitigation.** GIS allow flexible and novel approaches and procedures to carbon finance. Successful GIS could provide fertile learning grounds on the design and implementation of mitigation activities grouped under a programmatic or sectoral approach. With the need to scale up GHG mitigation, GIS experience could be relevant both for the CDM and for other potential new market-based instruments as well as for public funding mechanisms. However, replication of the GIS experience in any other mechanism may require appropriate adjustments to take into account the possible greater needs for methodological rigor in contexts where there is no surplus AAU.

7 Conclusion: An Experience worth Building On

Carbon finance, which has its roots in the Kyoto Protocol's market-based mechanisms, is now a proven tool to support GHG mitigation and sustainable development. Over the past decade, the World Bank and many others have gained practical experience with the Kyoto mechanisms. This experience demonstrates how carbon finance revenues can enhance the overall financial viability of low carbon projects and, as performance-based payments, can create positive incentives for good management and operational practices to sustain emission reductions over time.

Impressive achievements

The CDM has certainly exceeded expectations in terms of the number of projects: there are just over 2,000 registered CDM projects and more than 2,700 more projects undergoing validation. There are also almost 300 JI projects underway. It is expected that the overall emission reductions from CDM and JI will amount to more than 1 billion tons of CO_2e during the Kyoto Protocol's first commitment period. These mechanisms are thus on their way to making an important contribution to helping industrialized countries meet their emissions obligations under the Kyoto Protocol. Between 2002 and 2009, about 2.2 billion CERs have been transacted for approximately US$26 billion.

Carbon finance, either alone or in combination with other policy and financial instruments, has made a difference in favor of climate action and has catalyzed the shift of much larger amounts of (essentially private) financial and investment flows to low carbon development, although the full leverage potential of carbon finance has not yet been fully explored.

In addition to their contribution to meeting GHG commitments cost-effectively, the Kyoto mechanisms have generated other noteworthy benefits. There are many diverse examples of how the Kyoto mechanisms have contributed to sustainable development in host countries. They have also provided opportunities to support basic development needs and broader socio-economic co-benefits, such as improving energy access and services (e.g., through efficient lighting and biogas projects); providing solutions for the solid waste management problems so often associated with the increased urbanization of developing countries; reducing local air and water pollution and generating health benefits (e.g., through wastewater management projects); generating employment (e.g., through efficient brick making projects); and improving livelihoods (e.g., through reforestation projects). In addition, CDM and JI have contributed to technology transfer, and even more to technology diffusion, which is critical for scaling-up GHG mitigation.

Activities under the Kyoto mechanism have largely focused, at least initially, on the simplest projects to bring through the CDM system, those with lowest abatement cost and largest volume potential. Renewable energy projects (e.g., hydro, wind, and biomass) are the most popular types of projects in the CDM, followed by waste management and industrial projects (e.g., cement, coal bed/mine methane, and energy efficiency in industry). In terms of volume of emission reductions expected from the CDM, the renewable energy and industry sectors are joined in the top 3 by industrial gases (HFC-23, N_2O, etc), because the few industrial gas projects generate such

large volumes of CERs as a result of the much higher GWP of these gases compared to CO_2. Other important factors for attracting CDM activity are the capacity of project entities to carry out projects and the overall capacity of host countries. Thus far, CDM projects have indeed, overwhelmingly taken place in the largest and most advanced developing countries, with the notable dominance of China. China's success can be attributed not only to a GHG intensive electric grid and a large and growing economy, but also to the Chinese authorities' capacity development and a CDM support structure that have combined to facilitating overall strong project implementation capacity.

Experience has shown that the key success features of CDM/JI projects are similar to those of more typical development projects: (i) a committed champion (within the company or government); (ii) strong project design and planning from the start; (iii) solid poject financing; and (iv) the potential to meet objectives (in this case, reduce GHG emissions). Inability to reach financial closure has been the key reason for project ideas not developing into CDM (or JI) projects, with upfront financing barriers being significant for many projects. For those projects that have secured financing, it is becoming clear that the bulk of the work associated with CDM projects and programs actually takes place after registration. In fact, successful project implementation and CER delivery—which is the key test for carbon finance—often take more time than originally anticipated and require sustained efforts. Successfully adhering to the relevant methodologies and procedures defined in the monitoring plan is key.

The CDM (and JI) face operational challenges that need to be addressed

The environmental integrity of the CDM is critical to both the climate regime and to the carbon market. Developed through a "learning-by-doing" approach, the CDM and JI achievements must swiftly move to consolidate the rich learning from the practical experience brought by thousands of projects and the development and assessment of more than 100 methodologies and the engagement by so many stakeholders-from both developed and developing countries. It is indeed time to integrate the rich lessons and experience into reforms that will increase the mechanisms' efficiency, enhance their effectiveness, and enable them to reach their full mitigation and sustainable development potential, while laying the ground for transitioning towards larger-scale mitigation that will be necessary to meet the ultimate objective of the UNFCCC cost-effectively.

The CDM may be a victim of its success in terms of the large number of projects that it has stimulated, but the bottlenecks, the multiple checks translating into high transaction costs and lost revenues risk choking the project pipeline. The time needed to register a project has been increasing and now stands at 18 months, resulting in lost CERs valued at an estimated €800 million. The time required for processing requests for issuances is poised to increase as more and more projects seek to obtain their issued CERs by the end of 2012. The CDM validation and verification costs for both small and large scale projects have been on the rise as well.

It is essential to build on the impressive achievements, capacity, and institutions. It is a well worthwhile task, as the CDM regulatory risks are hampering the viability of good projects, making the acquisition of financing even more difficult for the projects that are most dependant on carbon finance. The regulatory risks are starting to erode the confidence and enthusiasm of stakeholders. The international community, the CDM EB, and the UNFCCC secretariat are taking steps in that direction; follow-through is vital.

A more streamlined system, accompanied by training and accountability of DOEs, as well as enhanced communication and collaboration between DOEs and the CDM EB, is possible and needed. The CDM should evolve towards trusting the validations and verifications, and enable the automatic registration and issuance of CERs to be automatic, but accompanied by a CER discount along with random spot checks. Such evolution would bring some much needed oxygen to the CDM, as well as lower regulatory and transaction costs, while also ensuring acceptable environmental integrity.

Methodologies and additionality also need to be examined, while the majority of projects used one of the two most popular methodologies, too many other methodologies have limited applicability and too many are overly complex and have onerous documentation and monitoring requirements that do not always match reality. Perfect accuracy is often not possible or too costly. Many methodologies have a high level of complexity and yet are still unable to pragmatically specify what is an acceptable level of uncertaint, exemplifying how "perfection can be the enemy of the good." Simplified methodologies and pragmatic monitoring requirements are needed. This can be facilitated by moving to ambitious yet realistic baseline standardization wherever possible, along with clear and objective additionality, including pre-defined additionality—accompanied by clear review provisions with predictable triggers. Such changes are essential to ensure the continued success of carbon finance as a meaningful tool to help tackle the climate change challenge over the coming decade.

The next phase of the mechanisms, which will largely depend on the level of ambition of GHG commitments adopted for the post-2012 period and the creation of longer-term demand for GHG credits, will need to (i) increasingly focus on more difficult/complex types of projects (e.g. end-use energy efficiency at the household level), (ii) extend the reach of carbon finance to new geographic areas, and (iii) exploit more effectively the synergies with host countries' efforts towards poverty alleviation and low carbon development.

