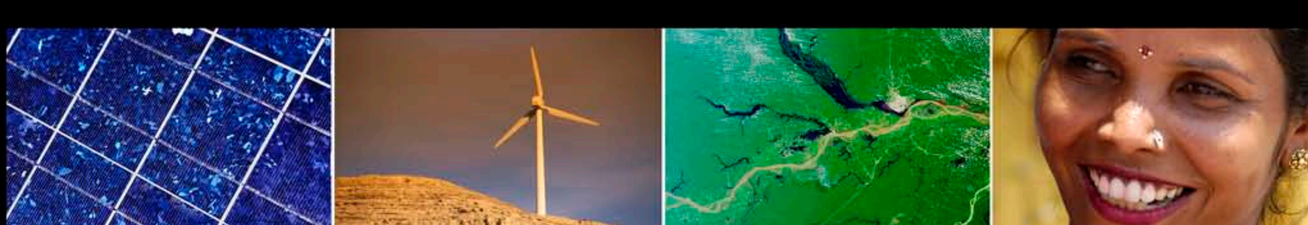
United Nations Development Programme

The Clean Development Mechanism
An Assesment of Progress



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UNDP is the United Nations global development network, an organization advocating for change and connecting countries to knowledge, experience and resources to help people build a better life. UNDP is on the ground in 166 countries, working with them on their own solutions to global and national development challenges. As countries develop local capacity, they draw on the people of UNDP and its wide range of partners.

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Foreword

It is becoming increasingly evident that climate change will emerge as a major issue facing the global community over the coming decades. For the poorer developing countries the potential impacts of climate could undermine progress towards achieving the Millennium Development Goals (MDGs) and exacerbate many poverty and environment issues they already face.

A key objective of UNDP over the next decade, and particularly that of the Environment and Energy Group within UNDP, is to increase the availability of sustainable energy services for the poor and to tackle the most pressing poverty and environment issues that have emerged. To address these matters there is a need to mobilize significant new sources of finance and technical assistance to augment existing Official Development Assistance (ODA) resources.

Under the Kyoto Protocol several new market-based instruments have emerged that are designed to deliver cost effective greenhouse gas emissions reductions. One of these new instruments, the Clean Development Mechanism (CDM), offers the opportunity to increase the flow of technology and finance to the environment and energy area and assist in promoting sustainable development. For this reason, UNDP is assisting developing countries to build the required capacity to effectively access the CDM and contribute to their national sustainable development objectives.

In the process of implementing CDM capacity development assistance over recent years, UNDP has been able to identify a range of common issues and constraints faced by many developing countries. This report discusses these issues and constraints and it is my belief that the report will provide a valuable source of information and guidance to all stakeholders with an interest in the CDM.

To compile a report of this nature requires a considerable amount of research, effort, and extensive stakeholder discussions. While it is not possible list all the people that have contributed to the production of this report there are several people that warrant particular mention. First I would like to acknowledge the work done by Brian Dawson who, as lead author, devoted considerable time and energy to making this report a reality. He was ably assisted by Khalid Husain (UNDP), Annika Lundgren and Bruce Usher (Ecosecurities) that assisted with background research and analysis. I would also like to acknowledge Einar Telnes (DNV), Leslie Ann Robertson, Emily Tyler (SouthSouthNorth), Michelle McLaren and Aaron Cosbey (IISD), and several other UNDP staff members (Matt Spannagle, Anne Fernqvist, and Marina Olshanskaya) for their valuable guidance, feedback and input to this report.

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Executive Summary

Climate change is one of the most critical issues of our time. Its predicted effects—including adverse ecosystem impacts, rising sea levels, increased frequency of storms, floods, and droughts, and adverse impacts on human health and agricultural production, among others—are expected to cause potentially major environmental and economic dislocations across the globe. Many of these impacts are likely to impinge most severely on the world's poorest countries, who are least able to cope and adapt.

Considerable debate surrounds the question of what actions should be taken—when, where, and by whom—to shift the world economy onto a development trajectory that is less intensive with respect to emissions of greenhouse gases (GHGs) responsible for global climate change. The Clean Development Mechanism (CDM) is one of three flexibility mechanisms introduced under the Kyoto Protocol, the 1997 agreement calling for legally binding limits on GHG emissions by Annex 1 Parties (i.e. industrialised countries) to the International Framework Convention on Climate Change—and the only such mechanism that involves developing countries. It allows Annex 1 countries to earn credits by investing in project activities that reduce GHG emissions and contribute to sustainable development in non-Annex 1 countries (i.e., developing countries and economies in transition). The CDM is thus designed to serve the dual purpose of providing Annex 1 countries with access to alternative emission reduction options, while also transferring flows of technology and capital that could help non-Annex 1 countries achieve more sustainable, less GHG-intensive pathways of development.

Progress in Establishing the CDM: Issues and Constraints

Some stakeholders have argued that the CDM has progressed at a much slower pace than anticipated and that it is not delivering the sustainable development benefits to non-Annex 1 countries that many expected it would. Key criticisms leveled at the CDM centre on:

- lack of clarity and understanding surrounding CDM rules and procedures;
- complex and time-consuming procedures for obtaining administrative approvals for CDM projects;
- high transaction costs that constitute a barrier to participation in the CDM;
- limited CDM project flows, producing smaller-than-expected volumes of emission reduction credits;
- high proportion of emission reductions generated by projects featuring end-of-pipe industrial gas capture, with few sustainable development benefits and limited technology transfer; and
- limited number and diversity of developing countries benefiting from the CDM.

While there is empirical evidence to support some of these criticisms, an alternate view holds that progress has been good, given that the CDM administrative infrastructure, rules, and procedures had to be created from scratch and that all stakeholders have faced a relatively steep learning curve.

The following report reviews experience with the CDM over its first few years of operation (i.e. 2002 through mid-2006) and assesses progress thus far in its growth and evolution. Specific topics examined include:

- issues and constraints at each stage of the CDM project cycle, especially those related to transaction costs;
- whether the CDM is delivering on the objectives laid out in Article 12 of the Kyoto Protocol, namely, the provision of alternative emission reduction opportunities for Annex 1 countries and contributing to sustainable development outcomes in non-Annex 1 countries;
- whether non-Annex 1 countries have the capacity to effectively access the CDM;
- potential for future expansion of the CDM project market;
- options for increasing the flow of benefits to a greater number and broader range of developing countries; and,
- potential trends in supply, demand, and prices in the international market for Kyoto-compliant emission reductions.

This review of progress with the CDM has been prepared by the United Nations Development Programme (UNDP), the lead United Nations agency for building national capacity for sustainable development, particularly with respect to providing technical assistance on climate change activities. UNDP believes that the CDM has the potential to make a significant contribution to sustainable economic development in poorer countries. Along with other emerging markets in environmental services, the CDM is likely to provide higher flows of technology and capital to developing countries than otherwise would have occurred. These flows are likely to target several project types that have traditionally been supported through official development assistance (ODA) and as such will augment current ODA funding levels. The CDM also could play an important role in increasing access to modern energy services for the poor and tackling issues related to poverty and the environment—both priority areas for UNDP.

To address the issues outlined above, this report draws on a variety of information sources. Chief among these has been a series of country studies commissioned by UNDP, which provide in-depth assessments of experience with the CDM in 11 selected countries, spanning five global regions (i.e. Africa, Arab States, Asia and the Pacific, Eastern Europe and the Commonwealth of Independent States, and Latin America and the Caribbean). The report also incorporates information and insights from a broad range of additional countries, based on UNDP experience with capacity building activities related to the CDM. Further information and input has been provided by various entities directly involved in CDM projects, including project developers as well as brokers and market analysts specialized in international emissions trading.

The report was initially intended to be an internal advisory and guidance document for UNDP regional bureaus and country offices. Since the information and analysis presented here is also likely to be of interest and use for a wider audience, UNDP has produced this public version of the document.

The CDM Project Cycle: Transaction Costs and Other Constraints

The very nature of the CDM as a baseline-and-credit type of emissions trading system makes it inherently complex to operate and administer. To ensure credibility of the system, intensive review and approval procedures are needed to verify that the emission reductions claimed are actually beyond the trajectory of emissions that would have occurred in the absence of the project (the 'business as usual' baseline).

However, many stakeholders consider that these project review and approval procedures are so costly and time consuming that they constitute a major barrier to projects entering the CDM market. The magnitude of transaction costs specific to the CDM (that is, in addition to general costs applicable to any project, such as project design, capital costs, obtaining permits, etc.) has attracted considerable attention and generated criticism from a range of stakeholders. In some cases, these costs have been large enough to prevent projects from proceeding.

To assess the impact of transaction costs on overall project viability, we identify and review issues and constraints encountered at each stage of the CDM project cycle. Considerable experience with the project cycle and its associated costs has been gained in recent years, with 395 projects officially registered or awaiting registration with the CDM Executive Board (the international body governing the CDM) as of 20 August 2006. We consider two main categories of transaction costs:

- *costs incurred through project registration*, including pre-feasibility studies, the preparation of a Project Design Document (PDD) containing a detailed description and specifications of the proposed CDM project, obtaining host-country approval, third-party validation to confirm that the proposed project meets CDM criteria, registering the project with the CDM Executive Board (EB), and payment of project registration fees; and,
- *post-registration costs*, including ongoing monitoring costs to accurately quantify emission reductions achieved by the project, third-party verification of project monitoring reports to certify that the emission reductions from project activities have in fact occurred, and payment of the EB Administration Fee, the Adaptation Levy (a fund set aside to assist the least developed countries with climate change adaptation projects), and any host-country fees or taxes.

Based on information obtained from project developers, carbon market brokers, and Designated Operational Entities (DOEs, organizations accredited by the EB to validate proposed CDM projects as well as to verify emission reductions of registered CDM projects), we estimate that *transaction costs through registration* average US$60,000 to US$200,000 per project, with some projects experiencing costs as high as US$300,000. Pre-registration transaction costs are generally 20 to 40 percent lower for projects classified as small-scale, a special category established by the EB in which streamlined procedures have been instituted to lower transaction costs for certain types of projects (such as renewable energy-based power projects with a maximum output capacity of up to 15 MW, energy efficiency projects that reduce consumption by the equivalent of up to 15 GWh per year, and several others). The main source of transaction cost savings for small-scale projects appears to be the simplified provisions for approval of methodologies to establish baseline emissions and monitor emission reductions, with these approval costs reduced by US$30,000 to US$60,000 relative to larger-scale projects requiring the development of a new baseline methodology.

Nevertheless, lack of access to upfront financing to cover pre-registration transaction costs remains a barrier for many prospective CDM projects. Information from carbon market brokers indicates that project developers need to be able to recoup these transaction costs within 1-2 years, or they will not pursue the project.

Post-registration transaction costs are two to four times higher than costs through registration and vary with the price of certified emissions reductions (CERs), the formal commodity purchased by Annex 1 entities based on CDM project activities. Since revenue streams from the sale of CERs are available to meet post-registration costs, these costs are generally less risky for project investors than those incurred earlier in the project cycle.

It is clear that *total transaction costs* vary with CDM project size and generally become less important as the size of the project increases. Projects generating fewer than 5,000 CERs per year face significant transaction costs that often make them financially unattractive and most are unlikely to be implemented until CER prices exceed US$15-20. However, for projects generating more than 15,000 CERs per year, total transaction costs do not appear to be particularly onerous relative to prospective revenues from CER sales.

Assessment of the CDM Project Mix

Based on analysis of the actual and expected flow of projects, we can characterize the CDM project mix with respect to project size, type, and location, as well as the distribution of CERs that these projects are likely to deliver in the Kyoto Protocol's first commitment period (2008–2012).

With 395 confirmed projects (i.e. registered projects *plus* projects in the pipeline that have been validated and are currently in the process of being registered) and 750 more projects in the pipeline, the CDM could, in principle, generate as many as 1.3 billion CERs by the end of 2012[1]. Actual output is likely to be somewhat lower, once project delays and under-delivery are accounted for. More than 80 percent of confirmed CDM projects are using technologies that could potentially contribute to sustainable development in host countries, including power generation from renewable sources, waste management and biogas, and energy efficiency technologies. However, these projects will account for barely one-third (34 percent) of CER flows from CDM projects through 2012. In contrast, just 21 projects targeting non-CO_2 industrial gas emissions will account for almost half of CERs through 2012.

Some project types, particularly transport and afforestation/reforestation, have not attracted much CDM investor attention to date, due to technical barriers, methodological risks, and long timeframes for CER delivery, among other factors. Hence, these project types currently do not figure significantly in the project mix.

In addition, the geographic distribution of CDM projects and CER flows is highly uneven. Asia and Latin America together account for 96 percent of projects and are expected to generate 95 percent of CER flow through 2012. Meanwhile, sub-Saharan Africa accounts for only 2 percent of

[1] Projects at the Project Design Document (PDD) stage are not included in these totals. If these additional projects are successfully submitted for registration by the end of 2007, they may contribute a further 100-200 million CERs by the end of 2012. See Chapter 6 for further details.

confirmed projects and 3 percent of CERs through 2012. The distribution of projects by country is similarly uneven, with just two countries, India and Brazil, accounting for over half of all CDM projects. Although more than 40 least developed countries (LDCs) have ratified the Kyoto Protocol, only four (Bangladesh, Bhutan, Cambodia, and Nepal) have confirmed CDM projects. This dominance of a handful of countries (particularly India, Brazil, China, and Mexico) is set to increase further in the medium term, given existing trends in the CDM project pipeline.

For CER flows, the geographic distribution is even more highly skewed. Just five countries—China, India, Brazil, South Korea, and Mexico—are expected to generate 82 percent of CERs (and a similar proportion of revenue flows) from confirmed projects through 2012. Just 18 percent of CERs will be spread among 30 other countries. Based on trends in the project pipeline, this pattern is likely to persist, with the same five countries accounting for upwards of 80 percent of the estimated CER flow in the medium term.

CDM Market Outlook through 2012

Carbon markets have matured rapidly in recent years, bringing much greater awareness and understanding of market functioning among both buyers and sellers. However, considerable uncertainly remains about many aspects of the market through 2012.

Based on analyses of recent market developments and possible future trends, we assess market potential for CERs to 2012 and beyond, including supply-demand balance and projected price trends. Annex 1 countries falling short of their emission reduction targets are likely to require 4-5 billion Kyoto-compliant units to meet their commitments through 2012. CDM projects (confirmed projects plus those in the pipeline) will probably be capable of supplying 180-210 million CERs per year, on average, across the first Kyoto commitment period, or approximately 1 billion units in aggregate by 2012. Thus, CER flows could meet around 15 to 25 percent of total market demand for Kyoto-compliant units. CDM projects are likely to have a secure medium-term market, with project developers able to sell as many CERs as they can generate through 2012. Whether there will be a significant CER market beyond 2012 remains uncertain.

Estimates of future market prices for CERs are highly speculative, due to uncertainty concerning the supply-demand balance in Kyoto-compliant carbon markets over the first commitment period. These markets are likely to be characterized by significant price volatility through 2012. Moreover, most CER prices will continue to be negotiated on a project-specific basis, depending on project type, the level of risk of late or under delivery of CERs, and the volume of CERs generated by the project. With secondary markets only beginning to emerge, it remains difficult to predict a single, reliable market indicator price for CERs.

A major determinant of CER prices will be the market power of countries, mainly Russia and Ukraine, with surplus AAUs (Assigned Amount Units, the GHG emission allowances assigned to Annex 1 countries, conferring the right to emit one tonne of CO_2 equivalent) that can be traded in international carbon markets. These countries have the ability to flood the market and drive CER prices to very low levels, depending on the timing and magnitude of their trades. Accordingly, CDM projects are likely to be price takers during the first commitment period, as market prices are likely to be determined largely by AAU-selling countries.

Host-Country Experiences

While much attention has focused on the establishment of the international administrative framework for the CDM, relatively little emphasis has been given to host-country capabilities and issues. Yet, building host-country capacity to effectively access the CDM is essential to realizing the full potential benefits for the developing world.

Countries have adopted various structures for Designated National Authorities (DNAs), the national bodies that grant host-county approvals for CDM projects (as required under Kyoto rules). The most common has been a multi-tiered structure involving several different ministries and support groups. This model appears to offer the best means of linking the CDM with national development priorities and facilitating broader stakeholder engagement.

The experiences of UNDP and other agencies indicate that it takes 2-3 years or more to build efficient host-country procedures for CDM project review and approval. Although establishing broad-based ministerial and stakeholder representation in the host-country CDM approval structure takes time and effort, it is critical to ensuring that CDM activities are integrated into wider sustainable development initiatives. In countries such as Brazil, Morocco, and South Africa, these arrangements now appear to be working quite effectively and have assisted in incorporating social considerations and community benefits into CDM decision making.

External technical assistance has played an important role in building public-sector capacity in some host countries. However, most of this assistance has been targeted at fewer than 20 countries, and much more needs to be done to extend technical assistance to a wider range of countries, particularly in sub-Saharan Africa and the LDCs. Financial sustainability of national DNA structures also is a key concern in many countries. The introduction of cost-recovery mechanisms may be needed in order for DNAs to become self-supporting.

Although private-sector decisions on technology options and energy sources will bear importantly on the development pathways and emissions trajectories of developing countries for decades to come, in many countries the role of private sector in the CDM has been largely ignored. Evidence suggests that the most effective means of increasing private-sector interest in and understanding of the CDM has been the availability of ‘showcase’ projects in host countries, combined with hands-on project training. In nearly all countries surveyed by UNDP, access to finance for project design and development remains a major constraint faced by the private sector.

Conclusions

The following conclusions are based largely on the experience of UNDP, but also incorporate the observations of other commentators and analysts. Undoubtedly, some stakeholders will disagree with some observations and conclusions, but the intent of this report is to present as balanced and objective an analysis as possible, based on the information available.

The CDM is likely to provide a significant volume of cost-effective CERs for Annex 1 purchasers during the 2008–12 commitment period and beyond. If the estimates prepared for this report prove accurate, the CDM may generate approximately 1,000 million CERs over this period. This is equivalent to about 15 to 25 percent of the expected market demand for

Kyoto-compliant emission reduction credits, and the CDM could thus become an important contributor to meeting the projected shortfall in GHG emission reductions in some Annex 1 countries. Since the average cost of CERs generated by CDM projects has been in the US$5–10 range, it appears that the CDM will provide a cost-effective abatement option for Annex 1 countries. Furthermore, the 1,000 million CER estimate is a conservative one: it makes allowances for potential shortfalls in pipeline performance arising from financing problems, project implementation delays and under-delivery of emissions reductions. If these problems can be effectively addressed by project developers, the CDM pipeline could, in principle, generate as many as 1.3 billion CERs by 2012.

Given trends in the existing project pipeline, the benefits of the CDM are likely to be unevenly spread among countries through 2012, and it remains to be seen whether the CDM can deliver a broad-based sustainable development dividend. In the medium term, a small number of countries are expected to account for most CDM projects, and the bulk of the revenues produced through sales of CERs will flow to just five countries. If the CDM is to have a discernible impact on sustainable development outcomes, there must be a significant increase in the number of projects, a broader geographic distribution of carbon revenue flows (especially to the least developed countries), and a fundamental, lasting market transformation. This will not happen overnight, nor will it happen by 2012. Nevertheless, the CDM appears to have significant long-term potential as an effective market instrument for promoting sustainable development.

The CDM project mix appears to be evolving in the right direction, but it will be some time before the complete range of project types is fully represented. While most of the projects registered with the EB thus far have used technologies that may promote sustainable development as well as providing emission reductions, the range of technologies used has not been very large. Moreover, several key project types—such as transport, non-industrial scale energy efficiency, and afforestation/reforestation—have not figured significantly in the project mix. Options for expanding the range of sustainable technologies represented in the CDM project mix include longer contracting periods, increasing the number of pre-approved baseline and monitoring methodologies for emission reduction projects, and proactive investment in methodology development.

Achieving a project mix that encompasses the full range of sustainable technologies will require fundamental changes in CDM market drivers. Some stakeholders have expressed concern that a majority of emission reductions and associated revenue flows will come from a small number of large industrial gas projects delivering limited development benefits. However, the early development of these highly profitable projects reflects market forces at work, and the large number of CERs they generate will play an important role in increasing CDM market liquidity in the short term, as well as helping to build a stable, mature market in the longer term. One option for addressing stakeholder concerns and ensuring that long-term CDM outcomes are not dominated by projects with limited sustainable development impacts would be to limit post-2012 crediting of emission reductions from such projects.

Uncertainty concerning the post-2012 climate framework and its implications for the continued existence of a broad-based international carbon market is the single most important factor influencing the outlook for CDM growth and evolution over the next 5 years. Even though the EU is committed to continuing its Emission Trading System beyond 2012, the broader international uncertainty over carbon trading affects both the *volume* and the *types* of projects entering the CDM project pipeline. This lack of medium-term stability and predictability makes the CDM a high-risk market for many investors, and serves to shorten the investment horizon for CDM projects. Unless greater clarity emerges by 2008, this market uncertainty will most likely lead to reduced project flow and delivery of fewer CERs during the first commitment period and beyond. Conversely, if a clearer picture develops, the flow of projects and CERs could ramp up quickly, and delivery of CERs could exceed 200 million per year by 2012.

With a significant scaling up of project activity, the CDM could have a meaningful impact on the trajectory of GHG emissions over the next few decades in non-Annex 1 countries. To a certain extent, the CDM is a 'zero-sum game' with respect to GHG emissions, shifting abatement from one jurisdiction to another rather than bringing about reductions in the absolute level of global emissions per se. However, the CDM could deliver an estimated 180–210 million CERs per year during the 2008–2012 commitment period, which is equivalent to lowering the trajectory of carbon emissions in non-Annex 1 countries by approximately 0.5 percent relative to business as usual. This is not a dramatic shift, but it is a start. To make a dent in global GHG emissions, the CDM must succeed in transferring technology, giving impetus to technology innovation, and delivering market transformation in both the developed and developing world.

Transaction costs do not appear to be a major deterrent for most CDM projects. Empirical evidence does not support the contention that transaction costs are a barrier to CDM project development and implementation. Indeed, many CDM transaction costs are likely to fall over time as market participants gain experience and as more information on the experiences and lessons learnt by 'early movers' is made available to newer market entrants. A notable exception is small-scale projects, which face a range of disadvantages that may not be easy to remedy. Evidence suggests that small-scale projects tend to focus on technologies with more discernible development benefits, and thus may warrant special efforts designed to 'level the playing field'. Although the EB has taken steps to lower upfront transaction costs for small-scale projects, additional action could lower transaction costs even further, particularly for village and rural-based projects that deliver important environmental, economic, and social benefits and help countries achieve the Millennium Development Goals.

The international administrative infrastructure set up to support the CDM is, for most of the steps in the project cycle, operating efficiently and effectively, although areas for further improvement remain. By its very nature as a baseline-and-credit type of emissions trading system, the CDM is bound to be administratively complex, requiring much time and effort to establish the necessary administrative infrastructure. Given limited available resources and the steep learning curve faced by all actors, progress has actually been quite good. Ensuring the credibility of the system is fundamental to its success, and thus taking the time, resources, and effort to get it right is of paramount importance. Although fine tuning will no doubt be needed over time, the existing infrastructure appears quite sound. To help ensure that the system continues to evolve in the right direction, further interaction and dialogue between the EB and other CDM participants (such as project proponents, carbon brokers, the business community, etc.) could be useful. In addition, the EB will likely have access to increased financial flows over the next few years (through donor funding commitments as well as project fees), which may provide options for greater investment in improving the efficiency of the system.

Although some countries have established the necessary capabilities, the capacity of most non-Annex 1 countries to access the CDM remains limited. In general, establishing adequate host-country capacity takes 3–5 years of experience in developing projects and seeing them through each stage of the CDM project cycle. This means that a truly broad-based level of participation will not be achieved before 2012, even if the issues surrounding post-2012 crediting of emission reductions are quickly resolved. If the CDM is to have ongoing political support in the developing world, and if it is to deliver a broad-based development dividend, the capacity constraints of non-Annex 1 countries must be addressed as a priority issue. As experience with the CDM grows, and as more web-based decision tools and knowledge products are made available to new market entrants, the steepness of the learning curve should lessen. However, much more needs to be done to build broad-based capacity in non-Annex 1 countries to effectively access the CDM and make it work for delivering sustainable development outcomes.

To expand the base of countries capable of successfully accessing the CDM, donors will need to provide considerable amounts of additional assistance to build host-country capacity, especially in the least developed countries. Market forces will drive CDM project development and generation of CERs, but left to its own devices, the market is unlikely to invest in developing institutional and technical capacity in host countries. Thus, the role of bilateral and multilateral donors is large and important, particularly in the least developed countries and other low-income countries that have not yet been able to effectively access the CDM. Donor assistance provided to date has, at times, been limited in scope, ad hoc in nature, focused on the public sector, and directed toward a limited number of countries. If the CDM is to gain traction in the poorest and least developed countries, donors will need to implement broad-based technical assistance strategies and programs over the next 5-10 years, targeting private- as well as public-sector capacity. To this end, UNDP intends to focus increased attention on building broader, near-term engagement by a greater number of countries.

To recap, the CDM does appear likely to both deliver a reasonable quantity of cost-effective emission reductions and increase the flow of technologies and finance to some non-Annex 1 countries during the first commitment period. It is also evident that the CDM could prove to be a useful market instrument for promoting sustainable development. However, for the CDM to realize its full potential, several key constraints will need to be overcome, particularly increasing the breadth of developing-country engagement and the ability of these countries to effectively access the carbon market.

1 INTRODUCTION

Climate change has emerged as one of the most important issues facing the global community in the 21st Century. The primary cause of climate change is increased concentrations of greenhouse gas (GHG) emissions due to human activities, such as combustion of fossil fuels, deforestation, and increased methane emissions. Expected impacts include increasing average surface temperatures, rising sea levels, increased frequency and intensity of droughts, floods and storms, species extinctions, adverse health and disease impacts, and impacts on agricultural yields. The effects of climate change are expected to bear most heavily on the poorest developing countries, due to their dependence on the natural environment for their livelihoods as well as their lack of resources required for adaptation. Climate change could also significantly undermine efforts to achieve and maintain the Millennium Development Goals (MDGs).

In response to these emerging impacts, the international community negotiated the United Nations Framework Convention on Climate Change (UNFCCC or the Convention), which was signed at the Rio Earth Summit in June 1992 and came into force in March 1994. To reinforce the goals of the Convention, the Parties to the Convention adopted the Kyoto Protocol in 1997, calling for legally binding limits on the emission of GHGs by Annex 1 Parties (i.e. industrialised countries).

The Kyoto Protocol also introduced three market-based ‘flexibility mechanisms’ to assist Annex 1 countries in meeting their emission reduction commitments in a cost-effective manner. The Clean Development Mechanism (CDM) is one of these three market-based instruments and the primary focus of this report.[2]

1.1 The CDM and its Potential Contribution to Sustainable Development

To adequately tackle the most pressing poverty and environment issues, an estimated US$60-90 billion per year will be needed over the next 15 years, according to the Poverty and Environment Partnership.[3] Historically, sustainable energy and environment-related activities have accounted for only a few percent of total expenditures for official development assistance (ODA) (averaging US$3-5 billion per year over recent years). It is clear that additional innovative mechanisms for financing development are required.

As the only flexibility mechanism under the Kyoto Protocol that involves developing countries, the CDM offers a potentially important means of supplementing ODA flows to developing countries. The Kyoto Protocol has spurred a rapidly growing market in Kyoto-compliant credits for reductions in emissions of GHGs. Worth only a few million dollars per year in the late 1990s, the market has since grown to over US$500 million per year and is expected to be worth US$10-15 billion annually by 2012. By participating in the CDM, developing countries could gain access to significant additional flows of technology and capital to help them achieve more sustainable, less

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[2] The other two flexibility mechanisms under the Kyoto Protocol are International Emissions Trading (IET) and Joint Implementation (JI), which are described briefly in Chapter 2.

[3] The Poverty and Environment Partnership (PEP) is a network of bilateral aid agencies, multilateral development banks, United Nations agencies, and international nongovernmental organizations (NGOs) that aims to address key poverty-environment issues within the framework of international efforts to achieve the Millennium Development Goals (MDGs).

greenhouse-intensive pathways of development.

Defined under Article 12 of the Kyoto Protocol, the CDM allows Annex 1 countries to earn credits by investing in project activities that reduce GHG emissions and contribute to sustainable development in non-Annex 1 countries (i.e. developing countries and economies in transition). The CDM is thus designed to generate important benefits in terms of foreign capital flows, technology transfer, and sustainable development as well as cost-effective emission reduction credits.

However, some stakeholders consider that establishment of the CDM has progressed at a much slower pace than initially anticipated and that it is not delivering the development benefits to non-Annex 1 countries that many expected it would. This issue has been the subject of considerable debate and has led some stakeholders to call for early reform of the CDM administrative rules and procedures. An alternative view is that progress has been really quite good, given that the mechanism is only a few years old and had to be developed from scratch with very limited resources.

Clearly, some of the initial expectations about the CDM, and what it could deliver, were optimistic, or even unrealistic. It is also evident that CDM participants face a range of constraints and market barriers that will take many years to overcome. Some of the key criticisms directed at the CDM over the past few years are:

- CDM project flow has been more limited than expected and the CDM will not provide large volumes of Kyoto-compliant emission reduction credits in the 2008-2012 period (i.e. the first commitment period under the Kyoto Protocol);
- Most emission reductions that will be generated from CDM projects will come from end-of-pipe industrial gas capture and destruction projects, with few sustainable development benefits and limited technology transfer;
- Lack of clarity and understanding surrounding the CDM rules and procedures, including the use of ODA funds to support CDM activities, has constrained the rate of progress in CDM implementation;
- Uncertainty concerning the size, or even existence, of the post-2012 market for CDM emission reduction credits has shortened contract periods for purchasing these credits (in general, purchase contracts extend only through 2012) and limited the type of projects entering the CDM pipeline;
- The number and diversity of developing-country participants is quite limited, with most of the benefits flowing to only a handful of countries;
- Project approval procedures are administratively complex and time consuming, particularly for gaining approval of methodologies for establishing baseline emissions (i.e. the benchmark against which project-related emission reductions are measured);
- High transaction costs associated with the CDM project cycle are a barrier to project development;
- The CDM's additionality rules have resulted in support for projects that are not financially sustainable in the absence of a carbon market; and that

- Host-country capacity constraints and slow approval times are a constraint on project flow and a major concern for private-sector project participants in many countries.
- Empirical evidence over the past 3 years appears to support some of these claims, but for others the evidence is less clear-cut. One of the aims of this report is to evaluate these issues and determine whether they are valid criticisms.

1.2 Objectives of the Report

The main purpose of this report is to review experience with the establishment of the CDM and assess likely progress in the evolution of the CDM project market over the period to 2012. Specific objectives are to:

- Provide general guidance and background information on the CDM project cycle, administrative procedures, and participating entities;
- Review the experience to date with issues and barriers at each stage of the project cycle, including transaction costs;
- Assess possible future supply, demand, and price trends in the Kyoto-compliant carbon market;
- Assess whether the CDM is delivering on the two main objectives set out in Article 12 of the Kyoto Protocol—namely, the delivery of emission reductions to Annex 1 countries and contributing to sustainable development in non-Annex 1 countries (mostly developing counties);
- Identify the potential for the future expansion of the CDM project market and options for increasing the flow of benefits to a greater number of developing countries;
- Provide an overview of the types of CDM administrative structures established to date in host countries and how effectively these have worked;
- Identify key capacity constraints in CDM host countries, in both the public and private sectors;
- Assess whether non-Annex 1 countries have the capacities to effectively access the CDM; and
- Identify future capacity development requirements and the role of UNDP and other agencies.

This report has been prepared by the United Nations Development Programme (UNDP), the lead UN agency for sustainable development capacity building, particularly in relation to climate change technical assistance activities. UNDP considers climate change a global issue and as such that it is essential to effectively engage the developing world in both mitigation and adaptation responses. In recent years, UNDP has played a key role in assisting non-Annex 1 countries to implement the UNFCCC and the Kyoto Protocol, including extensive experience in building host-country capacity to access the CDM. (For further information on UNDP's experience with providing technical assistance on the CDM in developing countries, see Box 1.1.)

To address the issues outlined above, the report draws on information compiled from a range of sources. Since early 2004, UNDP has commissioned its own internal CDM assessment studies in 11 selected countries, across all five UNDP regions.[4] The country assessments were commissioned to help UNDP efficiently target its future CDM capacity development activities and to take stock of the experiences in selected countries. The reports assessed progress with implementing CDM projects and establishing procedures in selected countries, and identified issues and constraints faced by both the public and private sectors. This report draws on the information contained in these reports, excerpts of which are presented in case studies and examples throughout the document.

The report also draws heavily on UNDP's experience with a range of capacity building activities in various CDM host countries, particularly with respect to establishing DNA capacity and public-private partnerships. Additional information and input on different aspects of the CDM project cycle and project development experience was provided by Ecosecurities (a brokerage house specialising in emissions trading, which undertook some primary research for this report), other carbon-market brokers and analysts, host-country project developers, and other entities directly involved in CDM projects.

The report was originally intended to be an internal CDM advisory and guidance document for UNDP Regional Bureaus and Country Offices to guide the development of CDM capacity development activities across the different regions. However, the information, experiences, and lessons learned by UNDP are also considered to be of potential interest to and use by a wider audience. As a result, UNDP has decided to produce a public version of this document.

1.3 Contents of the Report

Following this introductory chapter, Chapters 2 and 3 focus mainly on the international administrative infrastructure established to support the CDM and the processes and procedures associated with the CDM project cycle.

Chapter 4 assesses the experience to date with transaction costs incurred at different stages of the project cycle and some of the issues and constraints encountered by project proponents. It also undertakes some preliminary analysis of the impact of transaction costs on project viability and of sensitivity to different carbon prices.

This is followed by Chapter 5, which reviews the mix of projects in the CDM project pipeline and the trends in geographic distribution of projects and expected flows in emission reduction credits to 2012.

Chapter 6 provides an overview of the potential supply-and-demand balance in the Kyoto compliance market to 2012 in an attempt to determine the likely market for CDM emission reduction credits.

[4] UNDP's five global regions are: Africa, the Arab States, Asia and the Pacific, Eastern Europe and the Commonwealth of Independent States (CIS), and Latin America and the Caribbean.

Chapter 7 documents some of the experiences and lessons learnt by UNDP over the past 5 years and attempts to identify common trends and best practices in the host countries, both in the private and public sectors. The chapter outlines the administrative structures adopted by host countries, assesses the approaches to screening projects for sustainable development benefits, and reviews different project processing procedures. The chapter also briefly outlines some of the private-sector capacity constraints that have emerged in developing countries.

The final chapter presents the main conclusions and observations, with a view to providing a broad assessment of whether the CDM is operating effectively and whether it is delivering on the objectives of Article 12 in the Kyoto Protocol.

Box 1.1 UNDP and the CDM

UNDP is on the ground in over 160 countries, delivering broad-based capacity development. Since the mid-1990s, UNDP has implemented over 1,000 large-scale and 6,000 small-scale energy- and climate-related projects (mainly as one of the implementing agencies for the Global Environment Facility (GEF)).

To date, UNDP has implemented CDM technical assistance in a range of developing countries. Assistance has been provided in such areas as engagement of public and private sectors through pilot CDM projects, institutional capacity development, and general awareness-raising activities related to the CDM and opportunities for mitigating the impacts of climate change. UNDP has hosted project development forums, held consultations and training exercises, and conducted hands-on capacity building with project developers and government stakeholders.

UNDP’s capacity development approach has followed a ‘learning by doing’ and ‘learning by sharing’ strategy, involving actual CDM projects as examples to help developing-country participants better understand the complexities of the CDM project cycle. The table below lists the types of CDM-related activities undertaken by UNDP in different countries. In addition, UNDP is engaged in ongoing discussions with other governments to assist them in identifying their future CDM capacity development needs.

UNDP has also worked in partnership with other organizations such as the United Nations Industrial Development Organization (UNIDO), the United Nations Conference on Trade and Development (UNCTAD), and the World Business Council for Sustainable Development (WBCSD) as well as private-sector organizations such as Ecosecurities and Natsource. These partnerships have added a broader dimension to capacity development initiatives, particularly in relation to developing public-private partnerships in various countries.

The creation of a functional interface between the government and private sectors is crucial for for the CDM to operate effectively in host countries. For example, in Brazil and South Africa these public-private initiatives have led to the development of CDM projects and improved understanding of the CDM for both public and private-sector entities. UNDP also has considerable experience and expertise in engaging the private sector in a wide range of development activities above and beyond the CDM.

Matrix of UNDP Activities Related to the CDM

Country	Internal UNDP Awareness Raising	'Learning by Doing'	Feasibility	Institutional Capacity Development	Lessons Learned and Assessments
Asia-Pacific	✔	✔		✔	✔
– Bangladesh	✔	✔	✔	✔	✔
– China			✔	✔	✔
– India	✔		✔	✔	
– Philippines		✔	✔	✔	✔
– Malaysia	✔				✔
– Pakistan	✔				
– Indonesia	✔			✔	
Latin America and the Caribbean	✔				
– Peru		✔	✔		✔
– Trinidad & Tobago		✔	✔		✔
– Nicaragua		✔	✔		
– Brazil	✔	✔	✔	✔	✔
– Guatemala	✔	✔	✔		
Middle East and North Africa	✔				
– Morocco			✔	✔	✔
– Tunisia	✔		✔	✔	
– Yemen	✔			✔	
Eastern and Southern Africa	✔				
– South Africa		✔		✔	✔
Eastern and Central Europe	✔		✔	✔	✔
– Georgia			✔		✔
– FYR of Macedonia	✔		✔	✔	

Central to UNDP's CDM activities has been the development of knowledge products based on analyzing and documenting results, lessons learned, and best practices for CDM project activities. UNDP also provides clear and practical policy guidance on the CDM to developing countries. Knowledge products have included CDM assessment reports, packaged training materials, case studies and guidance documents. This document forms part of UNDP's ongoing development of CDM-related knowledge products.

2 THE CLEAN DEVELOPMENT MECHANISM: GOVERNANCE STRUCTURE AND PARTICIPANTS

This chapter presents an overview of the CDM, outlines its governance structure, and describes the various types of participants in the CDM. Its purpose is to provide readers with an understanding of the role played by these different entities as well as to explain some of the key terminology used throughout the report. To help orient the reader, the chapter begins with background information on climate change, the Framework Convention, and the Kyoto Protocol.

2.1 Climate Change and the UNFCCC

In 1979, countries from around the globe met at the World Climate Conference. Shortly after, the UN Environment Programme (UNEP) and the World Meteorological Organization (WMO) convened a series of international scientific workshops that helped to forge a tentative scientific consensus on the subject. This work led to the establishment of the Intergovernmental Panel on Climate Change (IPCC). Initially led by the industrialised nations, the IPCC now has global participation.

According to the IPCC, the average temperature of the earth's surface has risen by 0.6° C since the late 1800s, and temperatures are expected to continue rising by another 1.4 to 5.8° C by the year 2100. This rate of increase represents the most rapid change in the last 10,000 years. Based on recent computer modeling results, the impact of accelerated climatic change is likely to become increasingly evident over the coming decades.

The principal reason for rising temperatures is industrialisation, and in particular the burning of fossil fuels, the cutting of forests, and increased methane and nitrous oxide emissions from certain farming and waste management activities. These and other activities have increased the amount of greenhouse gas (GHG) emissions in the atmosphere, specifically carbon dioxide, methane, and nitrous oxide. Although such gases occur naturally and are critical for life on earth, increased concentrations of these gases is contributing to the rise in global temperatures and altering the climate. According to the IPCC, the 1990s appear to have been the warmest decade of the last millennium, and 1998 and 2005 are tied as the warmest years on record.

According to the IPCC, the sea level rose on average by 10 to 20 cm during the 20th Century, and an additional increase of 9 to 88 cm is expected by the year 2100. If the higher end of that scale is reached, the sea could submerge heavily populated coastlines of such countries as Bangladesh, cause the possible disappearance of large areas of some nations (such as the island state of the Maldives), adversely affect freshwater supplies for millions of people, and precipitate human migrations due to changed environmental conditions. On the other hand, desertification of continental interiors, such as in central Asia, the African Sahel, and the Great Plains of the United States, is also expected. These changes could cause significant disruptions in land use and food supply. To further aggravate the situation, the geographic range of diseases such as malaria may expand, affecting an even greater number of people. Agricultural yields are expected to drop in most tropical, subtropical, and temperate regions if the temperature increase is more than a few degrees. The current warming trend is expected to result in accelerated extinctions, particularly since numerous plant and animal species are already weakened by pollution and loss of habitat.

In response to rising temperatures and their predicted impacts, the international community created the United Nations Framework Convention on Climate Change (UNFCCC or the Convention), which established an international framework to stabilise 'greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system'. Since 1992, almost every nation has signed the agreement (189 instruments of ratification have so far been received). Despite the Convention's entry into force, most nations felt that the purely voluntary framework would not achieve meaningful reductions in GHG emissions. This led to discussions and negotiations that culminated in the Kyoto Protocol.

2.2 The Kyoto Protocol

The Kyoto Protocol was signed in 1997, at the 3rd Conference of the Parties (COP 3) to the Framework Convention on Climate Change in Kyoto, Japan. This treaty significantly bolstered the Convention by committing developed countries, known as Annex 1 Parties, to legally binding limits on GHG emissions. The Kyoto Protocol aims to reduce the GHG emissions of Annex 1 countries by at least 5 percent compared to 1990 levels over the period 2008-2012 (see Annex 1 for a listing of national targets). Six GHGs are covered under the Protocol (see listing in Table 2.1).

Table 2.1: Greenhouse Gases Covered Under the Kyoto Protocol

Greenhouse Gas (GHG)		Global Warming Potential (GWP)*[5]
Carbon dioxide	CO_2	1
Methane	CH_4	21
Nitrous oxide	N_2O	310
Perfluorocarbons	C_xF_x	6500-9200
Hydrofluorocarbons	HFCs	140 -11,700
Sulphur hexafluoride	SF_6	23,900

Based on its individual target, each Annex 1 Party is assigned a specified number of carbon dioxide equivalent (CO_2e) emission units, termed Assigned Amount Units (AAU), that it will be able to emit during the first Kyoto commitment period (i.e. 2008-2012). (CO_2e, the quantity of a given GHG multiplied by its global warming potential (see Table 2.1), is the standard unit for comparing the degree of warming which that can be caused by emissions of different GHGs.) One AAU equals one tonne of CO_2e.

To meet their commitments, Kyoto Parties can choose from a suite of options. Parties are generally expected to achieve a significant proportion of their emission reductions through a range

[5] Global warming potential (GWP) is a function of the atmospheric lifetime of a molecule and its 'radiative forcing', or ability to retain heat in the atmosphere. GWP is a relative scale, which compares a given gas to that of the same mass of a reference gas, which is taken to be carbon dioxide, with a GWP of one.

of domestic policies and measures. They may also acquire emission reduction credits by taking advantage of the three ‘flexibility mechanisms’ defined under the Protocol. These mechanisms are: (i) International Emissions Trading (IET); (ii) Joint Implementation (JI); and (iii) the Clean Development Mechanism (CDM).

IET is the trading of AAUs between two Annex 1 countries, while both JI and CDM are project-based mechanisms, i.e. project activities that reduce GHG emissions. These flexible mechanisms are market-based instruments that can assist Annex 1 countries in achieving emission reductions at least cost. The resulting emission reduction credits can be used by Annex 1 Parties to help meet their Kyoto commitments.

JI projects allow Annex 1 parties to implement projects that reduce GHG emissions in other Annex 1 parties. While JI projects can take place between any two Annex 1 Parties, in practice, this mechanism pertains mostly to projects in Eastern Europe and Russia, or countries considered as ‘economies in transition’. JI projects result in the generation of emission reduction units (ERUs),[6] which can be used to meet emissions targets under Kyoto. Given that AAUs and ERUs are related to emissions within Annex 1 countries, they in effect deliver a ‘zero sum’ outcome, as they are merely a transfer of emission reduction obligations between countries without reducing the overall level of emissions relative to the Kyoto targets.

The CDM allows for GHG emission reduction projects in developing countries (non-Annex 1 countries with no emission limitation targets). Like JI, the emission reductions registered under CDM are also a ‘zero-sum’ game, as these reductions merely take place at a different site (i.e. in a non-Annex 1 country rather than in an Annex 1 Party), without resulting in a net decline in global emissions. However, if the CDM results in the widespread adoption of less greenhouse gas-intensive technologies in non-Annex 1 countries (in other words, leads to market transformation), then future global emissions may be reduced .

The emission reductions from CDM and JI projects can be purchased by Annex 1 countries to help meet their Kyoto commitments. To be credited with project-based emission reduction units under either CDM or JI, the project proponents need to demonstrate that the reductions are in addition to emissions that would have occurred in the project’s absence. In other words, emission reductions need to be beyond business as usual (BAU) emissions.

The Kyoto Protocol entered into force[7] and become legally binding on February 16, 2005, after the required number of Parties had ratified the agreement. The United States of America and Australia were the only industrialised countries not to ratify the agreement. Their absence significantly undermines the effectiveness of the Kyoto Protocol, as they are jointly responsible for over 40 per cent of Annex 1 emissions.[8] In effect, their decision not to ratify means that total Annex 1 emissions (including those of the United States and Australia) will not be reduced by as much as originally anticipated by 2012.

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[6] One ERU equals one tonne of CO_2e.

[7] The main conditions for entry into force of the Kyoto Protocol were ratification by at least 55 Parties to the Convention, representing at least 55 percent of the total 1990 carbon dioxide emissions from Annex 1 Parties.

[8] Key GHG Data, UNFCCC, November 2005.

Aggregate emissions from Annex 1 countries that have ratified the agreement will likely fall below 1990 levels over the 2008-2012 period, due mainly to significant economic contraction in Central and Eastern European economies (particularly Russia) during the 1990s. However, the emission levels of some countries (mainly Canada, the European Community, and Japan) are well above their Kyoto targets and these countries will likely need to source emission reductions from elsewhere to meet their Kyoto commitments.

2.3 Overview of the Clean Development Mechanism

The Clean Development Mechanism (CDM) is defined in Article 12 of the Kyoto Protocol.[9] It allows Annex 1 Parties (or entities from those Parties) to invest in project activities that reduce GHG emissions and contribute to sustainable development in non-Annex 1 countries. The emission reduction credits generated by these projects are called certified emission reductions (CERs); one CER equals one tonne of CO_2e.

Although Annex 1 Parties (i.e. governments) hold the responsibility for meeting their Kyoto targets, countries may delegate part of this responsibility, often through regulation, to domestic entities that emit significant amounts of GHGs. Thus, although both government and the private sector are engaged in global GHG emission reduction efforts, the demand for CERs is driven primarily by governments, or multilateral institutions acting on behalf of governments.

Participation in the CDM is entirely voluntary. While there is no requirement that governments or the private sector utilise the mechanism, doing so may provide access to more cost-effective mitigation opportunities than those available in Annex 1 countries. CDM investments are market-driven in the sense that CER prices, volume, and terms of contract are negotiated between individual buyers and sellers. Chapter 6 provides further discussion of the current status of the CDM market and future trends in relation to the demand and supply of CERs.

While the CDM is designed to provide Annex 1 Parties and their entities with access to cost-effective emission reductions, it is also supposed to promote sustainable development in developing countries, the determination of which rests with the developing-country government. In addition to the requirement that host-country governments approve all CDM projects to be implemented within their jurisdictions, project developers must also comply with other rules and procedures, which are highlighted in Box 2.1 below.

[9] See http://unfccc.int/resource/docs/convkp/kpeng.pdf p. 12.

Box 2.1 Profile of the Clean Development Mechanism

The CDM's **main objectives** are to:

- Assist Annex 1 countries in meeting their GHG emission targets under the Kyoto Protocol
- Promote sustainable development in non-Annex 1 host countries.

Some **key characteristics of the CDM**:

- CDM projects must substantiate that reductions in GHG emissions go beyond business as usual (BAU) and are in addition to any emission reductions that would have occurred in the project's absence (known as 'additionality').
- Both public and private entities are eligible to participate and participation is voluntary.
- CDM projects result in real, measurable, and long-term GHG reductions.
- CDM projects must contribute to sustainable development, the determination of which rests with the host country.
- The Executive Board is the supervisory body of the CDM and is responsible for the administration of CDM rules and modalities.

The **CDM project cycle** comprises the following steps:

(i) Development of Project Design Document (PDD)
(ii) Approval by Host Country Designated National Authority (DNA)
(iii) Validation by a Designated Operational Entity (DOE)
(iv) Registration with the CDM Executive Board
(v) Project Monitoring
(vi) Verification and Certification by a Designated Operational Entity (DOE)
(vii) Issuance of Certified Emission Reductions (CERs) by the CDM Executive Board

Examples of CDM project types include:

- Energy efficiency
- Renewable energy
- Afforestation/reforestation
- Methane gas mitigation
- Fuel substitution.

2.4 Entities Involved in the CDM

Several types of entities are involved in the CDM, ranging from international and national approval bodies to public and private sector entities. In addition, multilateral organizations, such as the World Bank, also play a large role. These entities are reviewed below.

2.4.1 Governance

International

The CDM requires a range of regulatory and administrative bodies to enable it to operate. The Executive Board (EB) is the supervisory body of the CDM as well as its main administrative entity.

The EB is composed of 20 members: 10 full-time members and ten alternate members. These members are drawn from Annex 1 and non-Annex 1 countries, and from various UN regions.

The EB reports to the Conference of the Parties/Meeting of the Parties (COP/MOP) of the UNFCCC, and the UNFCCC Secretariat, located in Bonn, Germany, acts as the conduit for information flow between the COP/MOP and the Executive Board. As of September 2006, the EB had met 26 times since November 2001.

The EB is responsible for elaborating the rules and modalities governing the CDM, the approval and registration of CDM projects, the issuance of CERs, and the accreditation of operational entities. To assist it in performing these functions, the EB has established a range of panels and working groups, several of which are outlined below.

The most active panel is the *Methodology Panel* (Meth Panel), which is responsible for developing recommendations to the EB on guidelines for methodologies for determining project baseline emissions and monitoring plans as well as for evaluating submitted proposals for new baseline and monitoring methodologies. This Panel is composed of 19 members and has met 22 times since June 2002. A more detailed analysis of the status of methodology approval is provided in Chapter 2.

The *Small-Scale Working Group* (SSC-WG)[10] prepares recommendations to the EB for methodologies and project categories for small-scale CDM project activities. The SSC-WG is composed of seven members and has met seven times since its inception.

The *Afforestation and Reforestation Working Group* (A/R WG) reviews and prepares recommendations to the EB concerning afforestation and reforestation projects, including proposals for new baseline and monitoring methodologies as well as tools for assessment and demonstration of 'additionality'. It is composed of nine members and has met ten times since July 2004.

The *CDM Accreditation Panel* (CDM AP) makes recommendations to the EB regarding accreditation of an applicant Operational Entity (see below for definition), and the suspension, withdrawal, or re-accreditation of a designated operational entity (DOE). The CDM AP currently has seven members. A more detailed discussion of the status of accreditation for operational entities is provided in Chapter 3.

National

In addition to the EB, there are also national-level bodies that have approval functions. A Designated National Authority (DNA) is the national focal point for CDM activities in Annex 1 and non-Annex 1 countries. DNA approval from all Parties involved in a CDM project is a requirement for project registration.[11]

For Annex 1 Parties, a Letter of Approval (LoA) from the Annex 1 DNA must confirm that the Party has ratified the Kyoto Protocol and that the participation of the entity (to whom the letter is issued) is voluntary. The non-Annex 1 party that hosts the CDM project must also issue a LoA stating that an entity's participation is voluntary and also that the project contributes to the sustainable development of that country.

[10] The SSC-WG succeeds the Small-Scale Panel (SSP), which was operational from April to August 2002 and which made recommendations to the EB for draft simplified modalities and procedures to facilitate Small-Scale CDM project activities.
[11] Appendix Y lists countries that have established DNAs, as well as their status regarding Kyoto Protocol ratification.

More information on the functions and operation of DNAs is provided in Chapter 7.

2.4.2 Public Sector

As noted above, Annex 1 Parties (governments) are responsible for meeting their Kyoto targets. While many of them will devolve part of this responsibility to the private sector, several national governments have also chosen to become directly involved in CDM projects. Government ministries and departments, often led by the DNA, have chosen a variety of methods to acquire CERs. Most often this involves the launching of tenders or purchasing initiatives, either directly or by placing funds with intermediaries (such as institutions and consulting firms) to purchase CERs. Examples of these funds are listed in Appendix 2. Often, Annex 1 countries will sign a Memorandum of Understanding (MoU) with host countries that covers cooperative CDM project activities and eventual CER purchasing.

Host-country governments may also choose to develop CDM projects on a unilateral basis. However, since international emissions trading can take place only between Annex 1 Parties, non-Annex 1 Parties that develop their own CDM projects must still sell the CERs to an Annex 1 party, either directly or through an intermediary (such as a carbon fund). It should be noted that some host countries (for example, Malaysia and Thailand) do not permit unilateral CDM projects.

2.4.3 Private Sector

Project Proponents and other Entities

One of the most important entities in the CDM project cycle is the CDM *project proponent*. Project proponents can be owners of the individual projects, or developers that subcontract with a project owner to implement a CDM project component or other shared arrangement. These entities are responsible for developing the Project Design Document, arranging for project validation, obtaining the necessary project approvals, and implementing project activities to deliver the certified emission reductions (CERs). The resulting CERs accrue to the project participants (see below) and are distributed according to agreed allocation arrangements.

According to the EB, 'a *project participant* is (a) a Party involved, or (b) a private and/or public entity authorized by a Party involved to participate in a CDM project activity'. The project participant(s) is also responsible for communicating to the EB how to distribute the CERs resulting from the project activity. Not all project proponents are necessarily project participants, i.e. they might not receive a share of the CERs generated by the project.

In addition to the official project participants, a number of other private-sector entities may also be involved with the development of a CDM project. For example, c*onsultants* are often employed to help identify and design potential CDM projects and prepare the necessary project documentation (particularly in relation to emissions quantification and the development of baseline and monitoring methodologies). The sale of CERs is often achieved through *carbon brokers*. There are several brokerage houses that specialise in both project- and non-project-based emissions trading (for example, Ecosecurities and Natsource).

A *Designated Operational Entity (DOE)* is an independent third party that is responsible for validation and verification of CDM projects. DOEs must be accredited by the Executive Board for performance of these duties and for each of the sectors in which they wish to perform validation and verification activities. Chapter 3 provides more details on the number and names of accredited DOEs.

Lastly, a range of *private-sector carbon funds* have been established in recent years. Examples include the Greenhouse Gas Credit Aggregation Pool (GG-CAP), the Japan Carbon Fund, Climate Investment Partnership, ICECAP, and many others. These programs generally target CDM (and JI) projects that provide their clients (purchasers of credits) with cost-effective emission reductions. More detail on carbon funds is provided in Appendix 2.

2.4.4 Multilateral Organizations

A range of *multilateral organizations* have also been active in the CDM arena. These organizations can play a variety of roles, such as providing technical advisory services, capacity development assistance, research and scientific services, organizing project finance, and purchasing emission reductions on behalf of governments and corporations. The World Bank has been the most active of the multilateral organizations in this regard, initially with Activities Implemented Jointly (AIJ) and more recently the CDM. The World Bank has played an important role in the establishment of the CDM market, primarily through the Prototype Carbon Fund (PCF).

The PCF is a private/public partnership established under the World Bank as a learning-by-doing program. The success of this model has led to the development of several additional private/public partnerships intended to assist the development of CDM (and JI) projects and to purchase resulting credits on behalf of government and corporate participants. The different World Bank funds are now collectively termed Carbon Finance Business.