JI opportunities and challenges

The experience with Joint Implementation has not materialized as expected, as JI projects, which benefit from the environmental safeguard provided by an overall emissions cap, are facing particular issues and challenges. JI suffered from a late start compared to the CDM, and has not been able to fully recuperate and exploit the greater flexibility (resulting from its implementation in countries with emission caps) compared to the CDM. Moreover, in the case of projects located in countries that joined the European Union, navigating the interplay between the EU ETS and JI and avoiding double-counting have been challenging.

In addition, while JI provides host countries with greater regulatory authority and responsibilities (compared to the CDM), what has emerged is that JI projects face additional host country regulatory risks. The JI experience to date shows that it takes time and resources to build national systems, institutions, and capacities, as governments must develop rules to account for and manage these new national assets, including domestic procedures and guidelines for project approval, and issuance and transfer of emission assets.

Extending the reach of the Kyoto mechanisms to least developed countries

Market-based instruments are designed to help meet GHG objectives cost effectively. However, the resulting geographic distribution is striking with LDCs having largely been by-passed by the CDM thus far. Provided the rules are changed, the CDM could contribute to broader sustainable development in poor countries through mitigation and sequestration activities that help address these countries' challenges with energy poverty as well as with land management.

Good governance and an enabling environment are pre-conditions for attracting CDM. In addition, there are key areas to address:

- The streamlining and simplification of CDM procedures is an essential condition for extending the reach of the CDM to LDCs. Transaction costs and delays have to be dramatically cut to make small-scale projects viable.
- Managing the requirements of the CDM process, both for project validation and monitoring of emission reductions, requires substantial capacity building efforts and technical assistance support to project entities.
- New CDM methodologies or approaches are needed for LDCs, taking into account their state of significant

suppressed energy demand and their need for growth in energy services.
- Remedy "temporary" crediting in the afforestation / reforestation sector and expand the scope of forestry and agriculture activities eligible under the CDM.
- Programmatic approaches (i.e., through Programmes of Activities) could unlock some of the mitigation potential of the CDM in LDCs, but simplification and training is needed.

Scaling-up

The urgent need for scaling-up mitigation efforts is widely accepted. Successful approaches to scaling-up are expected to include a combination of policy-based and technological interventions to be defined by country-specific circumstances and capacities. Strategically, aggregated programs could become good vehicles to scale up system, subsector, or sector-wide mitigation efforts. Programmes of Activities under the CDM and JI are opening the door for the use of programmatic approaches for GHG mitigation activities in developing countries, but some clarifications of rules to adequately balance liability, credibility and efficiency are needed to facilitate implementation. It is too early to draw lessons but it is becoming clear that the key factors of a PoA are its design and the coordinating entity's capacity. Moreover, scaling-up mitigation through programmatic approaches will need to move from seeking to precisely measure every ton of GHG emission reduced (at each project site) to estimating with proper justification and confidence the total GHG impact of the PoA. Green Investment Schemes may be an efficient means for programmatic approaches in countries with emissions obligations, by providing transactional advantages through upfront financing for programmatic activities combined with timing flexibly for their subsequent implementation.

The importance of capacity building

The Kyoto mechanisms, their institutions, and the capacity built throughout the world over the past ten years are without a doubt a remarkable accomplishment that needs to be sustained and built-upon. Host countries need to develop the necessary capacity and provide the enabling environment for carbon finance to more effectively leverage climate-friendly investments. The evolution of the market-based mechanisms—whatever direction they take—will benefit from greater engagement from developing countries to ensure that they better integrate the practical realities of developing countries and offer meaningful opportunities to support their low carbon development priorities. The further contribution of the mechanisms both in terms of GHG mitigation and its contribution to sustainable development will be enhanced if they can build on synergies with host country policies and other financial instruments.

Post-2012 policy clarity

Clarity on the post-2012 international climate change regime, the longer-term demand for emission reductions, as well as on countries' plans to use market-based mechanisms to meet domestic GHG objectives, is urgently needed. Without clarity on these issues, the carbon market and carbon finance are losing momentum and face the serious risk that progress will come to a halt. Perhaps more serious, is the real danger of not being able to sustain, and even lose, the capacity developed over the past decade in so many countries, organizations, and companies in terms of integrating GHG considerations into policy and investment decision-making processes, and sustaining emission reductions over the long term. The failure to sustain this capacity would exacerbate the challenge of mitigating climate change over the coming years. The international community must work together to ensure that we move forward, build on the rich experience of the mechanisms and make the necessary adjustments to confront the climate and development challenges of the next decade and beyond.

8

Postscript – Building on 10 years of experience: Where the World Bank Goes from Here

This report has also been a way for the World Bank to celebrate its first decade of involvement in carbon finance. Looking back at the road traveled, it has been a fascinating journey of discovery of how market mechanisms can set in motion investments and behaviors that dramatically change the way we look at development opportunities in the World Bank's client countries.

It has been a journey traveled together with carbon fund participants, donors, host countries, the secretariat of the UNFCCC, and a diverse group of entrepreneurs and investors in many different countries, inspired by the belief that there can be alternatives to business as usual so that growth and poverty reduction can be achieved at the same time as a more sustainable world is preserved for generations to come. As the report documents, it has been at times a difficult journey but one that has been highly rewarding—and in which we have learned a lot. Today, the global community has a much better idea of not only what works and does not work, but also what could be done to let market mechanisms reach their full potential to achieve climate change mitigation at the scale required to address effectively the global challenge our planet faces.

Strengthened by the rich experience amassed over the past decade and convinced of the need to continue its support for mitigation actions, the World Bank proposes to embark on its next ten years of carbon finance. There is still a lot more to learn from the portfolio of projects we manage as we continue to help project entities to full implementation and deliver the emission reductions they are expected to generate.

While the global community strives to put in place an international climate regime post 2012, the World Bank will continue its work to expand the scope, scale and range of climate change mitigation activities in the various sectors of its clients' developing economies. Filling the climate finance gap will require that both the public and the private sectors get engaged on a significantly larger scale than heretofore. The private sector has indeed a key role in financing mitigation through carbon markets and related instruments; official flows or international funding will be an important complement to build capacity, correct market imperfections, and target areas overlooked by the market.

How the World Bank proposes to move forward matters. Building on its experience serving as a market maker (in the very early days), and a contributor to the global experiment that the first commitment period of the Kyoto Protocol has provided, the World Bank recognizes that the best chance for using carbon markets to achieve successful large-scale GHG mitigation in future will be a partnership between all countries involved. Thus in addition to continuing to "learn by doing", as is still required in many ways, a close partnership with all stakeholders will help find better solutions that address the urgent and critical challenges of climate change. Partnerships are also better suited to the evolution of capacity building and awareness among market participants, as well as the

concept of "common but differentiated responsibilities" embodied in the UNFCCC. Large-scale GHG emission reductions will require not only the use and diffusion of more advanced technologies, but will also entail innovation and collaboration over a long period of time as stakeholders both create and transfer knowledge.

As a participant committed to making the carbon markets work, the World Bank has played various facilitating roles, bringing together diverse stakeholders to overcome hurdles. It proposes to continue this bridge-building work whenever desirable by, for example:

- Facilitating technical roundtable discussions on various topics, bringing together rule makers (e.g., UNFCCC), those responsible for applying the rules (DOEs), project or program entities, and other stakeholders, with a view to sharing experience, learning from one another and brainstorming future procedures, processes and mechanisms;
- Providing a forum for host countries—through its Host Country Committee—to advise the World Bank on its carbon finance activities and share experience on the ground; and
- Facilitating participation of developing country sellers and regulators in forums such as Carbon Expo to bring them in direct contact with "the market";

Going beyond such informal initiatives, the *Forest Carbon Partnership Facility*, established in 2008, is an encouraging example of pioneering work undertaken by a strong partnership of more than 50 countries, dedicated to tackle the complex issue of REDD (Reducing emissions from deforestation and forest degradation) and beyond (REDD+) along with other REDD initiatives. Providing countries with the means to prepare themselves for future large-scale incentive payments for REDD+ and in the process, building not only knowledge, but also trust and confidence among all stakeholders involved, has proven critical to moving forward on this difficult REDD+ agenda.