Other institutions such as UNDP and UNEP have focused more on policy analysis, research, and host-country capacity development, for both government institutions and private-sector entities. The main objective has been to create improved host-country capabilities and CDM project enabling conditions. In recognition of the need to ensure that the CDM provides a meaningful flow of development benefits to developing countries, particularly the least developed countries, UNDP announced (in December 2005) the establishment a mechanism, the MDG Carbon Facility, to target CDM projects that provide development benefits, particularly for achieving the Millennium Development Goals (MDGs). Other multilateral agencies (for example, UNIDO) and development banks (for example, the Asian Development Bank) have also been involved in capacity development and technical assistance exercises, providing seed funding to cover start-up transaction costs, and developing a portfolio of projects for potential investors.

3 REVIEW OF THE CDM PROJECT CYCLE AND THE STATUS OF BASELINE METHODOLOGIES, DESIGNATED OPERATIONAL ENTITIES, AND DESIGNATED NATIONAL AUTHORITIES

This chapter describes and reviews the international administrative structures and procedures for the CDM, with the aim of shedding light on whether the necessary international governance structures have been put in place to enable the CDM to operate efficiently.

The chapter begins with an overview of the CDM project cycle and discusses each of its major steps. We then review particular aspects of the CDM process that have proven to be key factors in shaping the evolution of the CDM market and the number and types of projects entering the CDM pipeline, including the status of:

- methodologies for establishing baseline emissions and monitoring emission reductions achieved by CDM projects. Developing such methodologies and obtaining approval from the Executive Board (EB) is a crucial part of the CDM process, and one that has resulted in significant costs and delays for some project proponents;
- Designated Operational Entities (DOEs), independent third parties that are accredited by the EB to validate proposed CDM projects and to verify emissions reductions achieved by CDM projects. The limited number of accredited DOEs, particularly those based in CDM host countries, has been an issue for some stakeholders.
- Designated National Authorities (DNAs), the national entities that grant host-country approvals for CDM projects (as required by Kyoto rules). The number of DNAs registered with the UNFCCC, their geographic distribution, and the efficiency at which they operate has an important influence of the structure of the CDM market.

The chapter concludes by summarising some of the recent CDM decisions announced at COP-11 and subsequent decisions of the CDM Executive Board.

3.1 Overview of the CDM Project Cycle

The CDM project cycle involves a series of discrete steps. In general, project proponents must first identify a project, complete the necessary documentation, obtain host-country approval, secure project validation by an independent third party (i.e. an accredited DOE), and register the project with the EB. Following registration, the project proponent must then monitor project activities and obtain verification of the project's emission reductions by an independent third party. (Note that CDM rules specify that project validation and verification may not be performed by the same DOE (except for small-scale projects). Hence, each non-small-scale project will need to engage two different DOEs over the course of the project cycle.)

Apart from the formal CDM administrative processes, project proponents must also secure project financing and meet regulatory, legal, and administrative requirements not directly related to the CDM process (such as host-country environmental impact assessment requirements). CDM project proponents are well advised to secure these necessary approvals and be confident of obtaining project financing prior to submitting a proposal to the CDM Executive Board.

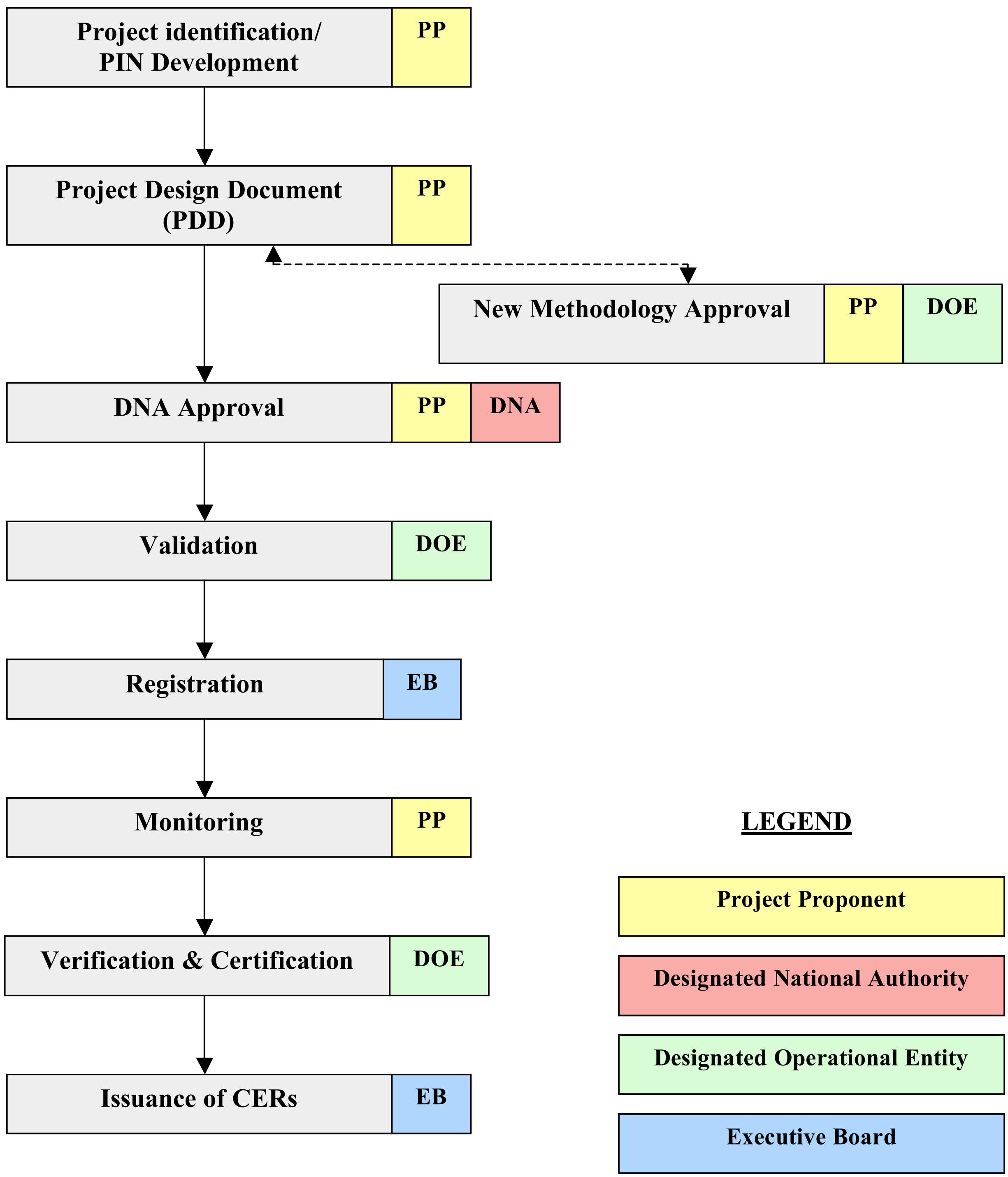
Table 3.1 lists the main steps in the CDM project cycle and indicates the entity responsible for completing each activity, while Figure 3.1 depicts the cycle graphically.

Table 3.1: Main Steps in the CDM Project Cycle

ACTION	RESPONSIBILITY
Project identification and PIN development	Project Proponent
Development of a Project Design Document (PDD)	Project Proponent
Develop & submit new methodology / Methodology approval *	Project Proponent / Executive Board
DNA approval	Project Proponent / DNA
Validation	Designated Operational Entity
Registration	Executive Board
Monitoring	Project Proponent
Verification and Certification	Designated Operational Entity
Issuance of CERs	Executive Board

** required only where an approved methodology does not exist*

Figure 3.1: Flow Chart of the CDM Project Cycle



The interval from project inception to registration varies considerably. The total time required is influenced by: type and complexity of the project; the time and effort needed to prepare project documentation and secure project validation; whether the project uses an existing baseline methodology or requires development and approval of a new methodology; and the time required to complete the EB registration process. A review of the projects registered to date (i.e. August 2006) suggests that, on average, it takes up to 2 years to move from the project identification stage to project registration.

Each of the key steps in the project cycle is discussed below.

3.1.1 Key Steps in the CDM Project Cycle

Pre-development and project design

The initial step in the CDM process is to identify a project that will generate GHG emission reductions at a cost likely to be attractive to potential purchasers of CERs, or that will provide an adequate return on investment to project owners. The project should also meet the sustainable development criteria of the host country. Projects are rarely implemented for the carbon emission reduction credits only (although some clearly are). In general, projects deliver a range of other services, such as electricity generation, useable energy, or waste reduction. To screen projects for their ability to generate cost-effective CERs, project proponents must have an understanding of:

- the types of technologies and project activities that can reduce greenhouse gas emissions;
- whether and how the project's emission reductions can be accurately measured and verified against a business-as-usual baseline;
- how many CERs the project is likely to generate and at what cost; and,
- the likelihood of project approval by the host country and the CDM Executive Board.

In some cases, a project proponent will undertake a CDM feasibility study in order to assess whether the project is worth pursuing. This analysis normally requires preliminary data collection and analysis in order to estimate the project's potential to generate emission reduction credits. The project revenue from sale of CERs is then weighed against likely transaction costs and project-related risks to determine the project's CDM feasibility.

Once a project has been judged potentially viable, the development of a Project Idea Note (PIN) is often the next step. A PIN generally provides a brief overview of the project, including estimated emission reductions, baseline and monitoring methodologies to be employed, and estimated project investment costs. The PIN is a useful means of presenting the project to prospective investors or host-country governments. Some potential buyers, such as the World Bank and UNDP, may also require submission of a PIN to enable them to undertake initial project screening and assessment. Some host countries[12] also require a PIN as an initial step in the project approval process and to enable preliminary screening against national CDM project criteria. The host DNA may issue a 'letter of no objection' following the screening of a PIN, providing the project proponent with a greater level of assurance that the project will be approved by the host government when the full PDD is submitted and thereby reducing project risk.

Project Design Document (PDD)[13]

After initial project screening and identification, the next important phase of the CDM project cycle is to prepare a Project Design Document (PDD). The PDD contains a detailed description and

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[12] Examples include Brazil, Egypt, India, Indonesia, Malaysia, Morocco, and South Africa.

[13] For a good overview of issues associated with the development of PDDs, see the UNEP Risoe Centre's *CDM PDD Guidebook: Navigating the Pitfalls*.

specification of the proposed CDM project, including information about the project, baseline scenario and quantification methodology, monitoring plan, stakeholder comments, and environmental impacts.

An essential component of the PDD is the *determination of the project baseline* against which emission reductions are measured. This requires that the project proponent identify:

- likely future GHG emissions in the project's absence (i.e. the baseline);
- how the project will reduce emissions relative to the project baseline;
- how emission reductions will be monitored; and,
- how the project will contribute to sustainable development in the host country.

The project proponent must also make the case that the project's emission reductions are in addition to reductions that would have otherwise occurred.

For a project to be eligible for registration, it must utilise an Executive Board-approved methodology for determining the baseline scenario, quantifying baseline emissions, demonstrating 'additionality' (i.e. substantiating that the project is not business as usual), and monitoring the data required to calculate the emissions reductions resulting from the project. To date, the EB has approved 62 methodologies (see Section 3.3 for details on the number and scope of approved methodologies). However, these approved methodologies can only be applied to projects with suitable characteristics. If a proposed project fits the criteria for use of a methodology already approved by the EB, then the project proponent can avoid the often lengthy and costly process of developing a new methodology and securing EB approval, and proceed with the PDD, validation, and host-country approval processes. (The process for submitting a new methodology for EB approval is outlined in the following section.) Most CDM projects will also require preparation of an Environmental Impact Assessment (EIA) before submission for host-country approval.

To help project proponents determine whether a project meets the CDM's additionality requirements, the EB has produced some guidance on this topic.[14] Determination of additionality is made by a Designated Operational Entity (DOE) during the project validation stage. (Note that a number of projects have been rejected, or needed to be revised, due to their inability to substantiate that their emission reductions were additional to business as usual.)

The PDD also must specify the period during which emission reduction credits will be generated. Project proponents may register for an initial 7-year crediting period (with the option of up to two renewals of 7 years each) or for a single 10-year crediting period, with no option for renewal.

In preparing a PDD, project proponents must consult with and take into account the views of stakeholders. This ensures public participation in the CDM process and enables stakeholders to learn about the project and voice any concerns. Stakeholder consultations often consist of a one-day meeting held in a city near the project site. The event is usually advertised in local newspapers, and invitations are extended to identified stakeholders.

Once completed, the PDD is submitted to a DOE along with supporting documentation.

[14] See http://cdm.unfccc.int/methodologies/PAmethodologies/AdditionalityTools/Additionality_tool.pdf.

Submission and approval of a new methodology

If none of the approved baseline and monitoring methodologies is applicable to the proposed project, the project proponent must develop a new one and secure its approval by the EB. As mentioned earlier, the EB has established a Methodology Panel ('Meth Panel') to assist with the review of new methodologies. (Note that this process does not apply to small-scale projects, for which streamlined procedures have been developed (see section 3.2, below), featuring the use of simplified, pre-approved baseline and monitoring methodologies.)

All new methodologies are submitted via a Designated Operational Entity (DOE). The Meth Panel reviews the documentation and recommends approval, rejection, or revisions to the methodology. Where revisions are required, project proponents have the opportunity (within a given time frame) to make the required revisions and then re-submit the methodology for approval. Once the Meth Panel has reached a determination, its recommendation goes to the EB for a final decision. In most cases, the EB upholds the Meth Panel's recommendation. It has generally taken 6-12 months to secure EB approval of a new methodology. An overview of the process for securing approval of a new methodology is provided in Box 3.1 below.

Box 3.1: Overview of Process for Approval of a New Methodology

A methodology consists of procedures for determining a CDM project's baseline scenario, calculating its baseline emissions, demonstrating 'additionality' of the project's emission reductions, and monitoring project activities to verify that emission reductions have been achieved.

The Executive Board has published procedures for developing new methodologies.[15] The steps are as follows:

1. Project proponent prepares a PDD, new methodology baseline (NMB), and new monitoring methodology (NMM) using the most current documents approved by the EB;
2. Project proponent submits PDD, NMB, and NMM to a DOE;
3. DOE confirms that the proposed project actually uses a new methodology rather than an existing approved one;
4. DOE forwards documents to the UNFCCC Secretariat, using the CDM Proposed New Methodology Form (CDM-PNM);
5. UNFCCC Secretariat forwards completed documents to the EB and Meth Panel and make the documents available for 15 working days. Comments are forwarded to the Meth Panel;
6. The new methodology must be submitted at least 7 weeks prior to the next meeting of the Meth Panel. If too many new methodologies have been submitted for a given meeting, review of some may be postponed to the following meeting;
7. Two members of the Meth Panel, as well as two external experts, are assigned to review the proposed methodology and provide comments to the Panel;
8. Meth Panel makes a recommendation to the EB;
9. EB makes a final decision at its next Board meeting.

[15] See http://cdm.unfccc.int/Reference/Documents. The steps outlined in Box 3.1 do not include additional time or effort required for re-submission should the methodology fail to be approved on the first submission.

DNA approval

The Designated National Authority (DNA) of the host country must issue a Letter of Approval (LoA) as a requirement for CDM project registration. If an Annex 1 Party is involved in the project, the DNA of that country must also issue an LoA. In each case, the DNA must confirm that the participation of the entity requesting project approval is voluntary.

In addition, the host-country DNA must confirm that the project meets national sustainable development criteria. Each host DNA will have its own unique approval process that project participants must comply with (see discussion of DNA structures in Chapter 7).[16] Project proponents should check with the relevant DNAs to ensure that they are aware of the project approval processes and requirements. A listing of DNAs can be found at http://cdm.unfccc.int/DNA.

Validation

Validation is the process by which a DOE assesses a proposed project's documentation to confirm that the project meets CDM criteria. Validation involves a range of tasks; in particular, the DOE will check that:

- The PDD conforms to CDM requirements and that the methodology is suitable and correctly applied;
- The calculations in the PDD are accurate and assumptions are correct and conservative;
- The project satisfies the additionality requirement; and
- The required DNA approvals and documentation have been issued.[17]

The above tasks are usually completed through a desk review, but the DOE may also make a site visit to hold interviews and discussions with project participants and relevant stakeholders. The DOE will make the PDD public (usually via the Internet) for a 30-day public consultation period.

A pre-validation report may be provided to the project participant outlining issues that must be resolved prior to the preparation of the final validation report. Once necessary revisions are made, a final validation report can be prepared for submission to the EB.

Registration

Following successful project validation, the DOE will submit the final PDD, a validation report, and the LoA(s) to the EB for registration of the project. The EB may choose to approve the project for registration, request a project review, or reject the proposed project. A project will be considered registered within 8 weeks of receipt by the EB if there are no objections from EB members (i.e. calling for a review).

If three or more EB members express concerns, the project enters a review phase. The EB must complete its review within 30 days. Decisions concerning project registration are made at EB

[16] Most DNAs publish the project approvals process on the DNA website or other publicly available documents.

[17] Note that DNA approval is not necessary for completion of project validation, but these approvals must be submitted with the PDD in order for the project to be registered.

meetings, which are normally held every 2 months; thus, the entire review process can therefore take up to 3 months.

When a project is submitted to the EB for registration, a registration fee is payable, based on the estimated annual CO_2 equivalent emission reductions.[18] In February 2006, the EB revised the registration fee structure (EB 23 meeting record, Annex 35). The revised structure is:

- No registration fee is payable for projects with estimated emission reductions up to 15,000 tonnes/year.
- For projects with estimated emission reductions of more than 15,000 tonnes per year, the fee is US$0.10/tonne for the first 15,000 and then US$0.20/tonne for each additional tonne up to a maximum of US$350,000.

The new registration fee structure is more equitable and reduces upfront transaction costs for small projects.

Once the project has been registered, it can proceed to the implementation stage.[19]

Monitoring

Project participants are responsible for collecting the necessary data required to accurately quantify emission reductions achieved by the project. This data collection and project performance monitoring must be undertaken in accordance with the monitoring plan specified in the PDD. Project participants must prepare monitoring reports and submit them to a DOE on a regular basis as specified in the monitoring plan (usually on an annual basis).

Verification and certification

In this step, project participants are required to secure verification of emission reductions before certified emission reduction credits (CERs) are issued by the EB. Verification is performed by a DOE, which confirms that the emissions reductions claimed in the monitoring report (described above) have in fact occurred. Except in the case of small-scale projects, the DOE contracted to verify project emission reductions must be a different than the DOE that originally validated the project.

To verify emission reductions achieved by the project, the contracted DOE will conduct a desk review of the documentation and normally will also perform an on-site inspection. Once satisfied that all the verification requirements have been met, the DOE will complete a Certification Report

[18] Until February 2006, all projects were subject to a registration fee, based on five categories of estimated annual CO2 equivalent emission reductions (<15,000=$5000; 15,000-50,000=$10,000; 50,000-100,000=$15,000; 100,000-200,000=$20,000; and >200,000=$30,0000). Under this structure, it was more expensive per tonne of emission reduction to register a small project than a larger project. It also created discontinuities between registration costs for projects of similar sizes that fell into different categories. (For example, the fee was 20 cents per tonne for a 49,000 tonne CO2eq/year project, but 30 cents per tonne for a 51,000 tonne CO2eq/year project.)

[19] There are some exceptions for projects that were implemented after January 1, 2000, but did not complete the necessary documentation (since the rules for CDM modalities and procedures for projects were not fully specified until November 2001). In these ‘prompt start’ cases, projects must be registered by December 31, 2005 in order to qualify under the CDM. This deadline was extended to 31 December 2006 at COP11/MOP1 in Montreal. Furthermore, the modalities and procedures for afforestation and reforestation projects were not decided upon until December 2004; thus, in some cases, these projects may have also been implemented prior to registration.

for submission to the EB. While verifications would normally be performed annually, some projects—particularly those generating large volumes of emission reductions—may select a more frequent verification schedule.

Issuance of CERs

Submission of the Certification Report to the EB constitutes the request for issuance of CERs. Upon its receipt, the EB will issue CERs within 15 days unless a review is required. CERs are deposited into the accounts of project participants as specified in the PDD and they are the official owners of the CERs.[20]

When the EB issues CERs, it levies an administration fee of US$0.10 per CER for the first 15,000 CERs per year and US$0.20 for additional CERs issued for that period. Note that the EB administration fee is payable only after the initial project registration fee has been recovered. (Thus, the CDM project registration fee is in effect a forward payment of the EB administration fee.) Except for projects generating very large volumes of emission reductions, projects typically do not become liable for payment of the EB administration fee until a year or so after CERs begin to be issued (i.e. the EB administration fee is offset during this period by recovery of the upfront registration fee).[21]

On issuance of CERs, the EB also levies an adaptation fee, equivalent to 2 percent of the CERs issued. Proceeds of the Adaptation Levy will be transferred to the 'Adaptation Fund' set up to assist developing countries to implement climate change adaptation projects.[22] Note that projects located in countries classified as Least Developed are exempt from the Adaptation Levy.

3.2 Streamlined Procedures for Small-Scale Projects

In an effort to minimise transaction costs for small-scale projects, the EB created special provisions for these projects. (See Chapter 4 for a more detailed discussion of transaction costs.) Small-scale CDM projects are defined as:

- Renewable energy project activities with a maximum output capacity of up to 15 MW;
- Energy efficiency improvement project activities that reduce energy consumption by the equivalent of up to 15 GWh per year;
- Other project activities that both reduce anthropogenic emissions by sources and directly emit less than 15,000 tonnes CO_2e per year; and
- Land use, land use change, and forestry (LULUCF) projects that generate less than 8,000 tonnes CO_2e per year over the crediting period.

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[20] Annex 1 governments, non-Annex 1 governments, and private-sector project participants are all eligible for CER ownership. However, a CER cannot be used to comply with Kyoto targets until it has been registered in an Annex 1 registry account and recorded in the International Transaction Log established under the UNFCCC.

[21] The maximum registration fee is US$350,000, which equates to approximately 1.75 million tonnes of emission reduction units per year. Projects that generate annual emission reduction volumes in excess of this amount will recover the registration fee in less than one year of operation and will need to pay the administration fee earlier than other projects.

[22] The Adaptation Fund disbursement and administrative modalities have not yet been finalised.

Although the project cycle for small-scale projects contains the same steps, certain procedures are simplified and streamlined relative to those required for non-small-scale projects.[23] These modifications include:

1) PDD requirements are reduced (i.e. no description of the technology is required; environmental impacts are documented only if an EIA is required by the host country; baseline and monitoring methodologies are simplified and pre-approved by the EB; and documentation of emission reduction calculations is simplified);
2) The same DOE can undertake both project validation and verification of emission reductions;
3) The registration fee is waived for projects with estimated annual emission reductions of 15,000 tonnes CO2e or less; and,
4) The review period for registration is shorter.

It should be noted that not all small-scale projects are treated equally. Different project types are subject to different maximum levels of emissions reductions in order to qualify as a small-scale project. For example, some project types are limited by the number of CERs they can generate per year (e.g., 15,000 CERs/year for non-electricity generation or 8,000 lCERs/tCERs[24] per year in the case of LULUCF). Others are classified as small-scale based on energy offsets (e.g., a maximum of 15 GWh for energy efficiency projects) or capacity limits (e.g., a maximum capacity of 15 MW for renewable electricity generation projects). Note that, in the examples just given, the latter project type (i.e. a 15 MW renewable energy project) typically is capable of generating far more than 15,000 CERs per year (the small-scale threshold for non-electricity generation projects), while the former project type (i.e. a 15 GWh energy efficiency project) would under most circumstances generate less than 15,000 CERs per year.

It is not clear why differential treatment of small-scale project types was adopted, but the result is that the small-scale project procedures tend to benefit some project types more than others.[25] This may be an issue for reconsideration at some future date to ensure that all CDM small-scale projects are treated equitably.

A comprehensive list of small-scale project types and their methodologies can be found at: http://cdm.unfccc.int/Projects/pac/ssclistmeth.pdf .

Bundling small projects[26]

CDM procedures contain a provision enabling project participants to bundle several projects under a single PDD. Bundling is designed to help reduce transaction costs and is most likely to be relevant for smaller projects where transaction costs have a greater impact on financial viability.

[23] See http://cdm.unfccc.int/Projects/pac/pac_ssc.html for more information.
[24] lCERs (long term) and tCERS (temporary) are different types of CER units assigned to afforestation/reforestation projects.
[25] One reason for adopting a capacity limit, rather than an emission reduction limit, for renewable energy projects may be that it is not known in advance how many emission reduction credits a renewable electricity generation project is likely to create. However, this does not seem to be sufficient grounds for establishing such a significant differential in treatment of project types.
[26] For more information, see http://cdm.unfccc.int/EB/Meetings/021/eb21repan21.pdf .

However, to qualify for treatment as a small-scale project, the aggregated component activities of the bundled project must remain within the size thresholds.

Bundling activities of the same type (e.g., renewable energy) may offer advantages and transaction cost savings because these activities can use the same baseline methodologies, and reporting and monitoring procedures. For example, bundling several small biomass projects within one country or region into a single PDD could potentially reduce transaction costs, particularly if the individual biomass projects were unlikely to be viable as CDM projects in their own right. Such a bundled project would also be likely to experience reduced unit costs for project design, validation, management, and monitoring and verification. Although such costs reductions are possible in theory, in practice bundling has yet to prove that it can produce significant savings.

Moreover, project proponents may find it difficult to put together proposals for bundled projects. For example, all activities within a bundled project must be submitted at the same time, thereby presenting possible timing conflicts.

3.3 Programmatic CDM

At COP 11/MOP1, the Parties approved an additional type of project eligibility under the CDM—namely, programmatic CDM. This creates the potential for generating creditable emission reductions through activities that result from the introduction of a specific policy or programme, for example, a minimum energy performance standard for electric motors. Credit is given not for introduction of the policy or programme per se, but rather for the resulting actions that serve to reduce GHG emissions.

Although programmatic CDM is not directed specifically at small-scale projects, it does offer the potential for aggregating a large number of discrete emission-reducing actions (for example, the replacement of appliances or equipment with new, more energy-efficient units that comply with a specific performance standard) under one project. The actual project itself may in fact be much larger than the existing small-scale category definition. Programmatic CDM differs from bundling in that the exact number of actions and sites are not known in advance but are determined after implementation of the specific policy or programme.

Programmatic CDM has the potential to enable a wider range of emission reduction activities under the CDM as well as acting as an incentive for the introduction of new policies and measures to accelerate the adoption of less GHG-intensive technologies. While this new CDM category has generated considerable interest, the EB has provided little guidance as to what would constitute an eligible project. What is clear is that any programme of activities in one project document must use an approved methodology and meet all other CDM requirements (concerning leakage,[27] additionality, verifiability, and so on). As of September 2006, nine P-CDM projects have been

[27] Leakage is a term that refers to the transfer of an emissions-generating activity from within the project boundary to a different location. For example, if an entity outsourced a GHG-producing activity (such as the melting of scrap material into new metal ingots) that they had previously done themselves, this would reduce emissions within the project boundary (i.e., the outsourced activity is transferred to an area not included in the project's emission inventory boundary), but would not lower emissions overall. Thus, the emissions simply 'leak' from one location to another.

registered by the EB; another one has been returned for corrections and five others are in the validation stage.

3.4 Approved Baseline Methodologies

As noted earlier, baseline and monitoring methodologies are crucial components of CDM projects. The need to develop methodologies and submit them for EB approval has proven to be a significant constraint on the evolution of the CDM market and has had a considerable influence on the size and type of projects entering the CDM pipeline. In some cases, the approval process has resulted in significant time delays and costs for project proponents. It has also created an increased administrative workload on DOEs and the EB (and particularly the work of the Methodology Panel).

3.4.1 Methodology Reviews and Approval Rates

Proposed new methodologies are rated by the EB as either A (approved), B (to be revised), or C (not approved). In this report, projects with methodologies receiving a B rating are listed as 'pending'. As of 20th September 2006, there had been 16 rounds of methodology reviews and a total of 181 methodologies had been developed and submitted to the EB. Of these, 31 large-scale, individual methodologies, nine consolidated methodologies, and three afforestation/reforestation methodologies had been approved.[28] These are in addition to the 19 small-scale methodologies developed and approved by the EB. An additional 32 methodologies (including 11 afforestation and reforestation methodologies) are presently under assessment or revision (pending). Of the remaining proposed methodologies, 82 (including 14 afforestation and reforestation methodologies) were not approved (rated C) and five were withdrawn.

Table 3.2 provides a list of the number of methodologies accepted, revised, rejected, and withdrawn.

Table 3.2: Status of CDM Methodologies

Status of CDM Methodologies	Total
1. Total Methodologies approved (A)	62
2. Methodologies under revision (B)	32
3. Methodologies not approved (C)	82
4. Methodologies withdrawn	5
TOTAL	181

Resubmission of methodologies

A C rating generally implies that a methodology has been rejected. However, proposed methodologies receiving a C rating can be revised and resubmitted, just as methodologies receiving a B rating can. Thus, to some extent, the distinction between a B and C rating is not

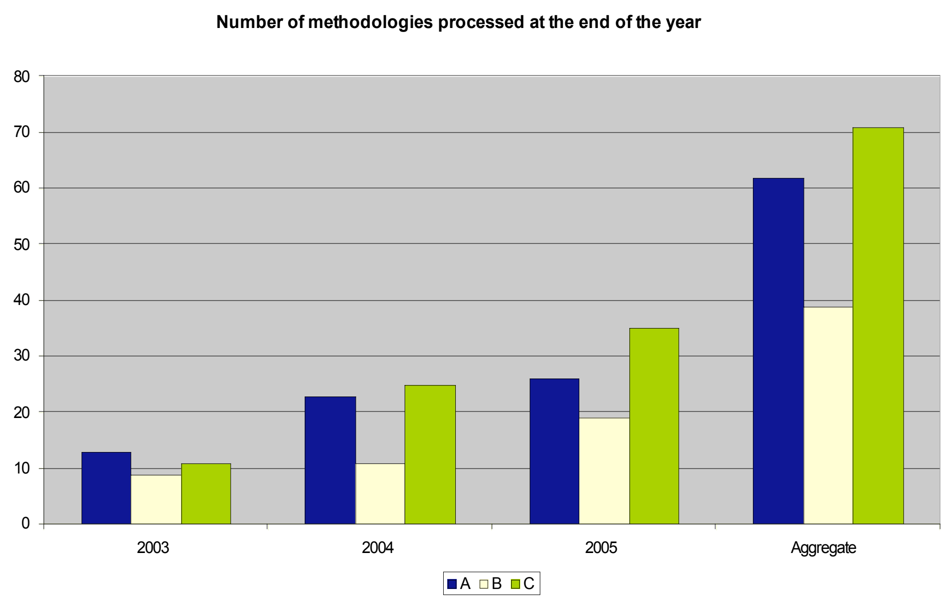
[28] In some cases, (e.g., AM0004, AM0005, and AM0015), methodologies have been replaced by approved consolidated methodologies.

completely clear. In practice, however, very few C-rated methodologies have been resubmitted (to date, 3) and only half of B-rated methodologies are re-submitted, according to the World Bank's *CDM Methodology Status Report* (August 2005).[29]

Trends in methodology submission and approval

The number of methodologies being submitted for approval has increased significantly since 2004. This reflects in part a significant increase in the number of projects entering the CDM pipeline. Figure 3.2 indicates the growth over time in the number of methodologies submitted to the Meth Panel since its first meeting in 2003. Note that percentage of methodologies receiving an A rating (approved) has declined since 2003.

Figure 3.2: Number of Methodologies Processed by the 14th Methodology Review



Decision times have been trending downward for methodology reviews (see Figure 3.3.). To date, approval times have generally been in the range of 6-12 months. Rejection times have been shorter, with decisions to reject usually made in 4-6 months. Although the rate of processing has tended to improve over time, an increasing backlog of methodologies pending review may mean that approval times could increase in the future.[30]

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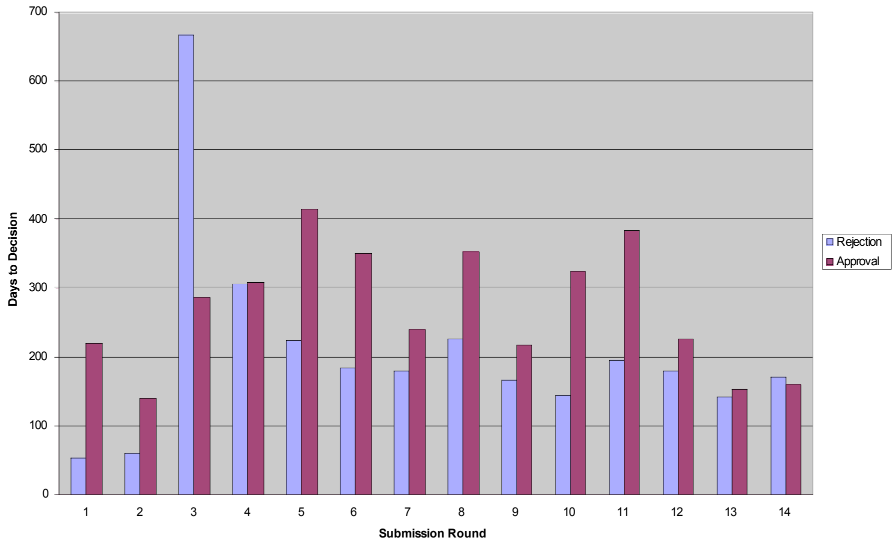
[29] See http://carbonfinance.org/docs/CDMStatusReport2005_ECONAnalysis_for_the_WorldBank.pdf.

[30] A more in-depth analysis of these issues can be found in the World Bank's *CDM Methodology Status Report* (August 2005). Online at: http://carbonfinance.org/docs/CDMStatusReport2005_ECONAnalysis_for_the_WorldBank.pdf .

Figure 3.3: Average Time to Final Decision from Date of Initial Methodology Submission



Source: UNEP Risoe Centre

3.4.2 Sector Coverage of Methodologies

The availability of an approved methodology has had a major bearing on the sectoral distribution in the CDM project mix. To some extent, the sectoral coverage of approved methodologies simply reflects the level of project developers' interest in certain types of projects, which is driven by a range of factors, such as the average cost of generating a CER, and not methodology issues alone.

Table 3.3. lists the approved methodologies for CDM projects by sectoral scope. While 13 out of the 15 sector categories have approved methodologies just three sector categories dominate, namely energy industries (sector 1) with 27 percent, waste handling (sector 13) with 23 percent and manufacturing industries (sector 4) with 12 percent. Energy demand (sector 3), agriculture[31] (sector 15), afforestation and reforestation (sector 14), and fugitive emissions from fuels (sector 10) have several methodologies. Nearly half the sectoral categories have only one methodology (e.g., energy distribution, mining/mineral production, metal production, fugitive emissions from halocarbons and sulphur hexafluoride) or no approved methodologies (construction, and solvent use).

Some stakeholders have expressed concern about the limited coverage of transport and afforestation/reforestation, as these sectors are seen as important areas for achieving sustainable development outcomes. The relative lack of approved methodologies in these sectors in part reflects a lack of attractive opportunities for generating cost-effective emission reductions as well the methodological complexities that can arise, particularly in the transport sector. The track record for afforestation and reforestation methodologies has been poor, with nine of the first 10

[31] These agriculture projects are comprised primarily of animal waste management projects, which actually fall under sectors 13 and 15.

methodologies not receiving approval. (Chapter 5 provides further discussion of the sectoral distribution in the CDM project mix.)

Table 3.3: Coverage of Methodologies in Confirmed Projects by Sectoral Scope[32]

Sectoral scope	Sectoral scope name	Number of meths large scale	Number of meths small scale	Number of meths[33] Cons.	Number of confirmed projects		CERs/yr, confirmed projects (kt)		CERs up to 2012, confirmed projects (kt)	
1	Energy industries[34]	9	6	5	248	63%	17,407	16%	127,900	17%
2	Energy distribution		1							
3	Energy demand	3	3		5	1%	97	0.1%	813	0.1%
4	Manufacturing industries	5	1	3	30	8%	2,345	2%	19,534	3%
5	Chemical industries	4			4	1%	17,228	16%	105,963	14%
6	Construction									
7	Transport	1	1							
8	Mining and mineral production			1						
9	Metal production	1								
10	Fugitive emissions from fuels (solid, oil and gas)	2	1	1	7	2%	2,307	2%	18,316	2%
11	Fugitive emissions from halocarbons and sulphur hexafluoride	1			11	3%	56,104	51%	367,918	50%
12	Solvent Use									
13	Waste handling and disposal	10	6	1	35	9%	9,699	9%	69,131	9%
14	Afforestation and reforestation	3	1		1	0.3%	26	0.02%	174	0.02%
15	Agriculture	2	3		54	14%	4,230	3%	30,820	4%

3.5 Accredited DOEs for Validation and Verification

As noted earlier, Designated Operational Entities (DOEs) are independent third parties that are accredited by the EB to conduct CDM project validations and verifications.

DOEs are accredited separately for each task. Although the number of DOEs has expanded considerably in the past 12-18 months, to date only 16 have been accredited to undertake project validations and only six are accredited to verify project emission reductions. A list of these DOEs is provided in Table 3.4 below. A further six entities are in the process of being accredited as DOEs

32 Confirmed projects are those that have been registered or have requested registration.
33 Blank spaces indicate 0 (zero).
34 Renewable and non-renewable source energy projects.

and are termed Applicant Entities (AEs). Thus, the number of accredited DOEs is likely to increase in the future.

Table 3.4: List of DOEs and Sectoral Scope of Accreditation

Entity Name	Sectoral scopes for validation	Sectoral scopes for verification and certification
Japan Quality Assurance Organization (JQA)	1, 2, 3, 4, 5, 6, 7, 10, 11, 12, 13	
JACO CDM.,LTD (JACO)	1, 2, 3	
Det Norske Veritas Certification Ltd. (DNVcert)	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 15
TUV Industrie Service GmbH TUV SUD GRUPPE (TUV-SUD)	1, 2, 3, 4, 5, 6, 7, 10, 11, 12, 13, 14, 15	1, 2, 3, 4, 5, 6, 7, 10, 11, 12, 13, 15
Tohmatsu Evaluation and Certiification Organization (TECO)	1, 2, 3	
Japan Consulting Institute (JCI)	1, 2, 13	
Bureau Veritas Quality International Holding S.A. (BVQI)	1, 2, 3	1,2,3
SGS United Kingdom Ltd. (SGS)	1, 2, 3, 4, 5, 6, 7, 10, 11, 12, 13, 15	1, 2, 3, 4, 5, 6, 7, 10, 11, 12, 13, 15
The Korea Energy Management Corporation (KEMCO)	1	
TÜV Industrie Service GmbH, TÜV Rheinland Group (TÜV Rhein)	1, 2, 3, 13	
KPMG Sustainability B.V. (KPMG)	1, 2, 3	
British Standard Institution (BSI)	1, 2, 3	
Spanish Association for Standardization and Certification (AENOR)	1, 2, 3	1, 2, 3
TÜV NORD CERT GmbH (RWTUV)	1, 2, 3, 4, 5, 6, 7, 10, 11, 12, 13	1, 2, 3
Korean Foundation for Quality (KFQ)	1, 2, 3	
PricewaterhouseCoopers (PwC)- South Africa (PwC)	1, 2, 3	
The following have received an indicative letter, but are not fully accredited		
Lloyd's Register Quality Assurance Ltd (LRQA)	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13	
ChuoAoyama Sustainability Certification Co. Ltd.	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13	
AZSA Sustainability Co., Ltd. (Former ASAHI & Co.)	1, 2, 3, 10	
Conestoga Rovers & Associates Limited.(CRA)	1, 4, 5, 10, 12, 13	
Colombian Institute for Technical Standards and Certification-ICONTEC	1, 2, 3, 4, 5, 8, 13, 14, 15	
ERA CERT, Certification, S.A.	1, 2, 3	

One issue that has recently arisen is the apparent variability among DOEs in their implementation of validation and verification procedures. This concern was highlighted at a DOE discussion group convened during the May 2006 Carbon EXPO in Cologne, Germany. Ensuring consistency in validation and verification procedures is crucial for maintaining quality, standards, and the underlying credibility of the CDM process. Thus, there may be a need for additional guidance from the EB to ensure consistency across accredited DOEs.

3.5.1 Sectoral Scope Coverage

DOEs have been accredited to undertake validation and verifications in 14 of the 15 project sectors. One DOE has been accredited to validate afforestation/reforestation (sector 14) projects, but, as yet, none has been accredited to verify such projects. As the number of afforestation/reforestation projects and approved methodologies increases, there is likely to be increased interest amongst DOEs in seeking accreditation in this area.

3.5.2 DOE Shares of Project Validation and Verification Activities

As of May 2006, just three DOEs—DNV, TUV-SUD, and SGS—dominate project validation and verification activities to date (see Figures 3.4a and 3.4b). This dominance reflects the early accreditation of these entities and the sectoral scope of their accreditations. The distribution of validation and verification activities among DOEs is expected to increase in the coming years, as more firms enter the market and others expand the sectoral scope of their activities.

Figure 3.4a: Distribution of Validation Activities by DOE

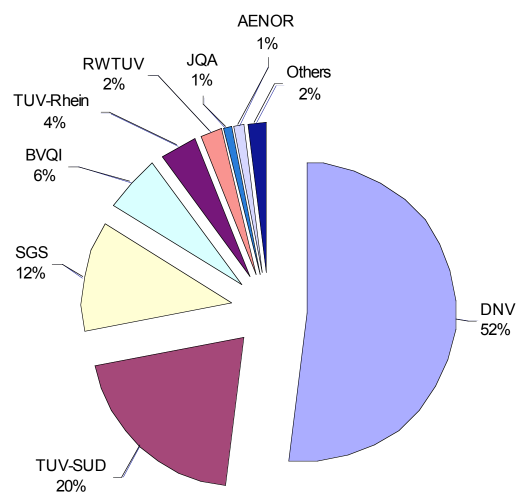
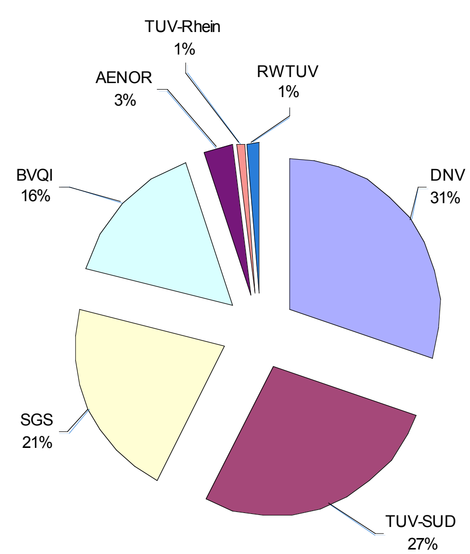


Figure 3.4b: Distribution of Verification Activities by DOE



3.5.3 Geographical Distribution of DOEs

Most DOEs and AEs are based in Annex 1 countries, primarily in Europe and Japan. Of the 16 accredited DOEs, only two are based in non-Annex 1 countries (South Africa and South Korea), although others, such as DNV, are establishing local offices in host countries. Of the six current Applicant Entities (AEs), just one is from a non-Annex 1 country (Colombia).

Some stakeholders have raised concerns that the relative lack of DOEs based in non-Annex 1 countries can result in higher project validation and verification costs. In principle, the use of locally based DOEs could reduce costs, especially for travel and consulting fees. However, until recently, there was little demand for greenhouse gas quantification, validation, and verification services in developing countries. These services require specialized skill sets that take time to develop. In response to growing demand in non-Annex 1 countries, the accreditation of service providers will increase and the training of host-country nationals will be expanded. The establishment of branch offices of existing DOEs could also contribute to this process, but it will take several years to build more broad-based capacity in this area.

Table 3.5: Summary of Methodology Coverage by Sectoral Scope and DOE

Sectoral Scope		Meth	Small Scale Meth	Consol. Meth	DOEs – validation	DOEs - verification
1	Energy industries (renewable and non-renewable source energy projects)	AM0007	AMS-I.A.	ACM0002	JQA DNV-CUK SGS-UKL TUEV-SUED TUEV-RHEIN JACO JCI AENOR BVQI KPMG RWTUV KEMCO KFQ TECO BSI PriceWaterhouseCoopers	DNV-CUK SGS-UKL TUEV-SUED AENOR BVQI RWTUV
		AM0010	AMS-I.B.	ACM0004		
		AM0014	AMS-I.C.	ACM0006		
		AM0019	AMS-I.D.	ACM0007		
		AM0024	AMS-II.B.	ACM0009		
		AM0026	AMS-III.B.			
		AM0029				
		AM0032				

Sectoral Scope		Meth	Small Scale Meth	Consol. Meth	DOEs – validation	DOEs - verification
2	Energy distribution		AMS-II.A.		JQA DNV-CUK SGS-UKL TUEV-SUED TUEV-RHEIN JACO JCI AENOR BVQI KPMG RWTUV KFQ TECO BSI PriceWaterhouseCoopers	DNV-CUK SGS-UKL TUEV-SUED AENOR BVQI RWTUV
3	Energy demand	AM0017 AM0018 AM0020	AMS-II.C. AMS-II.E. AMS-II.F.		JQA DNV-CUK SGS-UKL TUEV-SUED TUEV-RHEIN JACO AENOR BVQI KPMG RWTUV KFQ TECO BSI PriceWaterhouseCoopers	DNV-CUK SGS-UKL TUEV-SUED AENOR BVQI RWTUV
4	Manufacturing industries	AM0007 AM0014 AM0024 AM0032 AM0033	AMS-II.D.	ACM0003 ACM0005 ACM0009	JQA DNV-CUK SGS-UKL TUEV-SUED RWTUV	DNV-CUK SGS-UKL TUEV-SUED
5	Chemical industries	AM0021 AM0027 AM0028 AM0034			JQA DNV-CUK SGS-UKL TUEV-SUED RWTUV	DNV-CUK SGS-UKL TUEV-SUED
6	Construction				JQA DNV-CUK SGS-UKL TUEV-SUED	DNV-CUK SGS-UKL TUEV-SUED

Sectoral Scope		Meth	Small Scale Meth	Consol. Meth	DOEs – validation	DOEs - verification
7	Transport	AM0031	AMS-III.C.		JQA DNV-CUK SGS-UKL TUEV-SUED RWTUV	DNV-CUK SGS-UKL TUEV-SUED
8	Mining and mineral production			ACM0008	DNV-CUK	DNV-CUK
9	Metal production	AM0030			DNV-CUK	DNV-CUK
10	Fugitive emissions from fuels (solid, oil and gas)	AM0009 AM0023	AMS-III.D.	ACM0008	JQA DNV-CUK SGS-UKL TUEV-SUED RWTUV	DNV-CUK SGS-UKL TUEV-SUED
11	Fugitive emissions from halocarbons and sulphur hexafluoride	AM0001			JQA DNV-CUK SGS-UKL TUEV-SUED RWTUV	DNV-CUK SGS-UKL TUEV-SUED
12	Solvent Use				JQA DNV-CUK SGS-UKL TUEV-SUED RWTUV	DNV-CUK SGS-UKL TUEV-SUED
13	Waste handling and disposal	AM0002 AM0003 AM0006 AM0010 AM0011 AM0012 AM0013 AM0016 AM0022 AM0025	AMS-III.D. AMS-III.E. AMS-III.F. AMS-III.G. AMS-III.H. AMS-III.I.	ACM0001	JQA DNV-CUK SGS-UKL TUEV-SUED TUEV-RHEIN JCI RWTUV	DNV-CUK SGS-UKL TUEV-SUED
14	Afforestation and reforestation	AR-AM0001 AR-AM0002 AR-AM0003	AR-AMS0001		TUEV-SUED	
15	Agriculture	AM0006 AM0016	AMS-III.E. AMS-III.H. AMS-III.I.		DNV-CUK SGS-UKL TUEV-SUED	DNV-CUK SGS-UKL TUEV-SUED

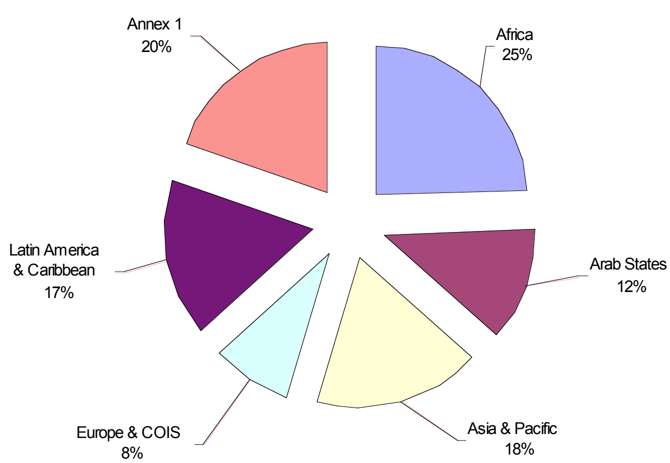
3.6 Designated National Authorities

Designated National Authorities (DNAs) play an essential role in the CDM process. The number of non-Annex 1 countries with DNAs has increased rapidly in recent year. From a relatively small base through 2004, the number of DNAs registered with the UNFCCC nearly doubled in 2 years. As of September 2006, 106 DNAs were registered with the UNFCCC, of which 86 were from non-Annex 1 countries.

Figure 3.5 depicts the geographical distribution of DNAs.[35] Of developing-country DNAs, nearly half are located in either Asia or Latin America. However, not all registered DNAs are necessarily capable of effectively screening and approving CDM projects. Some DNAs have yet to process any project proposals. For instance, sub-Saharan Africa accounts for 18 percent of all registered DNAs, but fewer than a third of these countries have CDM projects that have reached the validation stage.

Nevertheless, the increased number of DNAs does indicate that developing-country interest in the CDM is growing and that host-country approval processes are being established. The number and distribution of DNAs, and the efficiency at which they operate, has an important influence on the structure of the CDM market and the number of projects entering the market. Further discussion of these aspects is provided in Chapter 7.

Figure 3.5: Regional Distribution of DNAs (Annex 1 and non-Annex 1)



[35] The geographic distribution of DNAs has been broken out according to UNDP regional classifications (i.e. Africa, Asia and the Pacific, Europe and the Commonwealth of Independent States, and Latin America and the Caribbean) and by Annex 1 countries (non-UNDP countries, including Canada, Germany, Japan, New Zealand, Sweden and the UK).

3.7 Recent Developments in the CDM Administrative Framework

The CDM rules procedures and administrative processes have only been in place for a few years and have continually evolved since the EB was established in 2001. It was only in December 2005, at the first meeting of the parties (MOP 1) in Montreal, that the Marrakech Accords (the modalities and rules for CDM) were formally adopted. Some issues and constraints have emerged in relation to the establishment and operation of the CDM, including the:

- inadequate level of resources available to the EB to perform its functions efficiently and effectively;
- rate of expansion in the number of approved methodologies in key sectors;
- need to consider a range of new options for CDM projects; and,
- need to increase the contribution of the CDM to sustainable development.

While many issues remain to be resolved, the recent decisions of MOP1 and the CDM Executive Board have shown a willingness, on the part of all parties, to address some of the issues and concerns raised by stakeholders. At MOP1 and recent EB meetings, several key decisions were taken in relation to the CDM rules and modalities, clarifying future direction for the CDM. Key decisions include:

- formal adoption by MOP1 of the modalities and rules for CDM under the Marrakech Accords;
- increased resources for the EB, including pledges from countries for over US$8 million to help support the administrative expenses of the EB;
- appproval of the first LULUCF methodology ('Reforestation with multiple-use forest on degraded land with harvesting');
- introduction of programme-based CDM projects;
- invitation of experts to devise and submit methodologies for carbon capture and storage projects;
- extension of the registration deadline to 31 December 2006 for projects started between 1 January 2000 and 18 November 2004 (and that had also requested validation by DOE or submitted a new methodology by 31 December 2005) to enable retroactive crediting;
- streamlining of the methodology revision process to reduce administrative timeframes.

Furthermore, in response to some strong sentiments expressed by stakeholders, the EB invited suggestions on how certain contentious issues should be addressed. These issues include the decision not to allow non-renewable biomass fuel switching projects, as well as the limited sustainable development benefits from HFC destruction projects. The EB also called for a workshop, to be convened during 2006, on ways to increase the geographical distribution of countries hosting CDM projects and indicated that it will hold a series of DNA forums to help facilitate project activity in a wider range of countries. Another key decision was the introduction of a revised registration fee structure in February 2006, in particular, removal of the registration fee for projects generating 15,000 CERs or less per year.

Other recent decisions that may help support the longer-term growth of the CDM market include:

- agreement to commence 'open and non-binding talks' on the post-2012 regime (following the expiration of the Kyoto Protocol), which will help to reduce uncertainty about the existence of a post-2012 market for CERs;
- a decision to establish a compliance committee, consisting of enforcement and facilitative branches, to ensure compliance with commitments, which may strengthen CER market demand up to 2012; and
- agreement to establish the International Transactions Log (ITL) and other registries by April 2007, which is essential for the transfer and acquittal of CER and ERU flows during the commitment period.

The processes and procedures outlined in this chapter, and the administrative structures put in place to support them, indicate that the CDM project cycle is quite complex and involves many steps. Much has been achieved over the past few years in the evolution of the CDM administrative infrastructure, but further progress is still required in some areas. It must be recognized that the CDM is still a relatively new system and that it will take time for the system to reach maturity.

4 CDM PROJECT CYCLE: TRANSACTION COSTS, ISSUES, AND CONSTRAINTS

Over the past few years, considerable experience has been gained with different stages of the CDM project cycle. As of 20 August 2006, 299 projects had completed the registration process and another 96 were seeking registration.[36] A significant criticism leveled at the CDM is that the project approval and registration process is time consuming, costly, and administratively complex. Many stakeholders consider these factors to be a major disincentive to entering the CDM market.

This chapter assesses the experience to date with transaction costs, major issues and constraints in the project cycle, and whether transaction costs are a barrier to project development. Examples of small- and large-scale CDM projects will be used to illustrate the impact of transaction costs at different stages of the project cycle as well as the financial attractiveness of different project types and sizes.

4.1 Transaction Costs in the CDM Project Cycle

In addition to general project development costs—such as project design, capital costs (e.g., equipment, land procurement), permits (construction approvals and fees), and legal costs—there are costs specific to the CDM process. These costs, which are commonly referred to as 'CDM transaction costs', are associated with development of a Project Idea Note (PIN) and Project Design Document (PDD), project validation, registration with the Executive Board (EB), verification of emission reductions, and negotiating contracts with purchasers of certified emission reductions (CERs). In estimating their CDM transaction costs, project proponents have sometimes included project costs that would have been incurred regardless of whether the project was submitted as a CDM project. Thus, when analysing CDM transaction costs, it is important to distinguish between true CDM-related costs and general project development costs. In this study, the term 'transaction costs' refers only to those costs that are *directly* attributable to the CDM project cycle.

The magnitude of transaction costs incurred by CDM project proponents has attracted considerable attention and criticism from a range of stakeholders. These costs have, in some cases, been significant enough to prevent projects from proceeding. For this reason, it is important to assess the likely level of transaction costs, how these costs vary among projects, and whether these costs will continue to represent a major constraint for CDM projects. As limited data on project costs is publicly available, the information and analysis presented in this chapter is based on data supplied by UNDP sources as well as on published data and information obtained from DOEs, project developers, and carbon market brokers. As transaction costs can vary considerably among projects, the data and analysis presented in this chapter should be viewed as indicative only and not as a basis for investment decisions.

In general, transaction costs can be divided into two main categories: costs incurred up to registration and post-registration costs.

[36] The analysis of CDM project mix undertaken in Chapter 5 is based on the number of projects as of 20 August 2006.

(i) *Pre-registration costs:* The main costs incurred up to registration include pre-feasibility studies, development of a PIN, preparation of a PDD (which can also include development of new baseline and monitoring methodologies), project validation, obtaining host-country approval, and registering the project with the EB.

(ii) *Post-registration costs*: Following registration and project commissioning, CDM projects incur ongoing monitoring and verification costs. They must also pay the Executive Board Administration Fee and the Adaptation Fund Levy, as well as any host-country CDM fees or taxes.

4.1.1 Transaction Costs up to Project Registration

Pre-registration transaction costs can vary considerably and will be influenced by:

- project type and complexity;
- whether an approved baseline methodology exists or must be developed and approved;
- project scale (small or large);
- quality of the PDD, and any subsequent validation issues;
- whether project reviews are required during the registration process; and,
- efficiency of the host-country project approval process.