The World Bank would like to emulate this positive experience on other fronts.

It is in the process of establishing the *Carbon Partnership Facility* (CPF) to promote greenhouse gas emission reductions through larger-scale, longer-term carbon finance investments through the use of Programmes of Activities as well as other scaled-up approaches such as a proposed city-wide approach. For the first time, both buyers and sellers of emission reductions will work jointly to develop these new approaches, with the World Bank facilitating the partnership. The Facility is intended to be a catalytic agent by experimenting with new ways of leveraging private sector funds to invest in low-carbon development alternatives at large scale within host countries. Building on the lessons learned about the importance of capacity building, the Facility includes a specifically designed program preparation fund to provide technical assistance, as well as a more traditional carbon fund to purchase carbon credits derived from GHG emission reduction investments and client country activities.

Looking ahead, the World Bank plans to introduce a dedicated facility to help build adequate capacity in developing countries to make market instruments operational for meeting their own mitigation objectives. Through a proposed "*partnership for market readiness*", the World Bank is prepared, in collaboration with other partners, to: (i) create a platform to enable policy makers from both developed and developing countries, practitioners, and public and private entities, to share experience and information regarding elements of market readiness, learn from each other, explore and innovate together on new instruments and approaches; (ii) provide grant financing to the participating countries in building "infrastructure" for market readiness; (iii) pilot, test and sequence new concepts for market instruments, including identifying potential synergies between national market-based instruments at the design stage; (iv) create a body of knowledge that could be tapped for country-specific requirements; and (v) share lessons learned, including with the UNFCCC.

Last but not least, the World Bank's pioneering work carried out through its BioCarbon Fund and Community Development Carbon Fund are far from completed. The BioCarbon Fund needs to be continued to extend the benefits of the carbon market to the rural, poorest areas of the world, with projects that conserve or sequester GHGs in forests and agro-ecosystems, as well as strive to change agricultural practices leading to soil improve-

ments. Aware of the potential that such work has towards improving livelihoods and reducing poverty in its client countries, the World Bank seeks to build on the achievements of and lessons learnt from the Community Development Carbon Fund and support the development needs of the least-developed countries in future.

Market instruments should and can work for all countries at different stages of development. Making them suitable to the variety of needs and country situations will require flexibility, innovation, imagination and above ambition and perseverance. The World Bank is prepared to play its part, for another ten years...

Annex 1 – World Bank Funds & Facilities

Carbon Funds and Facilities at a Glance

PCF

At the close of calendar year 2009, the Prototype Carbon Fund has 23 of 24 projects generating emission reductions and eight of the PCF's CDM projects have issued Certified Emission Reductions. In early 2010, the PCF successfully completed its first transfer of Kyoto assets from its projects in Annex I countries.

Fund Capital ($ million)	219.8
Date Operational	April 2000
Participants	22
Private % (by capital invested)	57.6

CDCF

The Community Development Carbon Fund now has 33 emission reductions purchase agreement with a value of $98 million. Fifty-three percent of its portfolio is committed to projects in the world's poorest countries as defined by the World Bank Group's International Development Association or the United Nations' Least Developed Country designation.

Fund Capital ($ million)	128.6[#]
Date Operational	March 2003
Participants	25
Private % (by capital invested)	45.1

BioCF

The BioCarbon Fund has signed 17 contracts involving afforestation and reforestation, four of which have been registered under the Kyoto Protocol's CDM mechanism, and the remainder of which are in advanced stages of preparation. Fifteen of the projects have signed an emission reductions purchase agreement. Tranche 2 consists of 8 afforestation/reforestation projects, which are expected to generate 3.02 million tons in carbon emission reductions.

TRANCHE 1	
Fund Capital ($ million)	53.8
Date Operational	May 2004
Participants	14
Private % (by capital invested)	51
TRANCHE 2	
Fund Capital ($ million)	36.6
Date Operational	March 2007
Participants	7
Private % (by capital invested)	44

NCDMF

The Netherlands Clean Development Mechanism Facility has a mature portfolio that includes the first project ever registered under the Kyoto Protocol's CDM mechanism. The NCDMF portfolio includes a significant number of registered projects and others with signed emission reductions purchase agreements that are in the process of being registered.

Fund Capital ($ million)	**
Date Operational	May 2002
Participants	1
Private % (by capital invested)	0

NECF

The Netherlands European Carbon Facility (NECF) is co-managed with the International Finance Corporation and supports carbon market operations in Ukraine, Russia, and Poland.

Fund Capital ($ million)	**
Date Operational	August 2004
Participants	1
Private % (by capital invested)	0

Italian Carbon Fund

With a capitalization of $155.6 million, the Italian Carbon Fund (ICF) has signed six emission reductions purchase agreements totaling $145.9 million and 26 million tons of carbon dioxide. The portfolio includes projects operating under both the Kyoto Protocol's CDM and JI mechanisms.

Fund Capital ($ million)	155.6
Date Operational	March 2004
Participants	7
Private % (by capital invested)	30.2

Danish Carbon Fund

The Danish Carbon Fund (DCF) consists of seven emission reductions purchase agreements with a total carbon reduction volume of 6.8 million tons of carbon dioxide equivalent. The fund has an additional 9 projects in pipeline equivalent to another 35 million tons of carbon dioxide.

Fund Capital (€ million)	90
Date Operational	January 2005
Participants	5
Private % (by capital invested)	78

Spanish Carbon Fund

Divided into two tranches since 2008, the Spanish Carbon Fund (SCF) consists of 14 signed emission reductions purchase agreements. With total commitments of €156.7 million, the fund has 71.2% of its capital pledged. Tranche 2, which has a Green Investment Scheme focus, signed its first emission reduction agreements in 2008 purchasing 236,254 tons of carbon dioxide.

TRANCHE 1	
Fund Capital (€ million)	220
Date Operational	March 2005
Participants	13
Private % (by capital invested)	22.7
TRANCHE 2	
Fund Capital (€ million)	70
Date Operational	April 2008

Umbrella Carbon Facility

Consisting of five carbon fund administered by the World Bank and 11 members of the private sector, the Umbrella Carbon Facility (UCF) consists of €799.1 million, 75 percent of which comes from the private investment. In 2009 the facility delivered 19.2 million tons of carbon dioxide bringing the total amount of emissions purchased since inception up to 48.4 million tons of carbon dioxide.

Fund Capital (€ million)	799.1*
Date Operational	August 2006
Participants	16
Private % (by capital invested)	75

Carbon Fund for Europe

With total capitalization of €50 million, the Carbon Fund for Europe (CFE) signed a fifth emission reduction agreement in 2009 bringing the total amount of emissions purchased up to 3.4 million tons of carbon dioxide emissions. The fund currently has an additional 1 million tons of carbon dioxide emissions in its pipeline.