Based on experience to date, transaction costs for CDM projects up to the stage of registration generally range from US$40,000 to US$200,000 (excluding registration fees). For most projects, transaction costs are US$60,000–130,000, although some have incurred costs as high as US$300,000, due to a range of design, methodology, and validation issues. For small-scale projects, transaction costs are usually 20-40 percent lower than standard projects and generally range from US$40,000 to US$90,000 (US$50,000–70,000 for most).

Table 4.1 below provides an overview of expected highs and lows for transaction costs for each of the steps in the CDM project cycle. (These figures exclude project registration fees, which vary with project size and can be significant for projects generating very large volumes of emission reductions.)

Table 4.1: Estimated Range of CDM Transaction Costs by Stage in the Project Cycle[37]

Stage	Low	High
Pre-development	5,000	15,000
PDD	15,000	50,000
DNA Approval	0	5,000
Validation	10,000	40,000
Legal/Contracting	10,000	20,000
Total	40,000	130,000

The costs that are likely to be incurred at each stage of the project cycle are discussed below.

[37] Some projects may incur higher transaction costs if they are complex and require new methodologies.

Pre-development of project concepts and PINs

The pre-development and project concept stage is generally not significant in terms of financial outlays, but can be lengthy. The cost will depend on the project proponent's level of CDM knowledge and experience; project type, size, and complexity; and the project proponent's experience in working in a particular country. Where CDM project experience is limited, project proponents may need to hire a consultant or CDM specialist to provide advice on CDM processes and requirements, which can entail significant costs.

A feasibility study to examine a project's CDM viability may cost US$15,000 or more, particularly for large and technically complex projects.[38] Project proponents can generally expect to incur costs of less than US$10,000 for the development of a PIN, which is less demanding in terms information requirements than a PDD. However, the PIN may still require considerable time and effort to complete, and pre-feasibility work can take several months and possibly much longer. In some cases, project proponents may need to collect and analyse considerable amounts of data to determine whether a project is likely to be attractive as a CDM investment. Although extensive information gathering and data analysis will incur higher costs at the PIN stage, these will likely be offset by lower costs at the PDD stage, where much of this information will be required. In most instances, preparing a PIN is sensible, as this step can result in considerable savings by screening out activities that are not likely to be viable as CDM projects.

At the pre-development stage, a project proponent should also determine whether there is an approved methodology applicable to the proposed project type. If an approved methodology does not exist, the project proponent will need to evaluate the cost and effort involved in developing a new methodology for review and approval by the EB (see next section).

Project Design Document (PDD)

Preparation of a PDD is usually the largest transaction cost—in terms of both time and money—incurred by project proponents in the CDM project cycle.

The level of cost will depend on the experience of the project proponent and, even more importantly, on whether there is an approved baseline methodology that can be applied to the project. Note, however, that the use of an approved methodology from a similar project does not guarantee that the project will be successfully validated. Even with an approved methodology, poorly prepared and documented PDDs can result in longer and more expensive validation times.

The need to develop a new baseline methodology has proven to be an important factor constraining the growth of the CDM market in recent years. It is also one reason why small-scale projects account for nearly half the projects registered or validated to date, since the EB has developed simplified procedures for small-scale projects, including the availability of approved methodologies. (Some large-scale projects also involve the use of approved methodologies, but many of these methodologies are quite project specific.)

As discussed in Chapter 3, obtaining approval for new methodology generally takes 6–12 months, depending on whether revisions and resubmissions are required, the amount of input from a

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[38] See Axel Michaelowa and Frank Jotzo, 'Transaction Costs of the Kyoto Mechanisms' (2003). Online at: http://www.hwwa.de/Projekte/Forsch_Schwerpunkte/FS/Klimapolitik/PDFDokumente/Michaelowa_et_al_2003.pdf.

Designated Operation Entity (DOE), and the workload of the Executive Board (particularly the Meth Panel). Costs will vary accordingly. Estimated costs for development of a new baseline and monitoring methodology typically range from US$25,000 to US$50,000,[39] although some have incurred higher costs. In general, project proponents should expect to incur costs of US$30,000–40,000 for development of a new baseline methodology, but again this depends on the type and complexity of the project in question.[40]

Satisfying the ‘additionality’ requirement is a major challenge for some projects. In essence, additionality refers to demonstrating that the project goes beyond ‘business-as-usual’ (BAU) practice. However, determining a counterfactual (that is, what would have happened in the project’s absence) is often difficult and sometimes impossible. Thus, the need to establish a BAU baseline is a major complicating factor for baseline-and-credit emission trading systems, such as the CDM.

Project proponents need to provide adequate justification in the PDD to satisfy the DOE and the EB that the project results in emission reductions that would not have occurred in the project’s absence. For some projects, this can be relatively straightforward. For example, HFC, CH_4, and N_2O projects (where there is often no regulatory requirement or economic incentive to capture and destroy these gases) would not normally have occurred in the absence of revenues from the sale of CERs. For others, like many energy efficiency projects, it is less clear cut, particularly where such measures are the least-cost option. In these cases, project proponents will need to demonstrate specific barriers that prevent the project occurring in the business as usual case.

Another challenge encountered by some project proponents has involved ‘first movers’, such as the Dutch government and the World Bank. Some projects developed by these entities prior to clarification and specification of CDM procedures have failed to advance from the PDD stage due to a lack of compliance with CDM rules. An example is V&M do Brazil, a project developed by Ecosecurities, which has never moved beyond a ‘C’ methodology rating (rejected). This partly exemplifies the risks taken by early movers.

The PDD must also report the results of stakeholder consultations and provide information about the project’s environmental impacts. In general, these aspects do not generate significant extra costs, as this information would usually (but not always) be required by governments prior to project approval, regardless of whether the project was proposed for the CDM. For example, the information can often be found in environmental impact assessments, feasibility studies, project business plans, or investment memoranda. However, where stakeholder consultations have been poorly prepared or executed, project proponents have experienced delays and additional costs. Projects that require extensive community consultations can also result in extra costs for project proponents.

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[39] This cost range is based on data published in Michaelowa and Jotzo (2003) as well as project-specific data and communications with DOEs.

[40] Some have argued that potential ‘free rider’ issues with the development of new baseline and monitoring methodologies are a disincentive to project development under the CDM. If no existing methodology is applicable to a proposed CDM project, then the individual project proponent must develop a new methodology for approval by the EB, which, if approved, would then be available for use by later project developers. While this may be the case, it is also clear that many methodologies are project specific and need to be tailored to the underlying project. Thus, ‘free rider’ benefits may exist for some projects, but this is not a major issue for the CDM.

DNA Approval

In general, the DNA approval stage does not produce significant costs, though it can take some time. The level of effort required for DNA approval varies considerably among host countries, according to their administrative structures, processes, and procedures. Depending on the efficiency and rigor of the approval framework, this step can be relatively straightforward; for example, in India project processing and approval times have been relatively short. In other countries, securing DNA approval can be a lengthier undertaking; for example, in Brazil, it took more than a year for the initial batch of projects to secure Letters of Agreement (LoAs) from the DNA.

Costs incurred in preparation of DNA documentation and responding to DNA requests for further information generally are less than US$5,000. However, some projects have incurred higher costs (for example, the Kuyasa project in South Africa) due to extensive additional documentation and information requirements. Delays can also result in added costs if borrowed money or capital is left unutilised. (For a more detailed discussion on DNAs, including examples of approval processes, see Chapter 7.)

Obtaining a LoA has proven not to be a problem for most project participants, apart from significant time delays experienced in some countries. However, there is currently some confusion amongst market participants regarding the timing of LoA issuance. Ultimately, the LoA will need to be submitted to the EB along with the project validation report (i.e. the next step in the project cycle) prepared by a DOE. Although some DOEs prefer to have the LoA in hand prior to finalising the validation report, some countries, such as Canada, the Netherlands, and South Africa require a project validation report before they will issue an LoA.[41]

Since there appear to be no single agreed timeframe, project proponents will need to check the procedures that apply in the country in question. It should be noted that some LOAs issued prior to project validation were subsequently found to be deficient in some way (for example, not including a statement that the project meets the host country's sustainable development criteria), and needed to be reissued by the respective DNA.[42]

Except for the costs involved in preparing documentation and responding to any DNA requests for additional information, there are usually no specific fees levied by DNAs at this stage of the project cycle. However, some DNAs have considered introducing a processing fee and may choose to do so in the future.

Validation

The validation stage has proven to be both expensive and time consuming for many projects. Validation costs will vary depending on project complexity, the quality of the PDD, the existence of baseline or monitoring methodology issues, and whether a site visit is required. Costs for validation

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[41] Canada will, however, issue a preliminary LoA with submission of a non-validated PDD. See http://www.international.gc.ca/cdm-ji/vol-part-en.asp for more details. For information on the Netherlands' approval process, see http://international.vrom.nl/docs/internationaal/CDM%20Implementation%20document%2029%20May%2003%20def_1.pdf.

[42] Among the projects registered through the end of 2005, seven have required reissuance of LoAs. (Reliable information on projects registered in 2006 was not available as this report was being prepared.)

of a single project generally range from US$10,000 to US$40,000 (with most projects experiencing costs of US$10,000–20,000).[43]

To date, the most important factors influencing validation costs have been the quality of the PDD and whether approval of a new baseline methodology is involved. If the PDD is missing important information or does not correctly quantify baseline emissions and expected emission reductions, the DOE must seek clarification from the project proponent or execute corrections on its own. To date, most project validations have required at least some correction or clarification.

Problems commonly encountered during validation include:

- Insufficient technical specification of the baseline;
- Incomplete technical and performance data on new technologies, particularly in relation to performance reliability;
- Lack of clear justification of project 'additionality';
- Inadequate monitoring and reporting plans, particularly in relation to internal procedures and mechanisms for data collection and reporting;
- Inadequate stakeholder consultation; and,
- Insufficient documentation of host-country and/or Annex 1 approvals.

Addressing these problems not only causes delay, but can also generate increased costs for DOE services if the DOE has to spend additional time seeking more information or implementing corrections.

To minimise validation costs, project proponents should ensure the PDD includes all required information and applies the methodology correctly. They should also make sure that they have adequate supporting documentation and systems in place that will enable the DOE to access relevant information easily and quickly. Experience with the PDD development process is still limited, and understanding the lessons learnt to date will be important in improving PDD quality. Recent documents prepared by the UNEP Risoe Centre provide good guidance information for project proponents on PDD and validation issues.[44]

Registration

As outlined in Chapter 3, registration costs are based on a fee scale that varies according to the magnitude of estimated project emission reductions.[45] Unlike many of the costs outlined above, it is effectively fixed.

Thus far, the registration process appears to have operated quite efficiently. If the number of projects seeking registration rises rapidly over the 2006-2008 period, the time required to process

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[43] Based on communications with DOEs, actual project data, and information published in Michaelowa and Jotzo (2003) http://www.hwwa.de/Projekte/Forsch_Schwerpunkte/FS/Klimapolitik/PDFDokumente/Michaelowa_et_al_2003.pdf

[44] In particular, see the joint UNEP/DNV publication *CDM PDD Guidebook: Navigating the Pitfalls* (November 2005), which provides a good overview of key issues encountered at the PDD stage. Nevertheless, formal guidance on how to produce a good PDD is still limited.

[45] For projects expected to generate more than 15,000 CERs/year, registration fees are charged at a rate of US$0.10 per CER for the first 15,000 CERs and US$0.20 for each additional CER, up to a maximum of US$350,000.

registrations could increase due to a heavier workload for the EB. To date, this has not proven to be a major obstacle.

4.1.2 Post-Registration Transaction Costs

Unlike costs up to the point of project registration, which are incurred only once, post-registration costs recur at regular intervals over the life of the project. When aggregated over the project's entire crediting period, total post-registration costs are likely to exceed those incurred up to registration, often by a factor of two or three.

Monitoring

Once a registered project has been implemented, project proponents must collect the appropriate data to enable calculation of the actual emissions reductions achieved. The cost of ongoing project monitoring and reporting depends on several factors, particularly the size and complexity of the project in question. Once adequate data has been collected to enable a worthwhile verification to be undertaken, (which typically takes at least a year), project participants can submit a monitoring report to a DOE for verification. For projects that generate large emission reductions (for example, HFC destruction projects), monitoring reports are sometimes submitted more frequently.

As only a handful of CDM projects have reached the monitoring stage, reliable data is not presently available and it is difficult to assess the actual monitoring costs of different project types. Some estimates put annual monitoring costs as high as US$10,000.[46] For most projects, monitoring and reporting costs are expected to be in the range of US$5,000 to US$10,000 annually, but can be lower for well-designed and managed reporting systems.

Well-specified and administered data collection and monitoring procedures are essential to minimise monitoring costs. Experience from other GHG monitoring and reporting activities, at both the project and organisational level, suggests that costs are highly dependent on the internal data collection and checking systems put in place. It is likely that CDM project proponents will confront similar issues.

Verification and certification

The cost of verification also depends on the size and type of project under consideration. As few CDM projects have so far been verified, only limited data on verification costs is available. Consequently, it is not possible at this stage to draw definitive conclusions on the costs and efficiency of CDM verification activities.

In general, the costs of the initial verification are expected to be higher than subsequent verifications. For most projects, especially those that are complex, the first verification would usually involve a site visit, and may cost in the range of US$15,000 to US$25,000. These initial verifications test the adequacy of project monitoring and reporting systems, and provide a basis for DOEs to offer advice on what modifications, if any, are required to improve these systems.

[46] See Michaelowa and Jotzo (2003). However, given the nascency of the CDM, only limited data is available on actual monitoring costs incurred.

As both the DOE and project proponents become more familiar with what is required, verification costs should fall, and subsequent verifications would normally cost less than US$15,000 and often less than US$10,000. Some projects will always be more expensive than others to verify but in general, actual verification costs will be lower for projects with reliable data collection and reporting systems in place. If the necessary data records and calculations are unclear or not easily accessible, verification costs can rise significantly.

Ease of verification also depends on the skills and experience of the personnel performing the verification activities. As many DOEs are relatively new to the field, it will be a challenge for some to maintain internal quality standards and consistent performance. Like other actors in the CDM project cycle, verifiers will also need to go through a learning process.

Issuance of CERs

Again, since very few CDM projects have so far made it to this stage (55, as of 20 August 2006), it is not possible to assess how efficiently this step of the project cycle will function. Thus far, there have been no known issues or delays experienced with the issuance of CERs. However, project owners face several fixed transaction costs at this stage. Most project participants must pay two fees at the CER issuance stage:

- Executive Board Administration Fee (US$0.10/CER on the first 15,000 CERs per year and US$0.20 for each additional CER, up to a maximum of US$350,000)[47]; and,
- Adaptation Fund Levy (2 percent of CERs from all projects not located in a least developed country).

It is important to note that the impact of the Administration Fee on carbon revenues varies with CER prices. For example, at a CER price of US$5, the Administration Fee amounts to up to 4 percent of CER revenue for a standard (i.e. non-small-scale) project, but at US$10/CER, the fee is less than 2 percent of carbon revenues. The impact on project participants will depend on the arrangements negotiated in the carbon contract, in particular whether the contracts are negotiated at a fixed price per CER or as a share of CERs.[48] The Adaptation Fund Levy is a fixed cost (2 percent of CERs generated, except for LDC projects) and does not vary with CER prices.

Following the issuance of CERs, the host country may opt to retain a portion of the CERs (or the associated revenue) generated by a project. For example, China will levy a CDM fee based on project type.[49] As mentioned earlier, some countries may consider introducing CDM fees or taxes if financial sustainability of their DNA processes is considered an important issue or constraint (see Chapter 7), or if the CDM is viewed as a useful mechanism for generating revenues for other government activities.

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[47] No EB Administration Fee is payable until the registration fee is fully recovered.
[48] If the project owner receives a share of CERs, then the impact of the administration fee will vary with price. If the project owner receives a fixed price, and also has to pay the administration fee, then the impact of the fee is fixed for the duration of the contract.
[49] China intends to levy a tax at the rate of 65 percent for HCFC projects, 30 percent for N_2O projects, and 2 percent for all other projects.

Other transaction costs: Contracting, legal services, and project financing

Besides the costs outlined above, project proponents face other transaction costs, some of which are directly related to the CDM and some of which would have been incurred irrespective of participation in the CDM. For example, negotiating carbon contracts, completing the required legal documentation, and obtaining project finance all entail transaction costs, some of which are CDM-related.

Legal and contracting costs can be a significant transaction cost for some projects. Contracts for the sale and purchase of CERs, usually in the form of Emission Reduction Purchase Agreements (ERPAs), normally contain details on the conditions under which emission reduction credits are transferred between the buyer and seller, such as: the quantity of emissions to be purchased; the timing of delivery of emission reductions; and the price at which reductions are purchased or shared by the buyer. Such contracts may also contain provisions concerning the non-delivery of the emission reductions in the contracted amounts.

In general, the cost associated with an ERPA will depend on the nature of the project in question and the entities involved. The costs can be borne by the buyer, the seller, or both. Information obtained from carbon brokers and legal firms dealing with carbon contracting issues indicates that legal costs generally range from US$10,000 to US$ 20,000. Of course actual costs depend very much on the project in question, but could be significant for small-scale projects.[50]

As more projects reach the CER delivery stage, non-delivery of contracted CERs will undoubtedly become an issue. To reduce exposure to potential legal costs associated with non-delivery of CERs, in some cases buyers and sellers work out a contract that provides flexibility in terms of the actual number of CERs to be delivered in return for a lower price per CER (i.e. the seller takes a lower price but is absolved of responsibility for non-delivery of CERs if these cannot be generated at the level predicted).

Obtaining financing can also involve important transaction costs, since very few CDM projects feature direct equity investment from the carbon market. A signed ERPA can help project proponents secure project financing, particularly if carbon revenue contributes significantly to the project’s financial viability. In other words, where carbon revenues represent a sizeable share of total project revenues, they are likely to have a considerable influence on the project’s internal rate of return (IRR) on investment.

While the impact of CER revenue on a project’s IRR is important, it is by no means the only factor determining whether a project proponent decides to proceed with a CDM project. Financing costs will vary according to the country where finance is raised, risk perceptions on the part of the financial institution, the project’s overall financial attractiveness, and the project proponent’s credit rating.

[50] For more detailed information on legal issues associated with CDM projects refer to the UNEP Risoe report ‘Legal Issues Guidebook to the Clean Development Mechanism’.

4.2 Small-Scale Projects

4.2.1 Impact of Simplified Procedures on Transaction Costs for Small-Scale Projects[51]

As noted earlier, the EB has established simplified procedures aimed at minimising transaction costs for small-scale projects. It is important to evaluate the extent to which these provisions do in fact reduce transaction costs. Table 4.2 below provides an overview of the likely effect of simplified procedures for small-scale projects on transaction costs

Table 4.2: Impact of Simplified Procedures on Transaction Costs for Small-Scale Projects

SIMPLIFIED STEP	EFFECT ON TRANSACTION COST
Simplified PDD	• Some benefits, but not significant. • Costs reduced by up to US$5,000.
Simplified baseline and monitoring methodologies	• Can be a source of substantial savings if small-scale methodology can be used rather than developing a new methodology. • Costs reduced up to US$60,000 compared to a new methodology approval and up to US$30,000 compared to the use of an approved large-scale methodology.
Same DOE for validation and verification	• Usually reduces costs, but mainly in regard to the first verification. • Estimated cost savings of US$2,000–5,000.
No registration fee	• Can provide important cost savings for projects generating emission reductions of 15,000 tonnes/yr or less.
Shorter review period for registration	• Not yet fully tested in practice, but unlikely to deliver significant cost benefits.

As outlined in the previous section, the simplified provisions for small-scale projects can reduce some of the costs associated with completing the PDD. This is especially true for small-scale projects where a comparable large-scale methodology does not exist and the developer would need to prepare a new methodology.

The provision to allow small-scale projects to use the same DOE for validation and verification was designed to minimise verification costs. The reasoning is that the DOE will already be familiar with the project and therefore will require less time to conduct the verification. This is likely to reduce verification costs, although the advantage applies mainly to the initial verification. Since few small-scale projects have reached this stage, it is difficult to substantiate the cost savings, but advice sourced from DOEs suggest that this provision does in fact reduce verification costs.

The provision to waive the registration fee for small-scale projects has the potential to substantially reduce upfront costs for some projects, which has been identified as a major constraint in many countries. However, this provision does not apply equally to all small-scale projects, but only to those projects generating 15,000 tonnes of emission reductions per year or less. Meanwhile, a

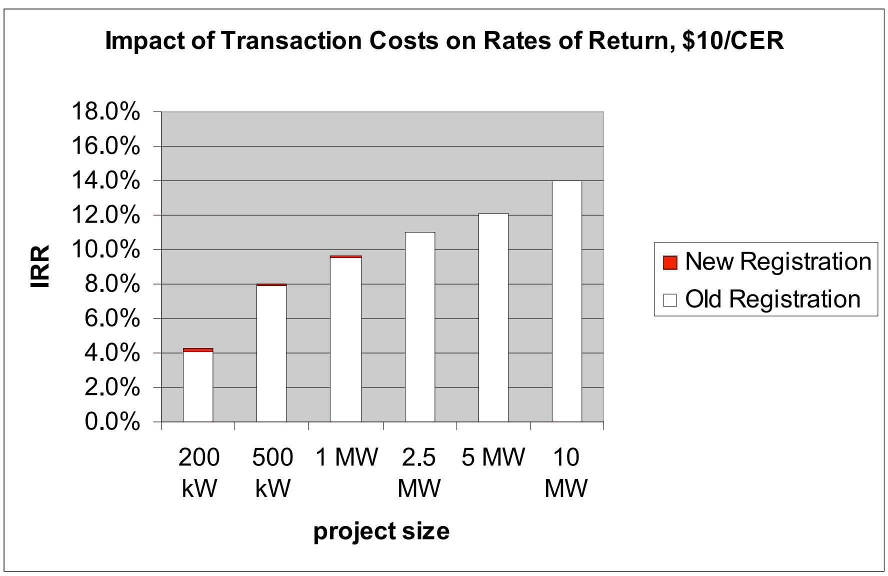
[51] Refer to Section 3.2 for a definition of small-scale projects.

small-scale renewable energy project could, under ideal conditions, generate more than 70,000 tonnes of emission reductions per year (making it subject to a registration fee of US$10,500).

Nevertheless, the February 2006 changes to the registration fee structure have definitely reduced pre-registration transaction costs for projects generating up to 65,000 tonnes of emission reductions per year (the point at which the benefit cuts out) compared to the previous structure. Note that the reduction of upfront registration costs does not lower total transaction costs incurred over the entire project crediting period, but instead postpones payment until after the CERs are issued. However, this shifting of costs into later project periods does have a positive impact (albeit very small) on the internal rate of return for very small projects (i.e. those generating less than 5,000 CERs/year).

Figure 4.1 below illustrates the impact of the revised registration fee structure for a set of hypothetical grid-connected, small-scale hydro projects.[52] In this example, the increase in project IRR is about 0.25 percentage points and cuts out for projects of greater than 2 MW in capacity.

Figure 4.1: Impact of Revised CDM Registration Fee Structure on Rates of Return for Small-Scale Renewable Energy Projects (at US$10/CER)



The simplified procedures for small-scale projects also entail a shorter review period for registration relative to larger projects (i.e. 4 weeks rather than 8 weeks). The effect of this provision is difficult to assess, as few projects have been subject to review. However, it is not expected to offer any discernible cost benefits.

[52] It is assumed that the project sells power for 5 cents per kWh; has a capital cost of US$1,200/kW for the small systems, declining to US$1,000/kW for the 10MW system; and operation and maintenance costs are the same across all units. All have the same resource availability factor; pre-registration transaction costs are assumed to be US$60,000, which is in the mid range for small projects; and CER revenues are based on a 7-year crediting period.

To illustrate the potential benefits of the streamlined procedures, we compare two sets of small- and large-scale CDM (Table 4.3 and Figure 4.2). The first comparison is between 10 MW and 20 MW hydro projects, while the second is between two waste-to-energy projects. (Note that the following analysis provides an assessment of CDM-specific transaction costs up to the point of registration and does not address any other project costs or benefits.)

Table 4.3: Comparison of Transaction Costs for Small-Scale and Standard Projects (US$)[53]

PROJECT TYPE	10 MW HYDRO	20 MW HYDRO	SSC WASTE-TO-ENERGY	WASTE-TO-ENERGY
Methodology	SSC:Type ID	ACM0002	SSC: Type IIID	AM0022
Pre-development (PIN)	$5,000	$5,000	$5,000	$5,000
PDD preparation	$24,000	$30,000	$24,000	$42,000
Validation	$12,000	$16,000	$12,000	$16,000
Host-country approval	$5,000	$5,000	$5,000	$5,000
Registration	$10,000	$15,000	$5,000	$30,000
Contracting	$15,000	$15,000	$15,000	$15,000
TOTAL TRANSACTION COSTS	$71,000	$86,000	$66,000	$113,000

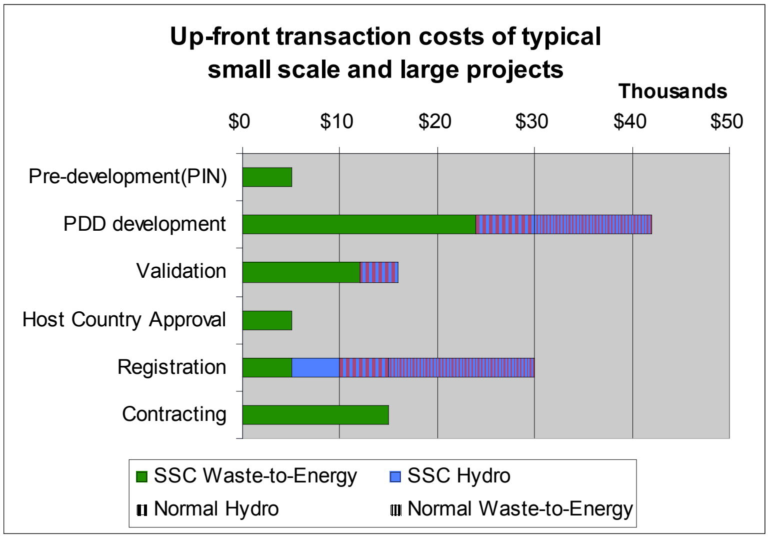
Source: Ecosecurities

As illustrated above, the transaction cost benefits of streamlined procedures for small-scale projects can vary among project types. For the two renewable energy projects, the difference in transaction costs between the small- and large-scale projects is not that significant (approximately US$15,000, or 17 percent), especially compared to the CER-generating capacity of each project. This is largely because the simplified small-scale methodology for grid-connected renewable energy projects is very similar to the approved consolidated methodology.

However, the outcome is somewhat different for the waste-to-energy projects. The transaction costs of the small-scale projects are more than 40 percent lower than those of the non-small-scale project. The majority of the additional costs for the larger projects are a result of complex baseline and monitoring requirements as well as higher registration fees. In this case, the simplified procedures do offer significant transaction cost relief.

[53] This cost data is based on actual projects registered prior to February 2006, when the new registration fee structure was introduced. This does not alter the findings significantly.

Figure 4.2: Upfront Transaction Costs of Typical Small-Scale and Standard Projects



4.2.2 Project Bundling and Programmatic CDM

The rationale behind provisions allowing bundling of CDM projects is to reduce transaction costs. However, there is little available data on bundled projects, so it is not clear to what extent transaction cost savings have actually been achieved.

Bundling does not necessarily reduce costs associated with PDD preparation, as each activity within a bundle still requires the same amount of project assessment and documentation. Nor would it reduce registration fees, since these are based on the expected level of emission reductions, which should remain the same, regardless of whether the projects are bundled.

Validation costs might be reduced relative to projects submitted separately, if the bundled projects are similar in nature and located in the same country, thereby reducing travel and associated costs. Such cost savings might also apply at the monitoring and verification stages.

Verification costs for bundled projects would be further reduced if spot verification or a representative sampling of projects were permitted as the basis for crediting. Under present CDM rules and procedures, this is not allowed, but the EB may wish to consider such an option if reducing transaction costs associated with verification is considered important.