Fund Capital (€ million)	50
Date Operational	March 2007
Participants	5
Private % (by capital invested)	20

Forest Carbon Partnership Facility

Operational since June 2008, the capital for the Forest Carbon partnership facility currently stands at €168.5 million. In 2009, Guyana, Panama, and Indonesia became the first three countries to submit Readiness Preparation Proposals to the facility, which is the first step in allowing them to build capacity to tap into incentives under REDD.

Fund Capital (€ million)	168.5
Date Operational	June 2008
Participants	51***
Private % (by capital invested)	3

Includes $ 5 million total participation of DCF
* Includes €224.54 million total participation of PCF, NCDMF, ICF, DCF, and SCF
** Not publicly available
*** 14 financial contributors 37 REDD country participants

Annex 2 – Key Elements of an Emission Reductions Purchase Agreement (ERPA)

COMMERCIAL TERMS:

- **Offset asset type** (CERs/ERUs/VERs)
- **Contract volume**
  - Seniority/*pari passu*
  - Annual/cumulative amounts (as specified in a delivery schedule)
  - 'Sweeping clause' (i.e. project over-performance leads to acceleration of delivery schedule)
- **Unit price** (fixed/variable)
- **Call option** for additional offset asset volumes & **exercise price** (fixed/variable/option premium)
- **Conditions** for sale & purchase obligations to become effective
- **Payment**
  - CER/ERU ERPA: upon delivery
  - VER ERPA: upon verification
- **Advance payment** (if any)
  - Certain percentage amount of contract value
  - Advance payment recovery risk mitigation tools (e.g., letter of credit, disbursement milestones etc.)
- **Transaction costs**
  - Costs related to project preparation/ implementation/supervision
  - Typically borne by Seller up to certain capped amount
- **Taxes** (if any)
  - Host country taxes: borne by Seller
  - Other taxes: borne by Buyer
- **CDM Share of Proceeds**
  - CER ERPA: borne by Seller
  - VER ERPA: borne by Buyer
- **Risk allocation**
  - General principle: Risks to be borne by party best able to manage them
  - CER/ERU ERPA: Seller bears political/project/ project registration (determination)/methodology/Kyoto regulatory risk; Seller and Buyer share price/*force majeure* risk
  - VER ERPA: Seller bears political/project risk; Buyer bears project registration (determination)/ methodology/Kyoto regulatory risk; Seller and Buyer share price/force majeure risk

Annex 3 – World Bank Social and Environmental Safeguard Policies

The World Bank's environmental and social safeguard policies are a cornerstone of its support to sustainable poverty reduction. The objective of these policies is to prevent and mitigate undue harm to people and their environment in the development process. These policies provide guidelines for World Bank and borrower staffs in the identification, preparation, and implementation of programs and projects. In projects where the carbon finance operation is a component of a World Bank investment operation such as an investment loan, the safeguards developed for the loan include the CF component. In line with the same requirements for other operations, even stand-alone projects taken up for consideration for the Carbon Finance portfolio are reviewed for compliance with these policies. This is in addition to the relevant host country approvals that are required under the Kyoto Protocol to confirm that a project will assist the host country in meeting its sustainable development priorities. The rationales for the safeguard policies are to (i) contribute to informed decision-making; (ii) build consensus on development alternatives; (iii) reduce unforeseen problems and issues; (iv) prevent costly delays and stoppages; (v) minimize or prevent disputes; (vi) sustain development impact; and (vii) build public confidence. The World Bank's safeguards policies cover:

- Environmental assessment
- Natural habitats
- Safety of dams
- Pest management
- Physical cultural resources
- Forests
- Involuntary resettlement
- Indigenous peoples
- International waterways
- Projects in disputed areas

In addition, project information needs to be suitably disclosed both locally and internationally. The World Bank also carries out stakeholder consultations and due diligence to ensure that there are no reputational risks associated with project activities.

The compliance requirements are specific for each project depending on its project boundary, location, technology type, and the activities envisaged under the project. As soon as possible after a project is accepted for development, a task team is assigned to review it and determine which World Bank Group safeguard policies are triggered. This determination is developed through field reviews, and the required safeguard measures and schedules for implementation are finalized before the World Bank agrees to the signature of an ERPA. Depending on the degree of complexity, projects are rated as C, B, or A, with progressively more intense compliance regimes.

At a minimum, all projects complete an environmental assessment report (including an environmental management plan); other plans (such as an Indigenous Peoples Plan, a Resettlement Plan or other action or management plans or material produced pursuant to safeguard policies) are determined on a project-specific basis. These are disclosed in line with relevant World Bank Group Policies & Procedures applicable to private sector projects both at the World Bank InfoShop *(www.worldbank.org/infoshop/)* and in a publicly accessible location in the host country of the carbon finance project.

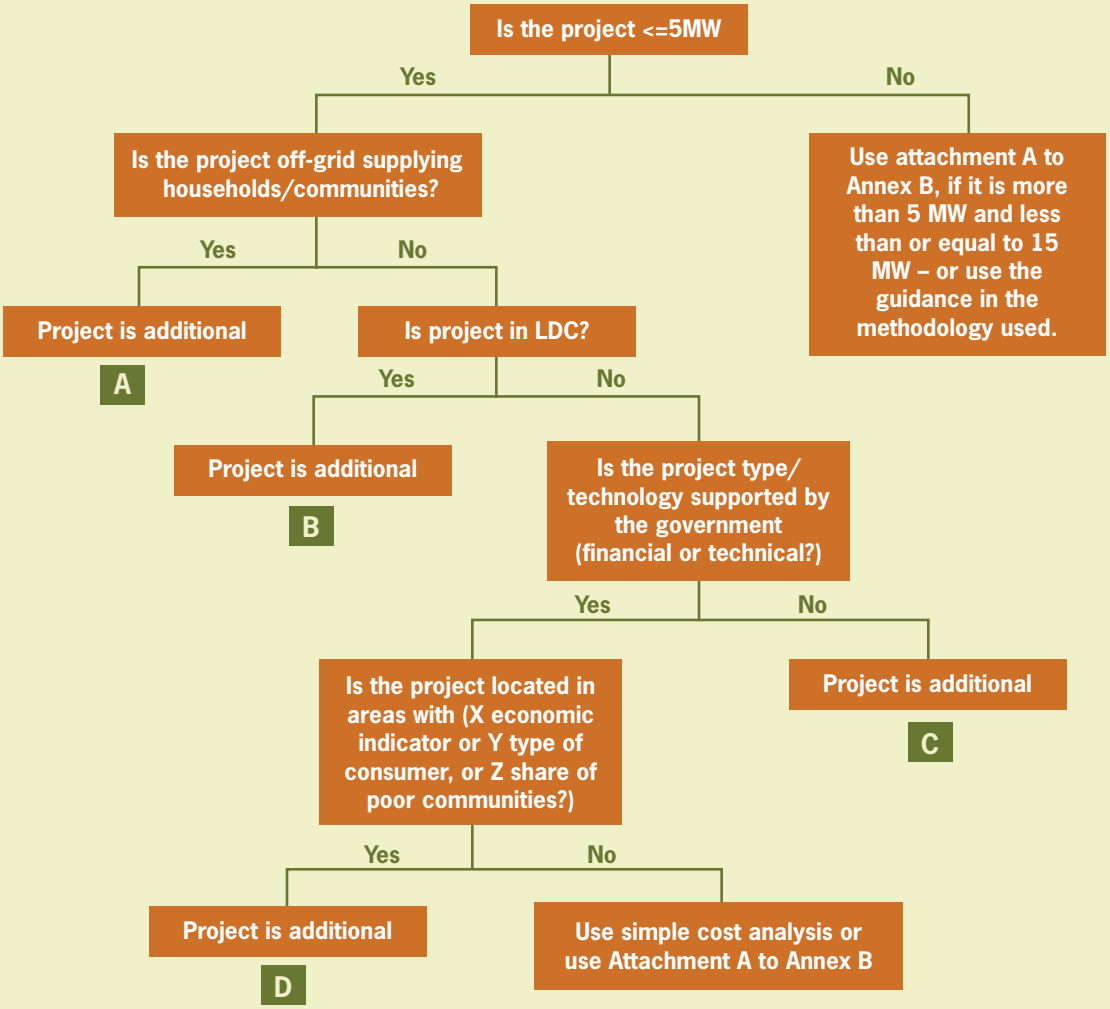
Annex 4 – Example of Simplified Modalities for Demonstrating Additionality

The CDM Executive Board issued a call for public inputs on simplified modalities for demonstrating additionality of small-scale renewable energy and energy efficiency project activities. The following example is drawn from the World Bank's submission (April 12, 2010) responding to the call for inputs (it can be found at http://wbcarbonfinance.org/Router.cfm?Page=Methodology&mt=Papers)

The World Bank's submission is structured to allow assessment of additionality for all small-scale category (SSC) projects. To ensure the success of the CDM, improved regional distribution of projects and reduction in the timelines of project approval procedures, cost-effective implementation of the simplified modalities for all small-scale projects needs to be assured. This involves close consideration and analysis of key issues related to types of projects, technology, and region/country specific circumstances. As delays in the registration process translate into lost CERs, further simplification of existing modalities for additionality demonstration will benefit both the developing countries and the developed countries seeking cost-effective mitigation.

The submission proposes a flow-chart based, yes/no assessment, that small-scale projects can use to prove automatic additionality. The suggested assessment is based on widely published documentation (e.g., UN MDG reports, IFC Doing Business reports, WB's green data book, and published national/regional/sectoral data) or country specific or sector specific national-level information available in the host country. The effort is to move away from project-specific assessment for this category of projects as it is practically impossible to find information on such small-scale projects, and the associated time and cost involved can easily outweigh the financial incentive provided by the carbon revenue, which should be utilized for the project and not solely towards CDM transaction costs. The flow chart outlined is intended to simplify the procedures for the demonstration of additionality for small-scale renewable energy projects and programs.

Demonstration of Additionality for Small Scale Renewable Energy Project activities with less than 5 MW*



*The World Bank example uses the threshold specified in the CDM EB call for public inputs, but a higher threshold (i.e., 15 MW and 60 GWh) is recommended.

Simple cost analysis has to prove that the type/technology of the project is costlier than the business as usual (BAU), say $/MW is higher than BAU, or demonstrate that the benefits to costs ratio is less than BAU based on the total costs and benefits expressed in discounted present values. This is without the need to follow regular detailed investment analysis.

The check points on the flow chart are selected based on the analysis of additionality criteria, which in turn are based on the analysis of registered small scale renewable energy CDM projects and lessons learned from the WB's portfolio of projects. A project or program can be considered automatically additional if it is:

1. *An off-grid project*; irrespective of its location and environment under which it has been implemented—This is considering the fact that the size of the project is small and directly contributes to sustainable development (A)
2. An *on-grid* project and *located in an LDC* (B)
3. An *on-grid* project, located in countries other than LDCs, but
   a. without any incentives from the government (C)
   b. located in areas with (X economic indicator or Y type of consumer, or Z share of poor communities) (D)

The following table explains the rationale behind various checkpoints suggested in the above flow chart:

TABLE 8 Explanation of additionality check-point for energy efficiency projects

Checkpoint	Rationale	Data Sources
A. Is the project an off-grid one?	Considering its small size and sustainable development priorities, any off-grid project with less than 5 MW capacities should be considered automatically additional irrespective of its country of location.	• No further data are required.
B. Is the on-grid project located in an LDC?	Considering its size, and that sustainable development benefits and obvious barriers exist in LDC countries, any grid connected project with less than or equal to 5 MW should be considered automatically additional. This is also considering CMP.5 declaration on LDCs to push the additonality of REs.	• No further data are required.
C. If the on-grid project is not located in an LDC, there are limited or no direct incentives from the government for the promotion of project type/technology.	Projects of this scale highly depend on incentives from the government mainly to reduce high upfront costs (considering their scale, location, choice of technology) and hence any such project with limited or no government support should be automatically additional.	• Any publicly available information on the government policies in the country

D. If the on-grid project is located in countries other than an LDC, in an area where the population is either poor and/or lacks access to infrastructure to meet their basic needs; (based on a specific indicator)	These types of projects help for the sustainable development of areas with economically poor population or areas that lack basic infrastructure to meet basic needs. Projects that contribute essentially to the sustainable development of the area should be encouraged and considered additional.	Last available published data on economic and welfare indicators such as:
		• Millennium development goals, such as
		  • Target 1.1: Proportion of population below $1 per day
		  • Target 7.8: Proportion of population using an improved drinking water source
		  • Target 7.9: Proportion of population using an improved sanitation facility
		  • Target 7.10 Proportion of urban population living in slums
		Others
		• Economic and financial indicators such as the rate of electrification

Note on indicators: The list of indicators is provided for discussion and illustration. It is proposed that all projects of this scale should be considered automatically additional till the relevant MDG goals are achieved or there is significant improvement in the other economic indicators in the division/province/state/country in which the specified project is being implemented.

Illustrative examples

There are numerous projects across the world where the development dividend is larger as compared to the climate mitigation benefit but which can provide the much needed *performance-linked incentive* for communities to pursue a low carbon path for development. Based on the checkpoints A-D described in Table 8, here we provide examples of projects that can be used to demonstrate the additionality (Source: UNFCCC website).

A. CDm Solar Cooker Project Aceh 1, Indonesia

The project strives to transfer and spread the most advanced technologies of solar cookers and of heat retaining containers (to finish cooking by unattended simmering and to separate meal-time and cooking time). The transferred state of the art technology from Germany uses renewable resources for cooking meals, heating and sterilizing water, and preserving food.

B. LUIGA Hydropower Project in Mufindi District, Tanzania (under validation)

LUIGA hydro power project is a 3 MW project located in Mufindi district of Tanzania with a main objective of developing the rural energy sector in order to make a significant contribution to bringing about rural transformation and poverty alleviation. Although the government considers electricity as an important source of modern energy, less than 10% of the total population has access to electricity supply, with rural access being lower than urban access. Estimates show that less than 2% of the population has access to electricity, despite this issue being a subject of both international and national concern in the country.

C. Yeghegis Small-Scale Hydro Project

This project involves installation of a turbine of 3.75 MW (3,750 KW) at the small scale hydropower plant on the upper flow of the Yeghegis river with electricity supplied to the national grid of Armenia. A first turbine at Yeghegis was installed and operational and not a part of the CDM project. The second turbine could not have been financed without the CDM project because this turbine will only operate during a wet season of approximately two and a half months. The first turbine produces about 25,000 MWh, while the second one will produce 7,296 MWh. There is no government incentive program to support such project.

D. West Nile Electrification Project

The project is the installation and operation of a 3.5 MW hydroelectric power plant, along with upgradation and extension of existing distribution networks in Paidha, Nebbi, and Arua municipalities in Uganda. It also connects existing and new customers, who would otherwise operate small, privately-owned generation facilities. The overall objectives of the West Nile Electrification Project (WNEP) are to promote socio-economic development in *rural Uganda* and to reduce energy-related CO_2 emissions causing global climate change. The project is being implemented under the Energy for Rural Transformation (ERT) program mainly to assist Uganda's rural energy sector in contributing to rural transformation and poverty alleviation.