Given the lack of clarity on how programmatic CDM will be implemented, it is too early to judge whether this approach will offer any transaction cost benefits. This is an area for future research and analysis, once methodologies and projects have been formulated and approved, and when some experience with programmatic CDM has been gained.

4.3 Comparison of Transaction Costs Across Project Types

To further illustrate the impact of transaction costs on different project types and sizes, an analysis was undertaken for seven different CDM projects, with the objective of assessing whether transaction costs really are a disincentive or barrier to investment in CDM projects. The projects include four renewable energy projects (both small- and large-scale), two waste-to-energy projects (also small- and large-scale), and one landfill gas project.

These sample projects are based on actual projects, but for reasons of confidentiality the projects are not identified by name.[54] The cost information provided in this section should be viewed as indicative only, although most of the data is based on costs incurred by the actual projects. While these examples by no means provide exhaustive coverage of the range of projects presently in the CDM pipeline, they do illustrate the relative importance of transaction costs in overall financial viability for different project types.

Transaction costs have been subdivided into two categories: costs incurred up to the point of registration and costs incurred after the project has commenced operation. Transaction costs are assessed against different CER prices to test their sensitivity to CER price variations. The results are reported as a percentage of total carbon revenues (assuming a 7-year crediting period, which is relatively conservative) and in terms of project payback period (i.e. the time it takes to recover transaction costs). Insufficient data was available on other revenue streams for the sample projects (for example, revenues from electricity generation) to calculate the impact of transaction costs on rate of return on investment. Nevertheless, the calculated payback period is an indicator that serves as a proxy for the potential contribution of carbon revenues to the project.

Tables 4.4 and 4.5 provide an overview of transaction costs for the seven sample projects. The tables present information on transaction costs incurred by different types of projects, the importance of transaction costs relative to total project costs, and transaction costs as percentage of carbon revenue. The tables also contain information on the contribution of carbon revenue to total project costs.

4.3.1 Comparison of Costs to Registration

Market participants often cite transaction costs incurred up to the point of project registration as a major impediment to CDM project development. However, the information presented in Tables 4.4 and 4.5 below (as well as the results of preceding analysis in this chapter) indicates that the magnitude of transaction costs up to project registration are much less significant than might be expected. (As noted above, transaction costs up to the point of registration vary among projects, but most fall within a similar range.) What is clear is that these transaction costs depend strongly on the magnitude of CER generation over the project's crediting lifetime.

For projects generating more than 250,000 CERs per year, the transaction costs up to the point of registration are not significant relative to estimated carbon revenues, even at low CER prices (e.g., US$5 per CER). Once CER prices increase beyond US$10, carbon revenues quickly rise and exceed the level of transaction costs, often within a few months (once the CERs are actually

[54] Not all these projects have been submitted to the Executive Board for registration. In some cases, transaction cost data has been extrapolated from other projects and approximates the likely costs if the sample projects had been registered and implemented, and had completed all requirements over a 7-year crediting period. As such, cost data is indicative and intended to illustrate the relative importance of various transaction costs for different project types.

issued). Projects generating large volumes of CERs do have to pay a significant upfront registration fee (for example, US$50,000 for a project generating 250,000 CERs per year, and up to US$350,000 for projects generating above 1.75 million CERs per year), but this fee is generally recouped quickly, as the initial CERs issued are not subject to the EB Administration Fee.

For projects generating medium-scale quantities of CERs (i.e. 50,000–250,000 CERs per year), the transaction costs to registration also are equivalent to only a few percent of carbon revenues and are usually recovered in a few months. Again, as CER prices rise beyond US$10, transaction costs to registration become even less significant.

The only case in which transaction costs to registration account for a significant percentage of carbon revenue is for projects generating less than 15,000 CERs per year. For these projects, it may take more than a year to recover transaction costs to registration when CER prices are low. However, once CER prices increase beyond US$10, transaction costs to registration become less and less significant for projects at this scale.

For the very smallest projects (i.e. those generating fewer than 5,000 CERs per year), transaction costs to registration can remain a serious constraint, even when CER prices are relatively high. For example, the transaction costs to registration for a small-scale PV project generating 500 CERs per year are US$60,000. In this case, CER prices would need to rise above US$15 just to recover the transaction costs to registration, let alone the costs incurred post registration. Thus, such a project is clearly not attractive from a CDM point of view, despite its potential sustainable development benefits.

4.3.2 Comparison of Post-Registration Costs

Post-registration transaction costs consist mainly of monitoring, reporting, and verification costs, as well as the fixed CDM charges (i.e. the EB Administration Fee and the Adaptation Fund Levy). In general, post-registration transaction costs are two to four times greater than transaction costs incurred up to registration. However, the importance of these costs varies considerably, according to project size, type, and location.

For some projects (particularly those generating up to 50,000 CERs per year), the fixed CDM charges can affect net carbon revenue flows and thus diminish project viability. For other project types, particularly those generating less than 15,000 CERs/year, pre- and post-registration costs are more evenly balanced.

The key difference between transaction costs incurred post registration and costs incurred up to the point of registration is that payment of post-registration costs is in effect risk free, since the carbon revenue stream (i.e. issued CERs) is available to cover these costs (unlike pre-registration costs).

4.3.3 Comparison of Total Transaction Costs

When all transaction costs are combined, it is clear that they can have a noticeable impact on net carbon revenues, particularly for small projects (see Tables 4.4 and 4.5). In general, the most important variable determining the significance of transaction costs is project size.

For large projects, total transaction costs are relatively small and account for 5–10 percent of carbon revenues (depending on CER prices). For projects generating medium-scale volumes of CERs, transaction costs overall can account for 10–20 percent of carbon revenues. Payback periods increase accordingly, but appear to remain quite manageable. For small-scale projects, however, total transaction costs are much more significant and are likely to account for 20–40 percent of carbon revenues (assuming a 7-year crediting period).

Whether these costs are significant enough to affect investment decisions will depend on: their overall impact on project IRR; the availability of upfront and project financing; and perceptions concerning the likelihood of multiple crediting periods. Later in the crediting period, and in subsequent crediting periods, the impact of transaction costs on net carbon revenue tends to fall, as these costs are spread over a greater number of CERs, and because monitoring and verification costs are likely to fall over time due to learning effects.

For very small projects (i.e. those generating less than 5,000 CERs per year), total transaction costs are likely to absorb most of the carbon revenues (at least until CER prices exceed US$15–20) and basically render these projects financially unattractive in most circumstances. For example, a 500kW Solar PV project would not even recover CDM transaction costs by the end of the crediting period unless CER prices exceeded US$25.

4.3.4 CDM Carbon Revenues and Project Viability

The contribution of carbon revenues to project financial viability can also be an important determinant for decision-making about whether to pursue CDM projects. As mentioned above, it is difficult to evaluate the impact of carbon revenues on project IRR without data on all the cost and revenue streams of the project, such as revenue from electricity sales, reduced energy costs, reduced waste handling charges and fees, and others. Nevertheless, assessing carbon revenues over the crediting period against total project costs (including all CDM transaction costs) does give an approximate indication of the relative contribution made by CER revenues to project viability.

Examining the sample projects reported on in Tables 4.4 and 4.5, it is clear that the CDM can be a very attractive option for some projects, particularly once CER prices rise beyond US$10. For example, at US$15/CER, the sample landfill gas project would recover total project costs more than six-fold during a 7-year crediting period, with a total project payback period of just over 1 year—making this a very attractive investment proposition as a CDM project. However, at lower CER prices (particularly US$5 or less), the returns on investment are much more modest but, for some, still reasonably attractive.

For other project types, particularly renewable energy projects that generate electricity for sale to the grid as the primary revenue source, the availability of carbon revenues as a secondary revenue source can make an important contribution to project viability. As illustrated in Table 4.5, at prices of US$10 per CER, 10–20 percent of the project investment can be easily recovered in just the first 7 years. Assuming that a post-2012 CER market exists, and that some projects could have potential crediting periods of up to 21 years, accessing the CDM would appear to make such projects attractive investment propositions.

Advice and information from Ecosecurities and other carbon brokers indicates that project developers are usually hesitant to pursue a CDM project if the revenue will not cover transaction costs within the first or second year of the project. Also important for decision-making is the impact of CER revenues (less transaction costs) on the project's IRR. For example, the decision to invest in an industrial gas capture-and-destruction project, where there is otherwise no economic or regulatory incentive to implement the project, is clearly driven by the potential to generate carbon revenues via the CDM mechanism. For projects that generate other revenue streams (such as electricity sales), the incremental increase to the project's IRR due to carbon revenues is the important variable for CDM project decision-making. A wind power project, for instance, with an IRR that is not sufficiently large to warrant investment in its own right might become financially attractive when CDM revenues are added into the equation, (i.e. the IRR passes the project developer's investment threshold).

Table 4.4: Impact of Transaction Costs on Large- and Small-Scale Waste-To-Energy and Landfill Gas Projects

	WASTE TO ENERGY (LARGE-SCALE)			WASTE TO ENERGY (SMALL-SCALE)			LANDFILL GAS (METHANE EXTRACTION)		
Project Size – Installed Cap.	2 MW			150 kW			11 MW		
CERs/yr	50,000			8000			330,000		
Total Project Development Costs	$3,600,000			$180,000			$3,600,000		
Pre-Registration Transaction Costs	$90,000			$60,000			$240,000		
Carbon (C) Price ($/tonne)	$5	$10	$15	$5	$10	$15	$5	$10	$15
Post-Registration Transaction Costs[55]	$210,000	$245,000	$280,000	$67,200	$72,100	$79,400	$1,043,000	$1,274,000	$1,505,000
Post-Registration Transaction Costs (as % of C revenue)	12.0%	7.0%	5.3%	24.5%	13.3%	9.1%	9.0%	5.5%	4.3%
Total Transaction Costs	$300,000	$335,000	$370,000	$127,200	$132,100	$139,400	$1,283,000	$1,514,000	$1,745,000
Total Transaction Costs (as % of C revenue)	17.1%	9.6%	7.0%	45.9%	24.1%	17.3%	11.1%	6.6%	5.0%
Payback for Total Transaction Costs (yrs)	1.20	0.67	0.49	3.18	1.66	1.16	0.78	0.46	0.35
Carbon Revenue (as % of total cost)	44.9	88.9	132.3	97.8	191.9	282.4	236.5	451.7	648.3

[55] Post-registration transaction costs consist of: Adaptation Levy (2 percent Levy), EB Administration Fee ($0.2/CER), and annual monitoring and verification costs.

Table 4.5: Impact of Transaction Costs on Hydro, Wind, and Solar PV Projects

	HYDRO (LARGE-SCALE)			HYDRO (SMALL-SCALE)			WIND FARM (LARGE-SCALE)			SOLAR PV (SMALL-SCALE)		
Project Size – Installed Cap.	155 MW			5.8 MW			20 MW			155 kW		
CERs/yr	470,000			20,000			50,000			500		
Total Project Devt Costs	$154,000,000			$7,700,000			$19,000,000			$592,000		
Pre-Registration Transaction Costs	$120,000			$75,000			$100,000			$60,000		
Carbon (C) Price ($/tonne)	$5	$10	$15	$5	$10	$15	$5	$10	$15	$5	$10	$15
Post-Registration Trans Costs[56]	$1,337,000	$1,666,000	$1,995,000	$243,000	$257,000	$271,000	$315,000	$350,000	$385,000	$35,700	36,050	36,400
Post-Reg Trans $ as % of C revenue	8.1%	5.1%	4.0%	34.7%	18.4%	12.9%	18.0%	10.0%	7.3%	204.0%	103.0%	69.3%
Total Trans Costs	$1,457,000	$1,786,000	$2,115,000	$243,000	$257,000	$271,000	$415,000	$450,000	$485,000	$95,700	$96,050	$96,400
Total Trans Costs as % of C revenue	8.9%	5.4%	4.3%	34.7%	18.4%	12.9%	23.7%	12.9%	9.2%	546.9%	274.4%	183.6%
Payback for Total Trans Costs (yrs)	0.62	0.38	0.30	2.43	1.29	0.90	1.66	0.90	0.65	38.28	19.21	12.85
Carbon Revenue (as % of total costs)	10.6	21.1	31.6	8.8	17.6	26.3	9.0	18.0	26.9	2.5	5.1	7.6

[56] Post-registration transaction costs consist: of Adaptation Levy (2 percent), Administration Fee ($0.2/CER), and annual monitoring and verification costs.

5 ASSESSMENT OF CDM PROJECT MIX TO 2012

Sufficient information is now available on projects in the CDM pipeline to undertake a meaningful analysis of the type, location, and size of projects that have emerged to date, as well as the distribution of CERs that these projects may deliver during the first commitment period (2008–2012). The purpose of this chapter is to analyse the available project information and ascertain how the CDM is evolving. In particular, the number and type of projects, their size and geographic distribution, the technologies they employ, and the magnitude of foreign investment flows will have a major bearing on the extent to which the CDM contributes to sustainable development in non-Annex 1 countries and provides Annex 1 countries with options for alternative greenhouse-gas emission reductions.

5.1 Project Categories

This chapter reviews the projects expected to become operational over the next few years. The main focus is on those projects that have reached the registration stage (either registered or have requested registration) as these are the most reliable indicators of the CDM project mix in the medium term. For purposes of analysis, these are aggregated in one category as 'confirmed' projects.

However, the CDM market is very dynamic and many of the projects currently at the validation stage will be registered and implemented over the next 3 years (particularly if more certainty emerges concerning the post-2012 CER market). These projects are classified as 'probable'. They provide an indication of the medium-term trends in the CDM project mix, and how the geographic distribution of projects and CERs may change through 2012.

Aggregating the categories of 'confirmed' and 'probable' projects yields the total number of projects in the CDM pipeline that are analysed in this chapter. This aggregate category is referred to as the 'combined' category.

A third category of CDM projects—namely, those that have completed the PDD stage, but have not yet reached the validation stage—are also part of the longer-term project pipeline and are classified as 'potential market supply'. Potential supply will depend on the number and quality of PDDs that progress to the validation and registration stages, the size of these projects, and their timelines for delivering emission reductions. While these projects represent possible supply during the period 2008–2012, they are not included in the pipeline analysis undertaken in this chapter (but are included in the analysis in Chapter 6).

Table 5.1 indicates the number of projects in each of the categories described above, as of 20 August 2006.

Table 5.1: Number of Projects by Category[57]

Category name	Description	Number of projects	CERs/yr (kt)	CERs to 2012 (kt)
Confirmed	Projects that have reached the registration stage (either registered or have requested registration)	395	110	~740
Probable	Projects currently at the validation stage	750	83	~520
Combined	Confirmed and probable projects combined	1,145	192	~1,260
Potential Market Supply	Projects that have completed the PDD stage, but that have not yet reached the validation stage	300-400	NA	NA

In addition, a large number of projects (currently estimated at more than 2,000) are at the PDD and PIN development stages.[58] While these provide a useful indicator of the number of projects that may enter the project pipeline at some future date, insufficient project data was available to undertake a meaningful analysis. UNDP's experience with CDM project development suggests that only a small fraction (generally fewer than a fifth) of PINs are translated into bankable projects. In the absence of a guaranteed post-2012 CER market, even those project developers whose projects appear relatively attractive may decide to postpone seeking registration until a clearer picture of the post-2012 climate change regime emerges. Because of these uncertainties, we have excluded from the analysis projects still at the PIN stage of the CDM project cycle.

Furthermore, registering projects and actually delivering the expected CERs are two very different matters. Many of the projects that are either registered or validated will deliver CERs over the period to 2012, but some will not deliver the quantities estimated in their PDDs, and others will not even be implemented. The net result is that actual CER delivery is likely to be substantially lower than estimated CER delivery. Until at least 2 years of project verification results are available, the deviation of delivered CERs from estimated levels will remain unclear.

For this analysis, we assume that all confirmed projects are actually implemented and deliver the quantity of CERs estimated in their PDDs. In the following sections, we discuss in detail the composition and geographical distribution of confirmed projects and the CERs they are expected to generate. Following this is an assessment of potential outcomes if the large number of projects in the probable category are also registered and implemented. The dynamic nature of the CDM market means that the following analysis presents a plausible snapshot of trends in project and CER numbers over the medium term, but these trends are likely to remain in flux to some extent over the next few years.

[57] The data used for this analysis is primarily derived from the UNEP Risoe Centre CDM statistics as of 20 August 2006.
[58] According to Point Carbon's (April 2006) CDM and JI data.

5.2 Distribution of Projects and CERs by Project Type

For the purposes of this report, CDM projects have been divided into different categories based on their technological and sector characteristics.[59] These categories are:

- Afforestation and reforestation;
- Agriculture (mainly animal waste management (AWM));
- Biomass/biogas energy;
- Cement;
- Energy efficiency (demand and supply side);
- Fossil fuel switching;
- Fugitive emissions (includes flaring, but excludes landfill gas and agriculture);
- HFC and N_20 reduction (commonly referred to as industrial gas projects);
- Landfill gas capture;
- Renewable energy generation (includes wind, solar, hydropower, geothermal); and,
- Transportation.

Although biomass/biogas is generally considered a renewable energy source, these project types have been classified separately to illustrate their contribution as a technology option. Similarly, landfill gas capture projects and animal waste reduction projects (classified as agriculture AWM)[60] have been categorised separately, due to the importance of these project types in determining likely CER supplies. Cement and fossil fuel switching projects are also allocated into separate categories due to their specific technology characteristics (although these categories have made a relatively minor contribution to project numbers and estimated CERs thus far). Industrial gas capture and destruction projects (such as HFC and N_20 projects) are grouped together due to their similar characteristics. Other project types, such as enhanced oil recovery and carbon capture and storage, have yet to feature in the CDM project mix.

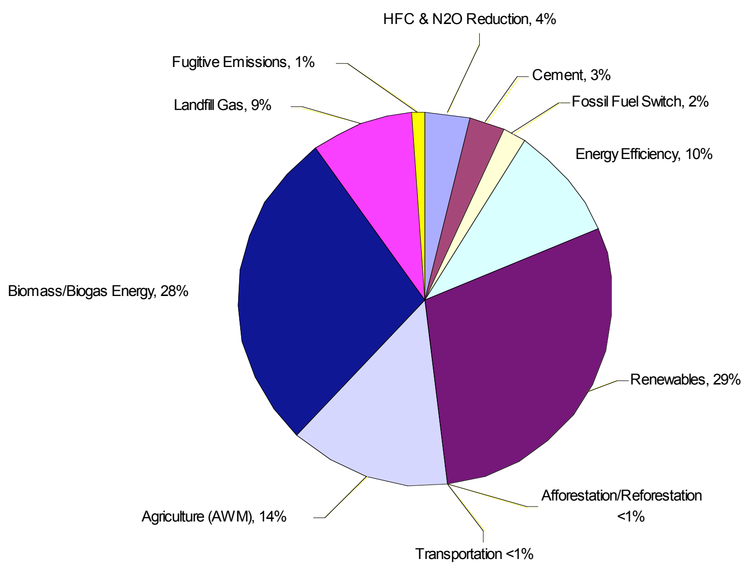
5.2.1 Distribution of Confirmed Projects by Project Type

Renewable energy is the most common project type to date (with a 29 percent share of projects by number), followed closely by biomass/biogas (28 percent), and then agriculture AWM (14 percent), energy efficiency (10 percent), and landfill gas (9 percent). Together, these five project types make up close to 90 percent of all projects in the confirmed category (Figure 5.1).

[59] These categories have been established by UNDP and are not intended to correlate with the classifications adopted by the UNFCCC or any other organization.

[60] It should be noted that there are currently no other types of agriculture projects besides animal waste management.

Figure 5.1: Distribution of Confirmed Projects by Project Type

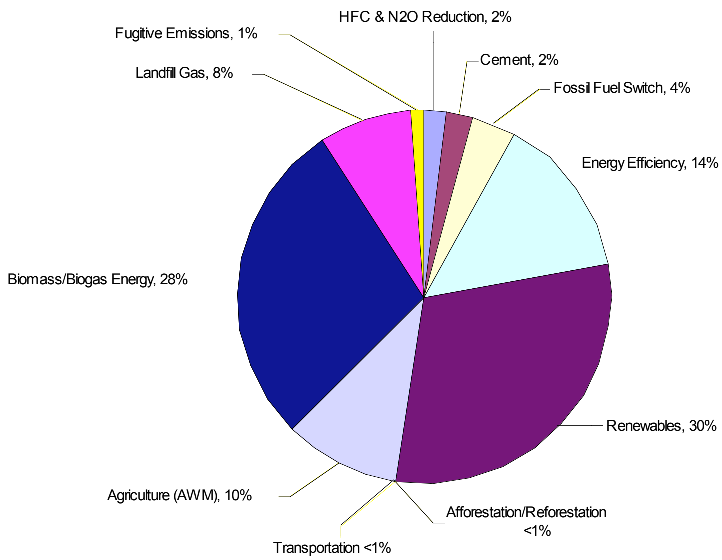


5.2.2 Distribution of Combined Projects (Confirmed + Probable) by Project Type

If we combine projects in the confirmed and probable categories, we get a reasonably clear picture of how the CDM project mix may evolve over the next few years. Although the CDM has been criticised regarding the types of projects it has supported, a majority of projects in the pipeline (in terms of project *numbers*) do appear to utilise technologies viewed as contributing to sustainable development.

As can be seen in Figure 5.2, renewable energy and biomass/biogas remain the most common project type (30 percent and 28 percent, respectively). Together with energy efficiency and agriculture AWM projects, these project types account for 83 percent of the projects in the combined category. If landfill gas projects are included, the proportion increases to 90 percent. Overall, the project mix remains reasonably balanced in terms of project type and is unlikely to change significantly in the next few years. However, note that the contribution from the transportation and afforestation/reforestation sectors remains insignificant.

Figure 5.2: Distribution of Combined Projects (Confirmed + Probable) by Project Type



5.2.3 Volume and Distribution of CERs from Confirmed Projects by Project Type

It is important to analyse the CDM project mix not only in terms of project numbers, but also by the volume of CERs these projects are expected to generate through the end of 2012. This is key for assessing which countries and technologies stand to benefit from the CDM through actual revenue flows from CERs in the coming years.

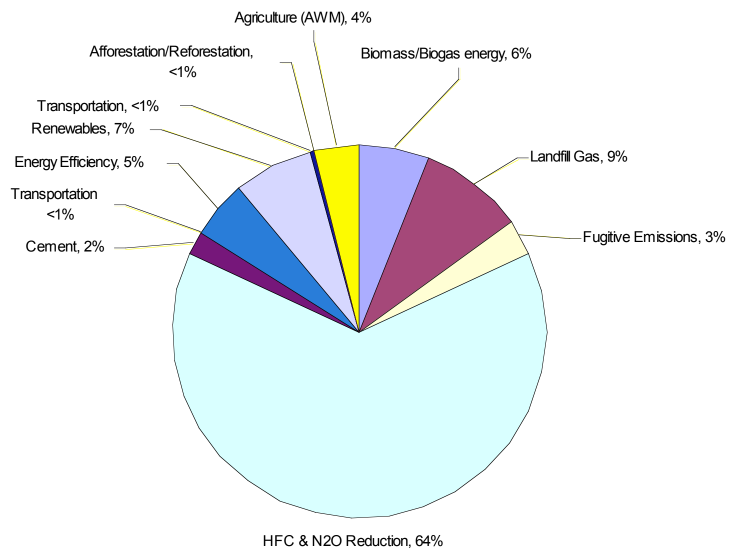
However, predicting volumes of CER delivery through 2012 is considerably more difficult than determining numbers of projects in the project mix. Based on regularly updated CDM project data from the UNEP Risoe Centre,[61] we estimate that projects in the confirmed category could generate an annual CER flow of 110 million tons of CO_2e and cumulative CER flows of about 740 million tons of CO_2e through the end of 2012.

Figure 5.3 indicates the distribution of expected CER flows by project type from the confirmed project category through the end of 2012. The picture that emerges is quite different from that in Figure 5.2 (distribution of project numbers by project type). For example, while renewable energy generation projects account for 29 percent of project numbers, they are expected to generate only 7 percent of CER flows. Similarly, biomass/biogas projects make up 28 percent of projects by number, but only 6 percent of projected CER flows. Adding in other project types that are considered to offer sustainable development and environmental benefits (such as energy efficiency and agriculture AWM) accounts for 83 percent of total projects by number, but only 22 percent of total CER flows.

[61] UNEP Risoe Centre: http://www.uneprisoe.org/

Conversely, nearly two-thirds (64 percent) of CER flow through the end of 2012 come from just eleven HFC projects and four N_2O reduction projects, accounting for only 4 percent of CDM projects by number.

Figure 5.3: Distribution of CERs to 2012 from Confirmed Projects by Project Type



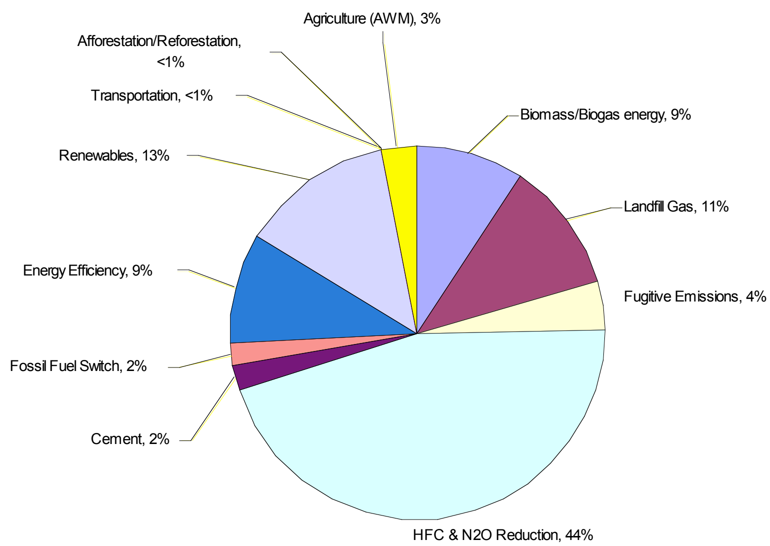
Some stakeholders have expressed concerns about the magnitude of CER flows coming from a handful of industrial gas projects that offer limited sustainable development benefits. Nonetheless, these projects do have an important role to play in the evolution of the CDM market. Since it will be some time before other project types generate significant volumes of CERs, the large CER flows from HFC and N_2O projects will provide much needed liquidity to the project-based carbon market over the next few years. Increasing the quantity of actual CERs in the market is essential to establishing the carbon market. Furthermore, the current dominance of these industrial gas projects also reflects the market at work, as these projects clearly are highly attractive to investors.

5.2.4 Volume and Distribution of CERs from Combined (Confirmed + Probable) Projects by Project Type

If we extend the analysis to include all projects in the confirmed and probable categories, CER flows by project type change somewhat. The share of industrial gas projects (HFC and N_2O) falls, but these projects still account for more than 40 percent of all estimated CER generation (see Figure 5.4).

With the expected substantial increase in the number of renewable energy generation, energy efficiency, biomass/biogas, and agriculture AWM projects entering the registration phase in the near future, their combined share of CERs could increase to 35 percent (up from 22 percent for confirmed projects alone). This is a positive trend that indicates that carbon revenue benefits will begin to flow to projects that provide a higher sustainable development dividend over the coming years. However, carbon revenues flowing to these projects will need to increase substantially if the CDM is to deliver significant technology transfer and development benefits.

Figure 5.4: Distribution of CERs to 2012 from Combined Projects by Project Type



5.3 Distribution of Projects and CERs by Project Size

It is also useful to assess the distribution of projects by project size. Some market analysts have asserted that high transaction costs represent a significant disincentive to development of small-scale projects, even with the adoption of simplified, streamlined administrative procedures, and that such costs will continue to limit the numbers of small-scale projects entering the CDM pipeline.