Annex 5 – CDM Guidance on Government Policies (E-/E+ Policy Guidance)

Annex 3 of the Executive Board's 16th meeting (October 2004) provides guidance on how to treat climate-friendly policies in the baseline. The aim of this guidance is to provide assurance that the CDM would not create perverse incentives and would not penalize host countries that have enacted climate-friendly policies.

According to this EB guidance, E- national and/or sectoral policies or regulations that have been implemented since the adoption of the Marrakesh Accords (November 2001) may not be taken into account in developing a baseline scenario (i.e., the baseline scenario should refer to a situation without the national and/or sectoral policies or regulations being in place)". An E–policy is defined as "National and/or sectoral policies or regulations that give positive comparative advantages to less emissions-intensive technologies over more emissions-intensive technologies (e.g. public subsidies to promote the diffusion of renewable energy or to finance energy efficiency programs)."

An E+ policy is national and/or sectoral policies or regulations that create policy driven market distortions which give comparative advantages to more emissions-intensive technologies or fuels over less emissions-intensive technologies or fuels. E+ national and/or sectoral policies or regulations that have been implemented before adoption of the Kyoto Protocol by the COP (decision 1/CP.3, 11 December 1997) shall be taken into account when developing a baseline scenario. If "Type E+" national and/or sectoral policies were implemented after the adoption of the Kyoto Protocol, the baseline scenario should refer to a hypothetical situation without the national and/or sectoral policies or regulations being in place.

The issue of E policy and additionality assessments by the EB is to be further elaborated. The Copenhagen December 2009 Decision 2/CMP.5 on Further guidance to the CDM requests that the EB "... consolidate, clarify and revise, as appropriate, its guidance on the treatment of national policies."

Annex 6 – Glossary

Accredited Independent Entity (AIE): Accredited independent entities (AIEs) are independent auditors that assess whether a potential project meets all the eligibility requirements of the JI (determination) and whether the project has achieved greenhouse gas emission reductions (verification).

Additionality: A project activity is additional if anthropogenic GHG emissions are lower than those that would have occurred in the absence of the project activity.

Afforestation: The process of establishing and growing forests on bare or cultivated land, which has not been forested in recent history.

Annex I (Parties): Include the industrialized countries that were members of the OECD in 1992, plus countries with economies in transition. They currently include Australia, Austria, Belarus, Belgium, Bulgaria, Canada, Croatia, Czech Republic, Denmark, Estonia, European Union, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Latvia, Liechtenstein, Lithuania, Luxembourg, Monaco, the Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Russian Federation, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom of Great Britain and Northern Ireland, United States of America. All but Turkey are listed in Annex B of the Kyoto Protocol.

Annex B (Parties): The 39 industrialized countries (including the European Union) listed in Annex B to the Kyoto Protocol have committed to country-specific targets that collectively reduce their GHG emissions by at least 5.2% below 1990 levels on average over 2008–12.

Assigned Amount Unit (AAU): Annex I Parties are issued AAUs up to the level of their assigned amount, corresponding to the quantity of greenhouse gases they can release in accordance with the Kyoto Protocol (Art. 3), during the first commitment period of that protocol (2008–12). One AAU represents the right to emit one metric ton of carbon dioxide equivalent.

Baseline: The emission of greenhouse gases that would occur without the policy intervention or project activity under consideration.

Biomass Fuel: Combustible fuel composed of a biological material, for example, wood or wood by-products, rice husks, or cow dung.

Carbon Asset: The potential of greenhouse gas emission reductions that a project is able to generate and sell.

Carbon Finance: Resources provided to activities generating (or expected to generate) greenhouse gas (or carbon) emission reductions through the transaction of such emission reductions.

Carbon Dioxide Equivalent (CO_2e): The universal unit of measurement used to indicate the global warming potential of each of the six greenhouse gases regulated under the Kyoto Protocol. Carbon dioxide—a naturally occurring gas that is a byproduct of burning fossil fuels and biomass, land-use changes, and other industrial processes—is the reference gas against which the other greenhouse gases are measured, using their global warming potential.

Certified Emission Reductions (CERs): A unit of greenhouse gas emission reductions issued pursuant to the Clean Development Mechanism of the Kyoto Protocol, and measured in metric tons of carbon dioxide equivalent. One CER represents a reduction in greenhouse gas emissions of one metric ton of carbon dioxide equivalent.

Clean Development Mechanism (CDM): The mechanism provided by Article 12 of the Kyoto Protocol, designed to assist developing countries in achieving sustainable development by allowing entities from Annex I Parties to participate in low carbon projects and obtain CERs in return.

CDM Executive Board: A 10-member panel elected at the Seventh Conference of the Parties, which supervises the CDM.

Community Benefits: Community benefits are identifiable and quantifiable improvements in the quality of life of a local group of people who are identified by the trustee and the project entity as in the vicinity of or affected by a project.

Conference of Parties (COP): The supreme body of the Convention. It currently meets once a year to review the Convention's progress. The word "conference" is not used here in the sense of "meeting" but rather of "association," which explains the seemingly redundant expression "fourth session of the Conference of the Parties."

Conference of the Parties serving as the Meeting of the Parties (CMP): The Convention's supreme body is the COP, which serves as the meeting of the Parties to the Kyoto Protocol. The sessions of the COP and the CMP are held during the same period to reduce costs and improve coordination between the Convention and the Protocol.

Crediting Period: The crediting period is the duration of time during which a registered, determined or approved project can generate emission reductions. For CDM projects, the crediting period can be of either seven years (renewable twice) or of ten years (non-renewable).

Designated National Authority (DNA): An office, ministry, or other official entity appointed by a Party to the Kyoto Protocol to review and give national approval to projects proposed under the Clean Development Mechanism.

Designated Operational Entities (DOEs): Designated operational entities are independent auditors that assess whether a potential project meets all the eligibility requirements of the CDM (validation) and whether the project has achieved greenhouse gas emission reductions (verification and certification).

Determination: Determination is the process of evaluation by an independent entity accredited by the host country (JI Track 1) or by the Joint Implementation Supervisory Committee (JI Track 2) of whether a project and the ensuing reductions of anthropogenic emissions by sources or enhancements of anthropogenic removals by sinks meet all applicable requirements of Article 6 of the Kyoto Protocol and the JI guidelines.

Emission Reductions (ERs): The measurable reduction of release of greenhouse gases into the atmosphere from a specified activity, and a specified period of time.

Emission Reductions Purchase Agreement (ERPA): Agreement which governs the transaction of emission reductions.

Emission Reduction Units (ERUs): A unit of emission reductions issued pursuant to Joint Implementation. One ERU represents a reduction of one metric ton of carbon dioxide equivalent.

European Union Allowances (EUAs): **the allowances in use under the EU ETS. An EUA** unit is equal to one metric ton of carbon dioxide equivalent.

European Union Emission Trading Scheme (EU ETS): The EU ETS was launched on January 1, 2005 as a cornerstone of EU climate policy towards its Kyoto commitment and beyond. Through the EU ETS, Member States allocate part of the efforts towards their Kyoto targets to private sector emission sources (mostly utilities). Over 2008–12, emissions from mandated installations (about 40% of EU emissions) are capped on average at 6% below 2005 levels. Participants can inter-

nally reduce emissions, purchase EUAs or acquire CERs and ERUs (within a 13.4% average limit of their allocation over 2008–12). The EU ETS will continue beyond 2012, with further cuts in emissions (by 21% below 2005 levels in 2020 or more, depending on progress in reaching an ambitious international agreement on climate change).

First Commitment Period: The five-year period, from 2008 to 2012, during which industrialized countries have committed to collectively reduce their greenhouse gas (or "carbon") emissions by an average of 5.2% compared with 1990 emissions under the Kyoto Protocol.

Flexible Mechanisms: Three procedures established under the Kyoto Protocol to increase the flexibility and reduce the costs of making greenhouse gas emissions cuts; they are the Clean Development Mechanism, International Emissions Trading, and Joint Implementation.

Green Investment Scheme (GIS): A GIS is a voluntary mechanism through which proceeds from AAU transactions will contribute to contractually agreed environment- and climate-friendly projects and programs both by 2012 and beyond.

Greenhouse gases (GHGs): Both natural and anthropogenic, greenhouse gases trap heat in the Earth's atmosphere, causing the greenhouse effect. Water vapour (H_2O), carbon dioxide (CO_2), nitrous oxide (N_2O), methane (CH_4) and ozone (O_3) are the primary greenhouse gases. The emission of greenhouse gases through human activities (such as fossil fuel combustion or deforestation) and their accumulation in the atmosphere is responsible for an additional forcing, contributing to climate change. The Kyoto Protocol regulates six GHGs: carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_20), as well as hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF_6).

Global Warming Potential (GWP): An index representing the combined effect of the differing times greenhouse gases remain in the atmosphere and their relative effectiveness in absorbing outgoing infrared radiation.

HFC-23 (triofluoromethane): Greenhouse gas that has 11,700 times the global warming potential of carbon dioxide and is a by-product in the manufacturing process of HCFC-22, used in air conditioning, refrigeration, and as a feedstock.

Host Country: The country where an emission reduction project is physically located.

Internal Rate of Return: The annual return that would make the present value of future cash flows from an investment (including its residual market value) equal the current market price of the investment. In other words, the discount rate at which an investment has zero net present value.

Joint Implementation (JI): Mechanism provided by Article 6 of the Kyoto Protocol, whereby entities from Annex I Parties may participate in low carbon projects hosted in Annex I countries and obtain Emission Reduction Units in return.

Kyoto Mechanisms (KMs): the three flexibility mechanisms that may be used by Annex I Parties to the Kyoto Protocol to fulfill their commitments. Those are the Joint Implementation (JI, Art. 6), Clean Development Mechanism (CDM, Art. 12) and International Emissions Trading (Art. 17).

Kyoto Protocol: Adopted at the Third Conference of the Parties to the United Nations Convention on Climate Change held in Kyoto, Japan in December 1997, the Kyoto Protocol commits industrialized country signatories to collectively reduce their greenhouse gas emissions by at least 5.2% below 1990 levels on average over 2008–12 while developing countries can take no regret actions and participate voluntarily in emissions trading through the CDM. The Kyoto Protocol entered into force in February 2005.

Land Use, Land-Use Change and Forestry (LULUCF): A greenhouse gas inventory sector that covers emissions and removal of greenhouse gases resulting from direct human-induced land use, land-use change and forestry activities. Expanding forests reduce atmospheric carbon dioxide; deforestation releases additional carbon dioxide;

various agricultural activities may add to atmospheric levels of methane and nitrous oxide.

Monitoring Plan: A set of requirements for monitoring and verification of emission reductions achieved by a project.

Offsets: Offsets designate the emission reductions from project-based activities that can be used to meet compliance—or corporate citizenship—objectives vis-à-vis greenhouse gas mitigation.

Primary transaction: A transaction between the original owner (or issuer) of the carbon asset and a buyer.

Project-Based Emission Reductions: Emission reductions that occur from projects pursuant to JI or CDM (as opposed to "emissions trading" or transfer of assigned amount units under Article 17 of the Kyoto Protocol).

Project Design Document (PDD): A central document of project-based mechanisms, the PDD notably describes the project activity (including environmental impacts and stakeholder consultations), the baseline methodology and how the project is additional as well as the monitoring plan.

Project Idea Note (PIN): A note prepared by a project proponent presenting briefly the project activity (e.g., sector, location, financials, estimated amount of ERs etc.).

REDD plus: All activities that reduce emissions from deforestation and forest degradation, and contribute to conservation, sustainable management of forests, and enhancement of forest carbon stocks.

Reforestation: This process increases the capacity of the land to sequester carbon by replanting forest biomass in areas where forests have been previously harvested.

Registration: The formal acceptance by the CDM Executive Board of a validated project as a CDM project activity.

Sequestration: Sequestration refers to capture of carbon dioxide in a manner that prevents it from being released into the atmosphere for a specified period of time.

Small-scale Projects: Projects that are compatible with the definition of "Small-scale CDM Project Activities" set out in decision 17/CP.7 by the Conference of Parties to the UNFCCC.

United Nations Framework Convention on Climate Change (UNFCCC): The international legal framework adopted in June 1992 at the Rio Earth Summit to address climate change. It commits the Parties to the UNFCCC to stabilize human induced greenhouse gas emissions at levels that would prevent dangerous manmade interference with the climate system, following "common but differentiated responsibilities" based on "respective capabilities."

Validation: Validation is the process of independent evaluation of a project activity by a Designated Operational Entity (DOE) against the requirements of the CDM. The CDM requirements include the CDM modalities and procedures and subsequent decisions by the CMP and documents released by the CDM Executive Board.

Verified Emission Reductions (VERs): A unit of greenhouse gas emission reductions that has been verified by an independent auditor. Most often, VERs are traded on the voluntary market.

Verification: Verification is the review and ex post determination by an independent third party of the monitored reductions in emissions generated by a registered CDM project, a determined JI project (or a project approved under another standard) during the verification period

Voluntary market: The voluntary market caters for the needs of those entities that voluntarily decide to reduce their carbon footprint using offsets. The regulatory vacuum in some countries and the anticipation of imminent legislation on GHG emissions also motivates some pre-compliance activity.

Annex 7 – Bibliography

Baker & McKenzie, CDM Rulebook (www.cdmrulebook.org)

Baker & McKenzie, JI Rulebook (www.jirulebook.org)

CDM website: www.cdm.unfccc.int

Community Development Carbon Fund (CDCF), 2009, "Assessment of Community Benefits and Sustainable Development".

Council of the European Union, 21 October 2009, "EU position for the Copenhagen Climate Conference (7–18 December 2009)", Council conclusions, 14790/09.

Ellis, Jane and Sami Kamel, May 2007 "Overcoming Barriers To Clean Development Mechanism Projects", document was prepared by the OECD and IEA Secretariats, and UNEP Risø Centre, in response to the Annex I Expert Group on the United Nations Framework Convention on Climate Change (UNFCCC)

European Environment Agency, 2009, "Greenhouse gas emission trends and projections in Europe 2009", EEA Report No 9/2009

De Gouvello, Christophe, Felix Dayo and Massamba Thioye, 2008, "Low-carbon Energy Projects for Development in Sub-Saharan Africa-Unveiling the Potential, Addressing the Barriers", The World Bank.