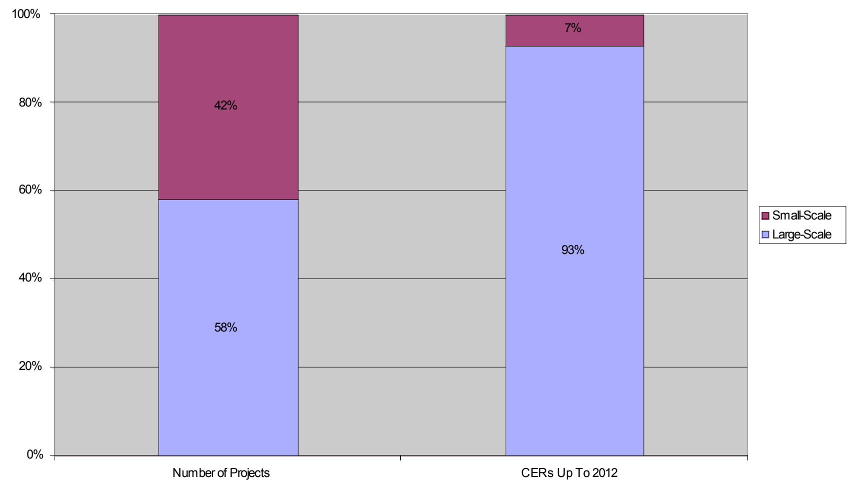
5.3.1 Distribution of Confirmed Projects by Project Size

Of the 395 projects in the confirmed category, 42 percent fall under the small-scale project classification, accounting for an estimated 7 percent of CER supply through the end of 2012 (see Figure 5.5). This disparity between project numbers and estimated CER flow is to be expected, given the small size of these projects and the dominance of CER generation by a few large industrial gas projects.

One observation of interest is that the average size of the small-scale projects in the confirmed category is around 26,000 CERs per year, with a median of just over 22,000

CERs. Both figures are well in excess of the benchmark for projects (other than renewable energy generation) in the small-scale category (i.e. 15,000 CERs per year).

Figure 5.5: Distribution of Confirmed Projects by Number of Projects and Volume of CERs to 2012, for Small- and Large-Scale Project Categories



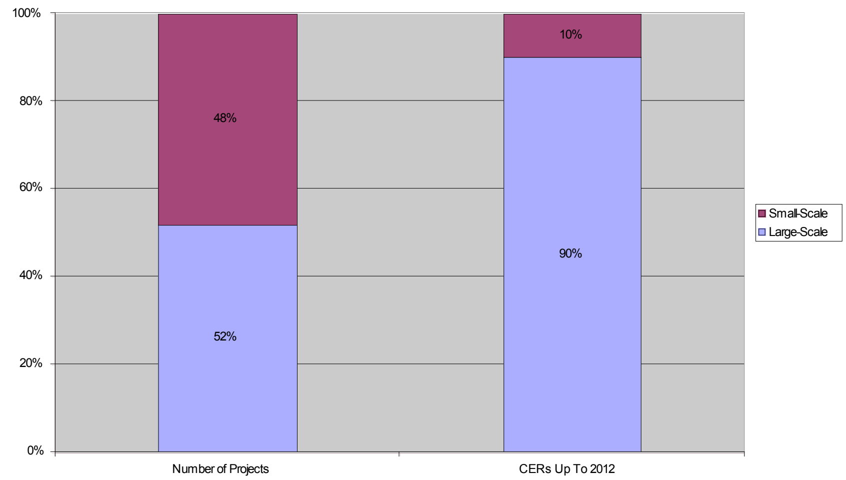
5.3.2 Distribution of Combined Projects (Confirmed + Probable) by Project Size

If we include in the analysis the 750 additional projects that have reached the validation stage, the share of small projects increases significantly, making up nearly half (48 percent) of the CDM project mix (see Figure 5.6).

Also of significance is the increase in the share of CER flows generated by small-scale projects, increasing from 7 percent to 10 percent (see Figures 5.5 and 5.6). However, this is due more to the decrease in the share of industrial gas projects in the validation pipeline relative to the confirmed category, than to the increase in the average number of CERs delivered by small-scale projects.

Nevertheless, the average size of small-scale projects in the combined category is likely to rise to more than 33,000 CERs per year (compared with 26,000 in the confirmed category alone). Key project types and technologies among small-scale projects in the combined category are biomass (25 percent), hydro (22 percent), energy efficiency (13 percent), agriculture (11 percent) and wind (9 percent).

Figure 5.6: Distribution of Combined Projects (Confirmed + Probable) by Number of Projects and Volume of CERs to 2012, for Small- and Large-Scale Project Categories



Several factors could account for the observed rise in the share of small-scale projects in the overall project mix, including increased experience with, and replication of, small-scale projects; ease of utilising small-scale methodologies; and/or difficulty involved in securing methodology approval for large-scale projects. While small-scale projects do not always offer greater sustainable development benefits than larger-scale projects, the technologies they employ and their scale of operations often mean that a wider section of the community benefits from project activities. A recent review of small-scale projects in the CDM pipeline suggests that such projects tend to deliver greater benefits to the least developed countries, particularly in rural areas where poverty reduction is often a pressing issue.[62]

The trend toward increasing average size of small-scale projects raises the question of whether the 15,000 CER per year limit on projects other than renewable energy generation is really a sensible threshold. Increasing the small-scale threshold to 30,000 CERs per year for all project types would better reflect emerging trends in the actual CDM project mix and eliminate some of the current differential treatment between project types.

5.4 Geographic Distribution of Projects and CERs

An important issue to evaluate is the geographic distribution of projects and CER flows over the period to 2012. Many stakeholders have raised concerns about the lopsided distribution of projects by host country and region. This is to be expected in the early phases of establishing the CDM, as some countries were early starters and others are only

[62] A review by the International Institute for Sustainable Development (IISD) indicates that the share of small-scale CDM projects is much higher in low-income and least developed countries (66 percent) than in higher-income countries (25 percent). In addition, the share of emission reductions delivered through small-scale projects decreases with the level of development, from 33 percent for LDCs to 0.3 percent for higher-income countries. See http://www.iisd.org/climate/global/ctp.asp.

just commencing. The geographic spread of projects and CER flows is likely to expand as more projects enter the pipeline and are registered. Meanwhile, the existing CDM project pipeline (confirmed plus probable projects) provides a good indicator of likely geographic distribution in the medium term.

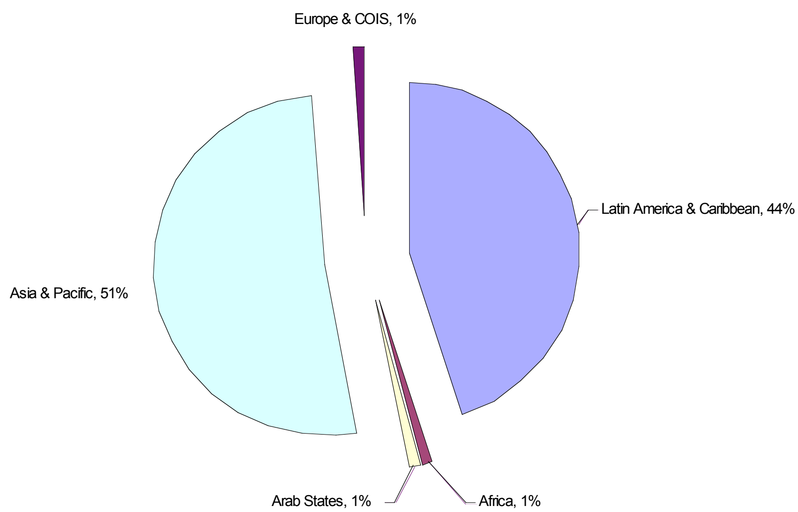
This section reviews the distribution of confirmed and probable projects by number and CER flow, on both a regional and an individual country basis. It needs to be recognised that the statistics presented are not weighted according to population size, size of host-country economy, or aggregate greenhouse gas emissions. Countries with large populations and economies (for example, China, India, and Brazil) account for most of non-Annex 1 greenhouse gas emissions and could be expected to account for a equally large share of CDM projects. What appears to be a skewed geographic distribution might not, in fact, be so unbalanced when population size and the size of the economy are taken into account.

5.4.1 Distribution of Confirmed Projects by Region[63]

Two regions - Asia and the Pacific, and Latin America and the Caribbean - dominate the distribution of confirmed projects. Together these regions account for 96 percent of projects by number and 96 percent of CER flows (see Figures 5.7 and 5.8). Since these regions account for a large share of the population and economic output of non-Annex 1 countries, it is not unexpected that these regions would also account for a large share of CDM projects and CER flows. However, their dominance of the CDM project mix is far more than proportionate, and the other global regions are significantly under-represented in terms of project numbers and CER flows. In particular, Africa (excluding North Africa) only accounts for 1 percent of confirmed projects and 0.02 percent of estimated CER flows through the end of 2012.

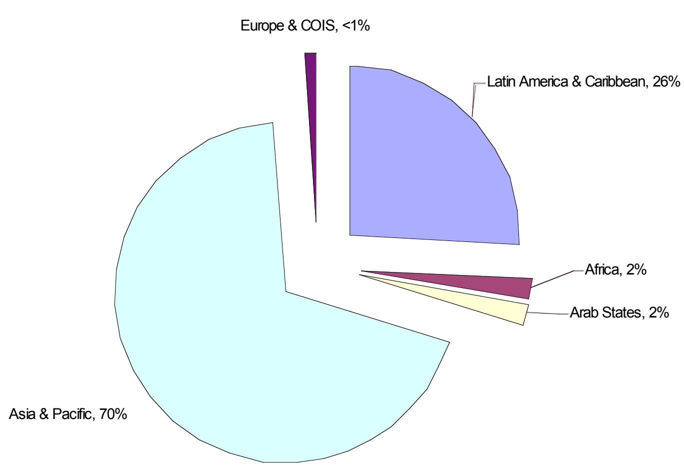
[63] Regions are based on UNDP classifications.

Figure 5.7: Regional Distribution of Confirmed Projects



While Asia and Latin America are roughly equal in their dominance of project numbers, the distribution of CER flows shows a significant disparity. Asia is expected to generate 70 percent of CERs, versus 26 percent for Latin America. The main reason for this imbalance is the extremely large emission reductions generated by a handful of industrial gas projects in China, India and South Korea.

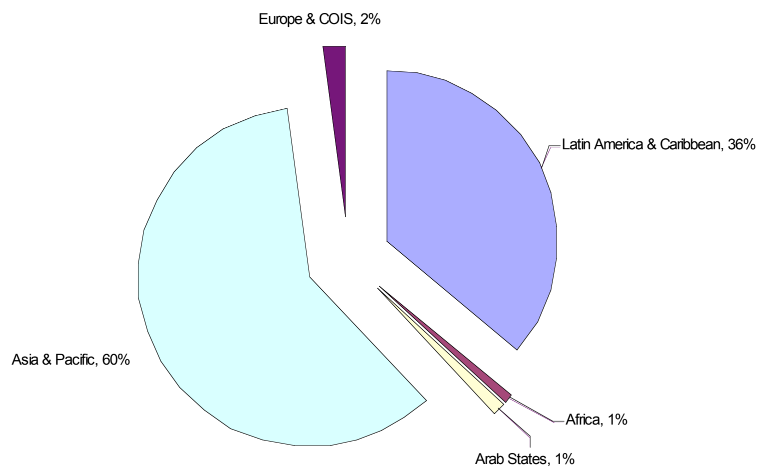
Figure 5.8: Regional Distribution of CERs to 2012 from Confirmed Projects



5.4.2 Distribution of Combined Projects (Confirmed + Probable) by Region

When the analysis is extended to include the 750 projects currently at the validation stage, Asia increases its share of projects relative to Latin America (60 percent versus 36 percent), although generally in line with the population and GDP differential between these two regions. Of all 1,145 projects in the combined category, 96 percent are expected to be implemented in Asia or Latin America (see Figure 5.9).

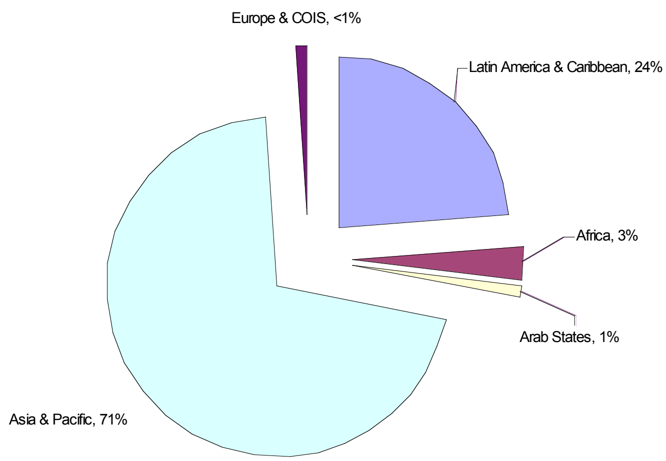
Figure 5.9: Regional Distribution of Combined (Confirmed+ Probable) Projects



In terms of total estimated supply of CERs from the combined category, Asia continues to dominate the picture, accounting for 71 percent (see Figure 5.10). Latin America's share is 24 percent, which is still considerably more than the other two regions. Africa's share of total CERs increases significantly, to 3 percent from 0.02 percent.[64]

[64] Note, however, that over half of the CERs flowing to African CDM projects will accrue to just two projects in one country (Nigeria).

Figure 5.10: Regional Distribution of CERs to 2012 from Combined (Confirmed+Probable) Projects



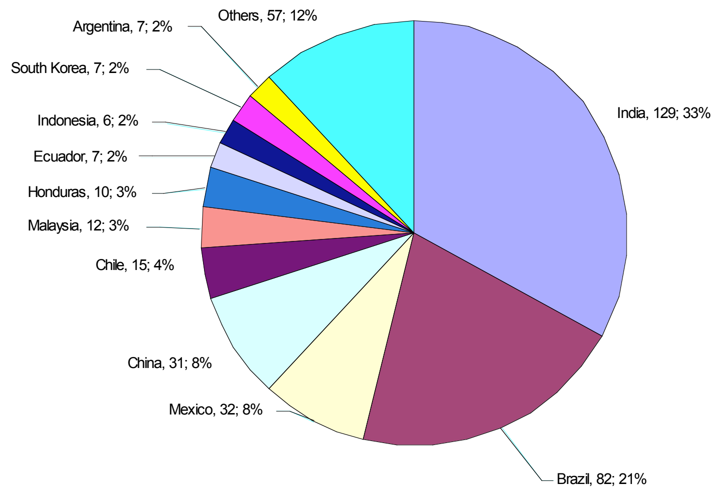
Based on this analysis, it is apparent that only two regions (Asia and Latin America) are likely to derive significant benefits from the CDM in the medium term.

5.4.3 Distribution of Confirmed Projects by Host Country

The 395 confirmed projects are spread amongst 40 countries. However, just a handful of countries dominate the CDM project flow (see Figure 5.11), with India and Brazil alone accounting for half of all confirmed projects (33 percent and 21 percent, respectively). Other countries emerging as important suppliers are Mexico (8 percent), China (8 percent), Chile (4 percent), Malaysia (3 percent) and Honduras (3 percent). In total, nine countries account for 82 percent of all the projects that have reached the registration stage. (See Annex 3 for more details.)

It is important to note that, while 48 Least Developed Countries (LDCs) have ratified the Kyoto Protocol, only four (Bangladesh, Bhutan, Cambodia, and Nepal) have confirmed CDM projects, representing less than 2 percent of total project numbers.

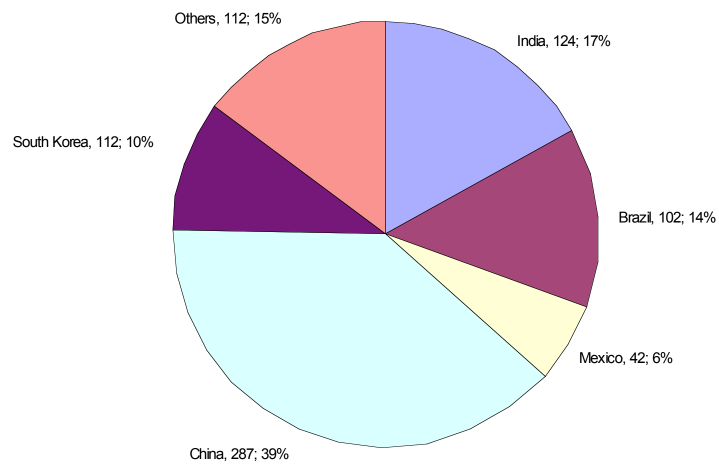
Figure 5.11: Host-Country Distribution of Confirmed Projects (countries with ≥2 percent share of projects)



When we look at the host-country distribution of CER flows to 2012, a very different picture emerges (see Figure 5.12). Of the 741 million CERs projected to be delivered, China emerges as the major provider of CERs (39 percent), with India and Brazil a distant second (17 percent and 14 percent, respectively). Note that, while China generates the largest volume of CERs by far, it has only one-quarter as many projects as India. Similarly, South Korea, with only 2 percent of projects, accounts for 10 percent of CERs. The main reason for this disparity is the extremely large of volume of CERs generated by eight industrial gas projects - seven HFC reduction projects (six in China and one in South Korea) and an N_2O project (in South Korea).

Overall, just five countries are expected to account for 85 percent of CER flows, with the remaining 15 percent spread amongst 35 countries.

Figure 5.12: Distribution of MCERs to 2012 from Confirmed Projects by Top Host Countries

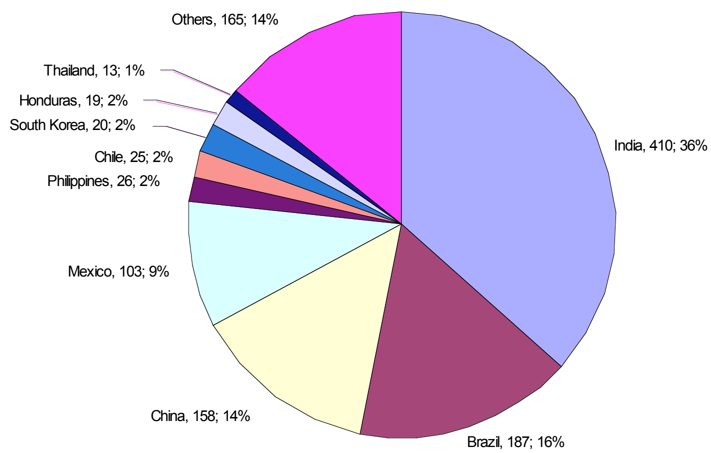


5.4.4 Distribution of Combined Projects (Confirmed + Probable) by Host Country

When projects at the validation stage are included in the analysis, it appears that the dominance of the big three (India, Brazil, and China) is set to increase (see Figures 5.13 and 5.14). With 410 projects in the combined category (129 confirmed), India's share of projects rises to 36 percent. The number of projects in Brazil also increases significantly (from 82 to 187), although its overall share of projects falls slightly from 22 percent to 19 percent. Together, India and Brazil account for more than half (52 percent) of projects in the combined category, with China (14 percent) and Mexico (9 percent) also remaining significant project providers. Overall, these four countries are expected to host 75 percent of CDM projects.

Another five countries (Chile, Honduras, Malaysia, South Korea and Thailand) account for 10 percent of projects, with the remaining 16 percent distributed amongst 45 other countries with projects in the pipeline. Just eight countries are expected to account for 83 percent of all projects, at least in the medium term. (See Appendix 4 for more details.)

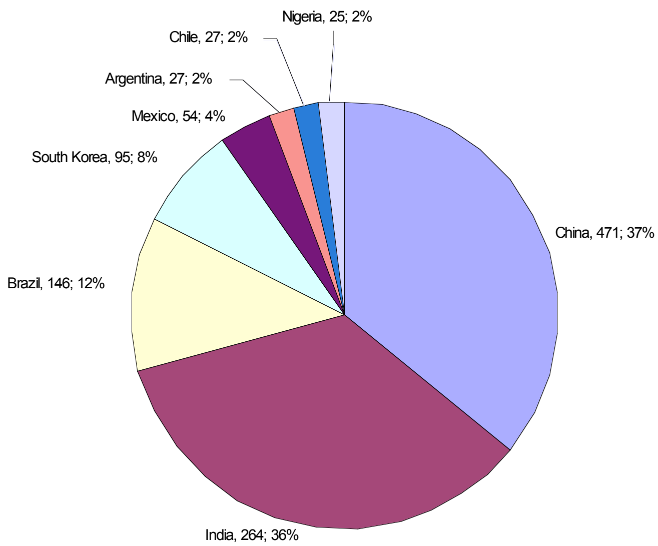
Figure 5.13: Distribution of Combined (Confirmed + Probable) Projects by Top Host Countries



An analysis of likely CER flows from projects in the combined category reveals that, of an estimated 1,263 million CERs that may be generated through the end of the first commitment period, just five countries are expected to account for 82 percent (see Figure 5.14). These countries are China (37 percent), India (21 percent), Brazil (12 percent), South Korea (8 percent) and Mexico (4 percent). Three other countries account for another 6 percent (Argentina, Chile, and Nigeria), while the remaining 46 countries account for 12 percent of expected CERs. Among the 17 projects in Africa, just two projects in Nigeria account for almost 60 percent of CER flows.

Note that 11 percent of CER revenues will flow to two OECD countries (South Korea and Mexico). In contrast, estimated CERs from projects in LDCs amount to about 0.5 percent of total CERs through 2012.

Figure 5.14: Distribution of CERs to 2012 from Combined Projects (Confirmed + Probable) by Top Host Countries (in millions of CERs)



5.5 Factors Influencing Project Selection

This section assesses some of the factors that may have influenced the types of projects being developed to date. As mentioned above, the majority of projects in the CDM pipeline fall primarily into just four sectors: renewable energy,[65] methane reductions/waste management,[66] landfill gas, and biomass energy.[67] (Energy efficiency projects are also expected to increase their share of registered projects over the next few years, mainly in the industrial sector).

Some project types are more attractive than others as CDM projects. In general, some key factors influencing the attractiveness of projects include:

- Return on investment (i.e. ability to generate large flows of cost-effective CERs);
- Ability to recover project costs in 1 to 4 years;
- Level of risk, including technology risk, risk of non-delivery of CERs, and political risk in the host country;
- Relative ease of securing project financing;
- Existence of approved, applicable, baseline methodologies, which reduces validation costs and risk of non-approval; and,
- Relative ease of substantiating project additionality.

These general factors play out in different ways in the various CDM project categories. In the renewable energy generation sector (mainly hydro, biomass, and wind), projects are

[65] Hydro projects in particular tend to dominate this category.
[66] Waste disposal and handling projects recover and destroy methane. These include projects dealing with manure waste management, municipal solid waste, wastewater treatment, and various fugitive methane emissions.
[67] Many of these projects are crop residue-based energy projects.

comparatively easy to develop due to the existence of applicable, approved methodologies and the growing body of experience with these technologies. These projects also generally have significant non-carbon revenue streams that increase their overall attractiveness as CDM projects.

Non-CO_2 emission reduction projects have proven to be very attractive to CDM project investors due to their higher GWPs (and thus their ability to generate large volumes of CERs) and relatively simple technologies. In particular, HFC and N_20 emissions reduction projects clearly are very attractive to project proponents: they generate very large quantities of CERs at relatively low cost; project additionality is easy to substantiate; they have approved methodologies that have been successfully applied and replicated; and, they are relatively quick to implement.

Some project types, particularly transport and afforestation/reforestation projects, have not attracted much investor interest to date. There are several reasons for this, including methodology risks, technical barriers, long CER delivery timelines, and relatively low volumes of CERs. Transport sector projects have faced especially high barriers, as these projects often are atomised in nature (i.e. characterised by a large number of small activities that deliver small quantities of CERs per unit, with potentially costly monitoring and verification issues). Large-scale transport projects (generally those involving modal shift from private cars to public transport) can deliver sizeable volumes of emission reductions, but face significant monitoring, verification, and leakage issues.

Under current CDM guidelines, projects in the areas of land use, land use change, and forestry (LULUCF) have been restricted to afforestation/reforestation (A/R) activities. Crediting arrangements in this sector involve the delivery of CERs with certain limitations (i.e. lCERs and tCERs) that have tended to reduce their attractiveness relative to normal CERs. Furthermore, A/R projects sequester carbon over long periods of time and often take 10 years or more before they generate significant volumes of CERs. The uncertainties concerning a post-2012 commitment period (which limit carbon contract periods) have also tended to reduce the attractiveness of A/R projects. A number of biological carbon sequestration processes (including land rehabilitation and grassland management) are not currently allowable under CDM, even though these offer potentially significant environmental and climate change adaptation co-benefits. These factors have tended to limit the role of carbon sink projects in the CDM project pipeline. This is an area that should be addressed in the discussions about the future CDM framework.

Even though renewable energy projects have attracted considerable attention from CDM investors, there are some countries in which they may not be particularly attractive. For grid-connected electricity generating projects, an important factor influencing project viability is the carbon intensity of the grid. The CDM EB has provided different methods to calculate the grid emission factor, which is used to determine the emission reduction value of the project. CDM projects are likely to be much more attractive in settings where they displace capacity (i.e. existing plants and/or those still in the planning stages) that is carbon intensive (e.g., coal- or oil-fired power generation) than in a system where hydro power dominates the generating mix and new plant construction.

Table 5.2 outlines factors influencing CDM project selection in specific project categories.

Table 5.2: Factors Influencing CDM Project Selection

Project Category	Factors
Waste management	• Issues with contaminated biogas and associated emissions • Delivery risk from challenge of maintaining consistency of waste stream and capture of gas flow rates in areas with less experience in managing complex waste flows
Renewable energy	• Additionality sometimes difficult to substantiate • Availability of data (e.g., dispatch analysis) for determining the grid emission factor
Off-grid renewable energy	• Monitoring and verification issues as well as higher transaction costs due to large numbers of small units • Complexities in defining a baseline, particularly with large numbers of scattered units • Additionality not always easy to substantiate
Energy efficiency	• Additionality sometimes difficult to prove, since many energy efficiency measures are also least-cost options • Challenge of establishing a baseline where there are no direct links between efficiency measures and energy savings • High transaction costs relative to quantity of carbon reductions for non-industrial-scale projects
Transportation	• Challenges in monitoring emissions from mobile sources (though some progress is being made in addressing this issue)[68] • High transaction costs (due in part to lack of market experience) • Just two methodologies have been approved • Complex operational requirements, e.g., specialised infrastructure required for LNG stations and vehicle conversions • High capital cost relative to CER return • Difficulty in quantifying baseline emissions and verifying resulting emissions reductions
Forestry	• Lack of clarity on implementation of rules (since these were only established in 2004) • Lack of eligibility of A/R projects in EU-ETS (this may be revised in 2006) • Limited uptake of projects by buyers due to post-2012 uncertainty • Longer time required for developers to recover their capital and/or transaction costs • Much longer time horizon (30–50 years) and need for upfront investment • Only four methodologies available (three large-scale, one small-scale) but this could soon change • Inability to guarantee permanence

[68] For example, IISD has initiated work to address this issue (see http://www.iisd.org/climate/global/ctp.asp).

6 ASSESSMENT OF TRENDS IN THE CDM MARKET: PAST, PRESENT, AND FUTURE

In this chapter, we analyse the potential market for CERs through 2012 and beyond. The chapter begins with an assessment of trends, past and possible future, in the demand for CERs. Based on the information provided in the previous chapter, we then look at the potential supply of CERs to 2012 and how this relates to demand for Kyoto-compliant emission reduction credits in light of predicted shortfalls in reaching Annex 1 Parties' Kyoto targets. The chapter concludes by examining factors that will determine future market prices for CERs.

6.1 Evolution of the CDM Demand-Side Market

There have been two distinct phases in the development of the CDM market. Initially, the CDM market was quite slow to develop, with few projects and participants between 2001 and 2004. Market activity increased significantly in 2005, following introduction of the European Linking Directive, which allowed the use of CERs as compliance units in the EU Emissions Trading System, and the entry into force of the Kyoto Protocol. The former was arguably the most important influence in the rapid development of the CDM market, as it created a firm market for CERs prior to the Kyoto Protocol commitment period (2008–2012).

6.1.1 Pre-Ratification of the Kyoto Protocol (2001–2004)

From 2001 to 2003, the volumes of carbon traded on the CDM market were relatively small and dominated by a limited number of buyers. The volume of project-based emission reductions traded (i.e. contracts for future emission reductions) in the Kyoto compliance market was approximately 5 million tons (Mt) CO_2e in 2001, increasing to 14.6 Mt in 2002, and 70 Mt in 2003 (with nearly all being CDM projects).[69]

Early on, the CDM market was dominated by just two buyers namely, the World Bank, acting on behalf of a number of international corporations and governments, and the Government of the Netherlands. Together, these two players accounted for the majority of traded CER volumes between 2001 and 2003.