Figueres, Christiana, with Margaree Consultants and Econergy International Corporation, 2005, "Programmatic CDM Project Activities: Eligibility, Methodological Requirement and Implementation", prepared for the World Bank Carbon Finance Unit (*http://figueresonline.com/publications/Programmatic_CDM*

Figueres, Christiana and Michael Philips, 2007, "Scaling-up demand-side energy efficiency improvements through programmatic CDM", Report produced for the Energy Sector Management Assistance Program (ESMAP) and the World Bank Carbon Finance Unit, ESMAP technical paper 120/07, www.carbonfinance.org

Haites, Erik, 2004, "Estimating the Market Potential for the Clean Development Mechanism: Review of Models and Lessons Learned", prepared for the World Bank Carbon Finance Business PCF*plus* Research program, the International Energy Agency, and the International Emissions Trading Association.

Intergovernmental Panel on Climate Change (IPCC), 2007, *Contribution of Working Group III to the Fourth Assessment Report of the IPCC*, www.ipcc.ch

International Energy Agency (IEA), 2008, *World Energy Outlook 2008*, Paris.

International Emissions Trading Association (IETA), 2009 "State of the CDM 2009 Reforming for the Present and Preparing for the Future"

Kossoy, Alexandre, 2010, Managing Expectations", *Trading Carbon*, 4(10), pp. 32–34

Kossoy, Alexandre and Philippe Ambrosi, 2010, "State and Trends of the Carbon Market", The World Bank.

MacWhinney, Ross, 2007, "Reducing HFC-23: A Crucial Component of the Battle against Global Warming", Evolution Markets, Executive Brief (http://new.evomarkets.com/pdf_documents/HFC-23%20Carbon%20Credits.pdf)

McKinsey & Company, 2009, "Pathways to a low carbon economy" – Version 2 of the Global Greenhouse Gas Abatement Cost Curve (http://www.mckinsey.com/clientservice/ccsi/pathways_low_carbon_economy.asp)

Michaelowa, Axel, 2008 "Additionality testing—good rules but sloppy practice?", presentation made at SB 28 side event "Reforms are needed in the CDM" Bonn, June 9, 2008<

Michaelwowal, Axel and Pallav Purohit, 2007, "Additionality determination of Indian CDM projects", Climate Strategies.

Moorcroft, Dave, Jasper Koch and Kija Kummer (October 2000), "The CDM: Exploring for Solutions through Learning By Doing", World Business Council on Sustainable Development (WBCSD).

Mueller, Benito, March 2009, "Additionality in the CDM," Oxford Institute for Energy Studies EV 44

OECD and IEA, 2000, *Emission Baselines – Estimating the Unknown*, Paris.

Rahman, Shaikh M., Ariel Dinar, and Donald F. Larson, 2010, "Will the Clean Development Mechanism Mobilize Anticipated levels of Mitigation?", Policy research working paper, The World Bank.

Schneider, Lambert, November 2007, "Is the CDM fulfilling its environmental and sustainable development objectives? An evaluation of the CDM and options for improvement", Öko-Institut, Report prepared for WWF

Seres, Stephen and Erik Haites (2008). *Analysis of Technology Transfer in CDM projects*. UNFCCC, Bonn.

Tuerk, Andreas, Dorian Frieden, Maria Sharmina, Helmut Schreiber, Diana Urge-Vorsatz, 2010, "Green Investment Schemes: First Experiences and Lessons Learned", Working Paper, Joanneum Research.

UNFCCC, 2009, *Annual report of the Executive Board of the Clean Development Mechanism to the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol*, FCCC/KP/CMP/2009/16 (http://unfccc.int/resource/docs/2009/cmp5/eng/16.pdf)

UNFCCC, 1997, *The Kyoto Protocol to the United Nations Convention on Climate Change* (www.unfccc.int)

UNEP, 2004, "CDM Information and Guidebook", Second Edition, The UNEP project CD4CDM

UNEP RISØ, CDM/JI Pipeline Analysis and Database, March 1st 2010

Wara, Michael, 2007, "Is the Global Carbon Market Working?", *Nature* (vol 445, p.595–596)

Wara Michael and David Victor, April 2008, "A Realistic Policy on International Carbon Offsets"; PESD Working Paper #74; Stanford University

World Bank Carbon Finance website: www.carbonfinance.org

World Bank Community Development Carbon Fund (CDCF), 2009, "Carbon Finance Guide for Local Governments", Coordinated by Haddy, J Sey and written by M. Grieg-Gran (IIED), M. Chambwera (IIED), B. Kantor (South*South*North); and Thais Corral (South*South*North)

World Bank Group, 2008, "Lighting Africa Year 1: Progress and Plans", Annual Report (September 1, 2008-August 31, 2008).

World Bank World Development Report 2010: Development and Climate Change, 2010.

World Bank Group, Energy Sector Management Assistance Program "Low Carbon Growth Country Strategies Program-Mitigating Climate Change through Development", 2009.

World Bank Group, 2010, "A City-Wide Approach to Carbon Finance" A Carbon Partnership Facility Innovation Series, The Carbon Finance Unit and the Urban Development Unit: www.carbonfinance.org

World Resources Institute, Climate Analysis Indicator Tool (CAIT), http://cait.wri.org

Annex 8 – Report's Methodology & Approach

This work has been a collaborative and consultative process. The Prototype Carbon Fund encouraged the World Bank to undertake this work in the winter of 2009. The work proposal was then discussed with the World Bank supported Host Country Committee, formed of representatives from developing countries CDM DNAs and from JI national focal points in May 2009. The concept was also discussed at the Prototype Carbon Fund's Annual Meeting in June 2009.

The Task Team produced an initial concept note in July 2009. It was reviewed by four peer reviewers Mr. Hans-Georg Adam, Ms. Jane Ebinger, Ms. Christiana Figueres and Mr. Johannes Heister.

Following the concept note, the Task Team developed an internal and external survey to capture the experience of the World Bank's internal and external stakeholders including World Bank staff, fund participants, and members of the World Bank supported Host Country Committee. The surveys were conducted in July and August 2009 over an Internet platform. Follow-up interviews were held in person or via-teleconference to clarify responses.

Throughout the summer and fall, the Task Team performed significant quantitative analysis on the World Bank carbon funds' portfolios. The quantitative results were followed up with internal discussions and cross checking between the Task Team and World Bank colleagues.

In October 2009, the Task Team prepared initial findings for several of the World Bank Carbon Fund participant meetings. These included the Carbon Fund for Europe, Community Carbon Development Fund, the Netherlands Clean Development Mechanism Facility and Danish Carbon Fund. At each presentation, participants' feedback and input were sought on both the overall assessment and findings. The task team also sought confirmation that the World Bank's experience and insights resonate with others involved in the CDM and JI market.

In early November 2009, the Task Team shared preliminary findings and sought additional feedback more broadly with the international climate change community on the margin of the Barcelona Climate Change Talks, and through an official web-cast side event (chaired by World Bank Sustainable Development Network Vice President Kathy Sierra).

Based on the body of feedback received to that point, the Task Team produced a brochure for release at COP15 in Copenhagen in December 2009. Entitled "10 Years of Experience in Carbon Finance: Insights from working with carbon markets for development & global greenhouse gas mitigation," the 20 page brochure covered many of the highlights contained within this report.

On the margins of the Copenhagen conference, the Task Team circled back to share and discuss the preliminary findings with members of the World Bank Host Country Committee at their meeting on December 12.

Post Copenhagen, the Task Team focused on accumulating the body of analysis, feedback, insights, and recommendations and sought to document a coherent report. A draft was later circulated to the peer reviewers and to a broader group of World Bank colleagues. The feedback received was very valuable in helping the Task Team finalize the report.

The final report is being released in Cologne at the May 26–28 Carbon Expo.

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