The World Bank entered the market initially through the Prototype Carbon Fund (PCF), which was established in 2000 as a pioneer public/private-sector fund. The PCF was designed to invest US$180 million in a balanced portfolio of CDM and JI projects. As of September 2001, the PCF had invested in eight CDM projects involving US$50 million[70] of forward purchase commitments. By September 2003, the PCF had increased its forward purchase commitments to approximately 30 Mt of CERs, valued at US$126 million.

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[69] World Bank/IETA, *State and Trends of the Carbon Market 2005* (May 2005).

[70] Due to difficulties surrounding EB approval of the methodologies for these projects (which were approved internally by the Bank), some of these estimated CERs might not be generated.

The Netherlands was an active purchaser of CERs through its Certified Emission Reduction Unit Procurement Tender (CERUPT) program, launched in 2001. CERUPT is supporting five CDM projects, which are expected to result in approximately 1.86 Mt of CERs[71] up to 2012. To pursue projects in Latin America, the Netherlands also initiated the Netherlands Carbon Development Fund (NCDF) in 2002 (in conjunction with the World Bank) as well as the CAF-Netherlands Facility.

By 2004, traded volumes of Kyoto-compliant, project-based emission reductions reached 106 Mt CO_2e (97 Mt CDM and 9 Mt JI). Furthermore, several new entrants—including Finland, Italy, Sweden, and several Japanese buyers—joined the market, many of which initiated purchasing programs, mostly in conjunction with the World Bank.

Despite the growth in the market for CER forward commitments, only one project (with an estimated supply of 670,000 CERs/yr) had actually been registered with the CDM Executive Board by the end of 2004. The main reasons for the small number of project registrations through 2004 were:

- Uncertainty about ratification of the Kyoto Protocol and the future value of CERs;
- High perceived CDM transaction costs (especially for small-scale projects), including time and costs required to identify projects, prepare PDDs, and develop baseline methodologies, as well as lengthy approval times for project validation;
- Lack of well-established CDM governance structure, including slow pace of accreditation of DOEs, limited number of effectively functioning host-country DNAs, and lack of procedures (i.e. approved methodologies);
- Low private-sector awareness and knowledge concerning development and financing of CDM projects; and,
- Inadequate financing for underlying project investments.

6.1.2 Post-Ratification Period

Russia ratified the Kyoto Protocol in November 2004, thereby ensuring that the Protocol would enter into force (which occurred three months later, in February 2005). Together with the EU Linking Directive, the ratification announcement by Russia removed a considerable amount of market uncertainty. This reduction in uncertainty sparked a substantial rise in CDM and JI market activity, with traded volumes of CDM emission reductions more than tripling from 97 Mt in 2004 to to 346Mt in 2005. (JI activity increased from 9 Mt to 18Mt.) By the end of the first quarter of 2006, an additional 75 Mt of CDM emission reductions (and 3 Mt of JI) were traded.[72]

Moreover, 2005 saw a significant increase in registration of CDM projects. The number of projects registered with the Executive Board rose from one at the beginning of the year, to five by mid-June, and 63 by year's end. The number of projects reaching the validation stage grew nearly eightfold, from 64 at the beginning of 2005 to 513 by the end of 2005. During the 8-month period from January through August 2006, the number of registered projects increased dramatically, from 63 to 395, with more than 750 additional projects in

[71] Information is not available on all the projects.
[72] IETA/World Bank, *State and Trends of the Carbon Market 2006*.

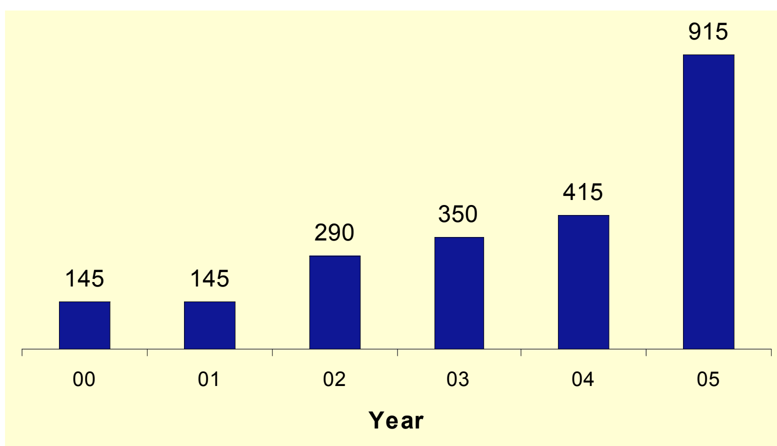
the pipeline (i.e. at validation). These trends signified a significant step change in the market since early 2005.

While a number of new private carbon funds emerged in Europe and Japan in this period, the World Bank has maintained its position as the leading international carbon fund manager. By September 2005, over US$900 million[73] were under its management (see Figure 6.1) in eight carbon funds, five of which are bilateral government-sourced funds,[74] one general fund, and two special target funds.[75] By September 2006, the total had risen to almost $2 billion.[76]

The Netherlands remains an active market participant, although less prominent than earlier years. In addition to the funds under World Bank management, the Netherlands also has the US$160 million Netherlands Clean Development Facility and has recently expanded its CER-purchasing activity through partnerships with three private-sector organizations—Rabobank, IFC, and CAF.

Japan has also emerged as an important buyer of CERs since 2004. Purchases are being made through the Japan Carbon Fund (US$100 million), the Japan Greenhouse Gas Reduction Fund (US$141million), and the Japan Kyoto Acceleration Program (US$73 million in 2005 and estimated US$90 million in 2006). Several other private, public, and private-public funds have also emerged. (Appendix 2 provides a listing of the main carbon funds.)

Figure 6.1: Total Carbon Funds (US$) Managed by the World Bank (2000–2005)



Source: *World Bank's Carbon Finance Annual Report 2005.*

One other factor contributing to the significant increase in project registration rates during 2005 was the pending deadline, of 31 December 2005, for registration of prompt start projects (i.e. projects initiated prior to the elaboration of the rules and procedures for CDM

[73] World Bank, *Carbon Finance Annual Report 2005* (31 August 2005).
[74] Danish Carbon Fund (DCF), Spanish Carbon Fund (SCF), Italian Carbon Fund (ICF), Netherlands CDM Facility (NCDMF), and Netherlands European Carbon Facility (NECF), the latter for JI projects.
[75] Prototype Carbon Fund (PCF), Community Development Carbon Fund (CDCF), and BioCarbon Fund (BioCF).
[76] World Bank, Carbon Finance website.

projects).[77] That said, however, there were still only a limited number of project registrations that occurred before the second half of 2005. These reasons for this included:

- longer than expected validation times (nearly all the initial batch of projects required some revision or correction during the validation stage);
- uncertainty over the Executive Board registration review process (four of the first five projects were subject to review); and,
- slow methodology approvals and high rejection rates.

The rapid increase in project registration rates and validation completions in the second half of 2005 led to an increased level of market confidence. While the COP11/MOP1 decisions have contributed to this enhanced confidence, uncertainties and constraints in the market remain, particularly the lack of clarity on post-2012 commitments. This lack of clarity, if not resolved, is likely to have a major influence on project flow by 2008.

6.2 Estimating the Supply of CERs to 2012

As discussed in the previous chapter, it is not possible at this stage to derive a reliable projection of the volume of CERs that will be generated through the end of 2012. However, based on the projects that have reached the registration and validation stages (and, to some extent, the number of potential projects at the PDD stage), one can produce a broad, 'ballpark' estimate.

The dynamic nature of the market means that the supply of projects in the 'confirmed' category (i.e. registered projects plus those requesting registration) could grow quite rapidly over the period to 2008. The number of projects that have reached the validation stage ('probable' supply) is also an important determinant of future supply. However, the future flow of CERs from projects not yet validated is much less certain. Factors influencing future supply from these projects include the:

- number and quality of PDDs entering the validation stage;
- amount of time required to validate and register these projects through the CDM process;
- extent to which these projects are actually financed, implemented, and deliver their estimated emission reductions;
- timing (or indeed, existence) of any agreements reached concerning a post-2012 climate change regime; and,
- price and availability of AAUs and ERUs, both of which are alternative emission credit purchase options for Annex 1 countries.

6.2.1 Supply of CERs from Confirmed Projects

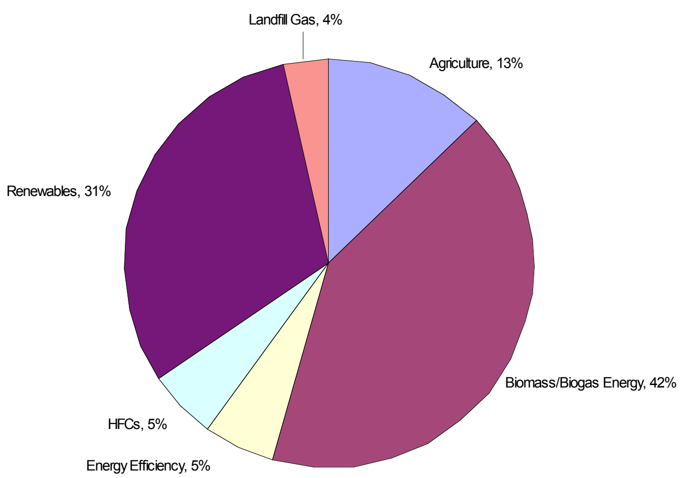
As of 20 August 2006, 55 projects had been issued CERs, with an aggregate total of approximately 14.4 million CERs (76 percent from HFC projects).[78] The number of issued

[77] The Executive Board stated that these projects, many of which were already underway, had until the end of 2005 to register.

CERs is expected to grow significantly over the next few years, as more projects are verified and certification reports are submitted to the Executive Board. The 395 projects in the confirmed category, for example, could potentially generate up to 110 million CERs/year when implemented and fully operational, providing a potential cumulative supply of approximately 750 million CERs by 2012. However, based on the performance of CDM projects to date, it is highly unlikely that they will deliver the estimated reductions.

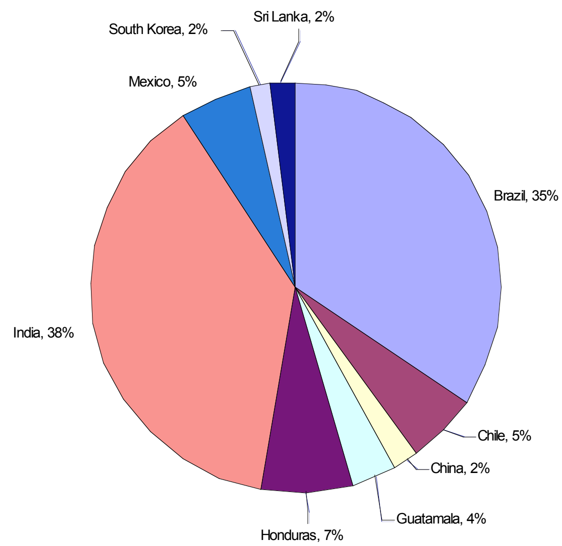
Even though the sample size is presently quite small (approximately 15 percent of registered projects), and covers only six project types and nine countries (Figures 6.2 and 6.3), it does provide a reasonable early indicator of project performance. So far, a majority of the projects (36, or 65%) are delivering fewer CERs – in some cases, considerably fewer CERs – at this stage of their operational lifetimes than originally envisaged by project proponents. Amongst the 55 projects, CER generation averages just 68% of the estimated supply. Some projects are delivering more CERs than expected, but their CER 'surplus' (585,000 CERs extrapolated to 2012) is markedly insufficient to compensate for the 32 million CER 'deficit' (by 2012) amongst the remaining 36 projects.

Figure 6.2: Distribution of CER-Issued Projects by Project Type



[78] Appendix 4 contains a breakdown of the CERs issued for each of the 55 projects.

Figure 6.3: Distribution of CER-Issued Projects By Host Country



If this under-performance continues, the 55 projects will generate 31 million fewer CERs by 2012 than originally projected. Although extrapolating from such a small sample is statistically risky, if we were to extend this under-performance to the pipeline as a whole the CDM could fail to supply up to one-third of its anticipated CERs, amounting to over 400 million tonnes of CO_2e.

For the over-achieving projects, one-third of the 'surplus' is accounted for by just two projects, a methane capture and combustion project in Chile and a hydroelectric scheme in Guatemala. Over three-quarters of the 'deficit' is attributable to four projects: a landfill gas project in Brazil and three HFC projects (two in India, one in South Korea). These large projects do, however, have a major impact on the CER delivery schedule to 2012: their under-performance is certainly relevant.

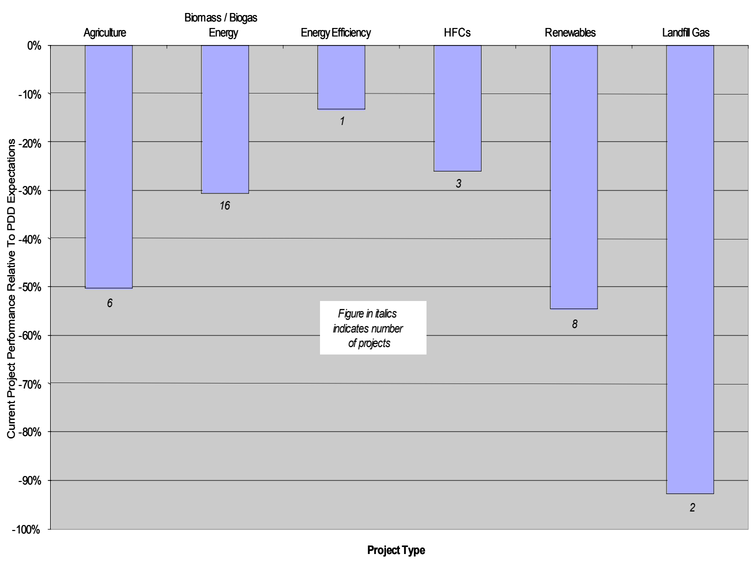
All of the HFC projects that have so far had CERs issued are under-performing. However, given the small absolute sample size (three projects) and the fact that, together, they represent just one-quarter of all confirmed HFC projects, it is difficult to draw any firm conclusions from this. In fact, the performance of CER-issued HFC projects has not been wildly divergent from that of some other project-types (see Table 6.1), and, expressed in percentage terms, HFC projects are not the worst performers (Figure 6.4). Statistical analysis[79] suggests that the performance differences between project-types (and between host countries) show no discernible trend.

[79] Chi-square testing using Monte Carlo probability estimation.

Table 6.1: Performance of CER-Issued Projects By Project Type

Project Type	Number of CER-Issued Projects	CER-Issued Projects as a % of Confirmed Projects	% of CER-Issued Projects That Are Under-Performing	% of CER-Issued Projects That Are Over-Performing
Agriculture	7	13%	86%	14%
Biomass / Biogas Energy	23	21%	70%	30%
Energy Efficiency	3	8%	33%	67%
HFCs	3	27%	100%	0%
Renewables	17	15%	47%	53%
Landfill Gas	2	6%	100%	0%

Figure 6.4: Percentage CER Shortfalls Amongst Under-Performing CER-Issued Projects by Project Type



The data suggest that the heavy reliance upon large projects, HFC or otherwise, is both a strength and a weakness of the current CDM pipeline. On the one hand, large-scale HFC, N_2O and landfill gas projects have allowed the potential CER supply to grow rapidly, achieving a theoretical 2012 supply of up to 1.3 billion CERs by 2012. On the other hand, when such projects fail to meet expectations, the downside is significant.

Twenty-eight very large-scale projects (each capable of generating more than one million CERs per year) account for over half of the CDM's cumulative CER supply up to 2012. While performance will undoubtedly improve as projects 'bed down', the potential for significant supply shortfalls cannot be discounted. As more CERs are issued to a growing number of projects, it will become clearer just what magnitude of shortfall can be expected.

6.2.2 Supply of CERs from Probable Projects

In addition to the 395 projects in the 'confirmed' category, there were another 750[80] projects in the validation process ('probable' supply category*).* If all these projects are successfully validated, registered, and implemented and if they perform to their design capacity, they could supply a further 83 million CERs/year (400-500 million CERs up to 2012), on top of the 110 million CERs per year of confirmed supply category. In aggregate (confirmed plus probable), CER supply could be around 190 million CERs per year (almost 1,300 million CERs by 2012).

Of those projects that have reached the validation stage, around half have opted for an initial 7-year crediting period and half for a one-off 10-year crediting period. Two afforestation/reforestation projects have opted for a 30-year crediting period, while another has opted for a 20-year crediting period.

6.2.3 Potential Additional CER Supply (Projects at the Pre-Validation PDD Stage)

For the purposes of this study, we assume that another 30–40 million CERs per year (100–200 million up to 2012) could possibly come from projects that are not yet at the validation stage, but which may be submitted for registration by the end of 2007. (Note that information on these projects is not very reliable and should be viewed only as an indicator of additional projects that could generate CERs during the period 2008–2012).

6.2.4 Estimated CER Market Supply to 2012

It is common for market analysts to base projections of future CER supply on estimated emission reductions specified in PDDs. For some projects, these estimates are reasonably reliable. However, for others, supply can diverge considerably from the PDD estimates. This can be due to a number of reasons, such as difficulties in obtaining project financing, delays in commissioning and registered projects, and variability in resource availability (e.g. hydroelectric projects may have to contend with drought).

Aside from potential under-delivery of emission reductions from a project in operation, an even bigger potential obstacle is actually securing the necessary underlying project finance to ensure that the project proceeds, and in accordance with the timeline envisaged by the project proponents. To account for under- and delayed market delivery of CERs, estimates of aggregate supply of CERs over the period to 2012 are presented in terms of a probable range (see Table 6.2).

The analysis indicates that, for projects at the validation/registration stage, it is likely that, on average, around 130–190 million CERs per year could be available to the market during 2008–2012. Actual CERs delivered per year may be lower early in the commitment period and higher towards the end. Given the rate of flow of projects into the CDM pipeline since

[80] As of 20 August 2006.

mid-2005, as well as the rapid increase in project registrations, actual CER delivery could be as much as 200–230 million/year in 2012, if an early agreement on the post-2012 commitment period is reached. Given the ongoing uncertainty about the post-2012 compliance market, it is too early to judge what the upper end of the range may be.

If we combine the confirmed, probable, and potential categories, these projects could theoretically generate up to 1,350 million CERs in aggregate through the end of the first commitment period. However, this seems highly unlikely. It relies upon projects performing to their PDD forecasts, which has not been the case to date. The 55 projects that have now been issued with CERs have, overall, generated just 68% of their anticipated supply capacity. Even allowing for improvement in the future, as projects ramp up and project developers learn from earlier mistakes, it still represents a significant shortfall potential. Moreover, the 1,350 million CER figure embodies the rather optimistic assumption that all probable and potential projects will successfully secure funding, will suffer no time delays and will achieve registration with the CDM Executive Board. Again, this seems unlikely.

It is, therefore, fair to assume that not all projects will be implemented and perform to their nameplate capacity. For this reason, Table 6.3 provides a likely range for CER delivery that takes into account some of the likely non-delivery or under-delivery of CDM projects and CERs. Although this range appears large, it reflects the high level of uncertainty surrounding the performance delivery of CERs.

Table 6.2: Potential Supply of CERs to 2012 (millions of CERs)

Supply Category	Number of Projects	Max CER/year (millions)	Total CERs up to 2012 (millions)
Confirmed	395	110	500-700
Probable	750	80	300-450
Potential	~300	~35	100–200
Total	1,445	228	900-1,350

Furthermore, an analysis of some of the projects at the validation stage suggests that while they may be economically attractive over a 7–10 year crediting period, their attractiveness is likely to decrease if the available crediting time is shorter. Many emission reductions purchase agreements are guaranteed only up to 2012; purchase and price certainty beyond that point is limited (although some post-2012 emission reductions are contracted).

Given that registering, implementing, and commissioning projects normally takes at least 1–2 years after completion of the PDD, some projects will be able to generate assured revenue flows for only 4–5 years. This may mean that some project proponents, even if they proceed to the registration stage, may choose to wait until further clarity emerges on the post-2012 market for project-based emission reductions before committing to project implementation. (Note that, as shown in Chapter 4, some CDM projects are still very attractive even with only 3–4 years of carbon revenue streams.)

A review of projections by several market analysts indicates that estimates of CER supplies for the 2008–2012 period range from 150 to 250 million per year.[81] The upper end of this range seems unlikely (even assuming that a reasonable number of additional projects from the potential supply category enter the market), and the lower figure is more realistic. China, India, and Brazil are all potentially large future suppliers of CDM projects and this could result in a significant increase in CER supplies later in the commitment period. Due to the dynamic nature of the market, estimating CER market volumes beyond the medium term (3-4 years) is very uncertain.

Based on the record to date, we can tentatively conclude that cumulative supply by 2012 is likely to be *approximately* 1 billion CERs.

6.2.5 Estimated Supply of ERUs from JI Projects

An important variable in the supply-demand balance in the carbon market is the expected flow of ERUs from JI projects. Here there is much more uncertainty, as JI is still in the early development phase. The ability of countries to meet their eligibility requirements for JI prior to 2008 is still unclear, and some countries (e.g., Russia) have not yet finalized their JI rules and procedures. The inclusion of several potential JI countries in the EU Emission Trading System (EU ETS) has also meant that potential JI supplies may be less than previously expected. Nevertheless, market analysts still expect average annual supplies of 50–100 million ERUs to be available over the 2008–2012 period.[82]

Data from the UNEP Risoe Center (as of 20 August 2006) indicates that there were 128 JI projects with PDDs available for public comment. If all are implemented, they would generate an estimated 16 million ERUs per year. If the projections of some market analysts are to materialise, there will need to be a five-fold increase in the number of JI projects (or some very large individual projects) entering the pipeline by 2008. It is not clear that the market would, in reality, be able to deliver this project flow (particularly as the number of JI transactions since the last quarter of 2005 has been quite small). It is possible that annual volumes will rise toward the latter part of the commitment period, but when averaged over 5 years (i.e. 2008–12), flows are likely to be less than some market analysts estimate.

For the purposes of this analysis, we assume that JI projects will only be able to deliver at the lower end of the range (averaging 50–70 million ERU/year), with an aggregate supply in the range of 100–200 million ERUs through the end of 2012. Again, the wide range reflects the considerable uncertainties concerning project flow and delivery, progress with post-2012 discussions, and the adequacy of the regulatory procedures put in place.

6.3 Estimated Demand for Kyoto-compliant Emission Reduction Credits

The demand for CERs up to 2012 will be depend on the extent to which Annex 1 countries fall short of their commitments, as well as the availability and price of alternative sources of

[81] Review of estimates contained in several studies, including Natsource (*Looking Forward from 2005, IETA 2005 Carbon Market report*) and Haites, 'Estimating the Market Potential for the Clean Development Mechanism' (2004).
[82] IETA *2005 Carbon Market Report,* 'Looking Forward from 2005: More Surprises to Come', Natsource.

emission reductions. The options available to Annex 1 countries to meet their Kyoto commitments are to:

- implement domestic emission abatement measures;
- purchase CERs from CDM projects;
- purchase ERUs from JI projects;
- purchase Assigned Amount Units (AAUs) from other Annex 1 countries; or,
- default on their Kyoto commitments.

To identify the potential demand for CERs, it is necessary to estimate the likely magnitude of potential Annex 1 shortfalls in emission allowances as well as the availability of ERUs and surplus AAUs. As 6 years remain until the end of the first commitment period (end 2012), it is difficult to ascertain with any accuracy the level of Annex 1 emissions. Much depends on: the effectiveness of domestic GHG mitigation measures: the price of Kyoto units (relative to domestic abatement opportunities); growth rates (and hence energy demand) in the major economies; and, relative energy prices (a major influence on the energy demand mix, particularly for coal).

6.3.1 Estimated AAUs Required by Countries with Emission Reduction Shortfalls

Predicting the magnitude of AAU shortfalls from countries that are likely to exceed their Kyoto emission quotas is difficult. A wide range of variables must be considered, and as a result, estimates vary substantially.
Based on recent 'business as usual' projections, Annex 1 countries are expected to require up to 5.5 billion Kyoto-compliant units over the commitment period to meet their emission reduction obligations.[83] However, if all countries introduced aggressive domestic GHG reduction measures, the shortfall could be as low as 2.5 billion AAUs, according to World Bank estimates. A mid-range estimate is around 3.75 billion AAUs by 2012, which reflects the view that emissions are likely to be below business as usual trends, and that domestic emission reduction measures will deliver results.[84]

The bulk of the shortfall is expected to come from three sources: the EU, Japan, and Canada.

Expected EU shortfall

The European Union has committed itself to an 8 percent reduction in greenhouse gas emissions (relative to the 1990 level) by 2012. However, the EU countries' aggregate emissions in 2004 were only 0.9 percent below 1990 levels.[85] Some EU member states (particularly Ireland, Greece, Portugal, and Spain) have experienced significant increases in their national emission levels over recent years.[86] On current projections, EU emission levels may be just 1.6 percent below 1990 levels by 2012. As a consequence, EU countries are,

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[83] World Bank *Fourth IETA Forum.*
[84] Natsource: IETA *GHG Market Report 2005.*
[85] Wuppertal Institute for Climate, Environment & Energy, *JIKO Newsletter* (April 2006)
[86] UNFCC Key GHG data Nov 2005.

collectively, expected to require additional emission allowances in the region of 1.5 billion[87] to 2.2 billion tons of CO_2e by 2012.[88]

Some EU members may restrict the number or type of AAUs that they will purchase (for example, buying only 'greened' AAUs).[89] This will tend to increase the demand for CERs and ERUs relative to AAUs. There are also some restrictions on the type of CERs and ERUs that can be used for compliance. For example, CERs generated by sinks and large hydro projects are not currently eligible under the EU ETS, although this may change following a review of the rules in 2006. (However, as there are unlikely to be any significant CERs from sinks or large hydro projects before 2012, this does not seem to be a relevant issue for the market.) There has also been ongoing discussion about placing limitations on the amount of CERs that can enter EU registries during the commitment period, but there has been no official announcement on what these limits may be.[90]

Japan

Japan has been very active in introducing policies and measures to reduce national GHG emissions. Its economic growth rates over the past decade have been relatively slow, keeping emission levels lower than anticipated. However, recent increases in economic activity, as well as developments in the Japanese energy sector (particularly the much lower than anticipated additions of nuclear capacity), are likely to put upward pressure on emission levels over the next 5 years. There is a growing recognition that Japan is likely to fall short of its target by 0.8[91]–1.5 billion[92] AAUs during the first commitment period. Based on recent UNFCCC emissions trend data, Japan's shortfall is more likely to be around 1–1.2 billion AAU by 2012, but again, considerable uncertainty remains.

Canada

In recent years, Canada's emissions have been steadily increasing and are estimated to be at least 20 percent above its Kyoto target by 2012, producing a shortfall of emission allowances in the range of 1.3[93] to 1.5[94] billion tons of CO_2e between 2008 and 2012. If Canada decides to include LULUCF in its emissions inventory, the shortfall could be even greater.

A 2005 plan released by the Government of Canada outlined its intention to invest over CDN$1 billion (US$840 million) in a 'Climate Fund' to purchase credits from domestic and international GHG reduction projects. A new government, elected in January 2006, has given some indications that it may not follow through with these commitments.

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[87] Wuppertal Institute for Climate, Environment & Energy, *JIKO Newsletter* (April 2006)
[88] World Bank *Stock-take on Market and Compliance Gap* (March 2005).
[89] A 'greened AAU' is one where the money from the sale of the AAU is invested in a approved program or project that reduces greenhouse gas emissions—for example, renewable energy or energy efficiency measures. In effect, the surplus AAU is 'greened' by promoting other beneficial environmental outcomes.
[90] Claire Byers, 'EUA and CER Price Differentials' (Fortisbank, 2005).
[91] Natsource: IETA *GHG Market Report 2005.*
[92] World Bank *Stock-take on Market and Compliance Gap* (March 2005)*;* Point Carbon (Kristian Tangen) presentation at Carbon Market Insights 2005 (March 2005).
[93] Natsource IETA *GHG Market Report 2005.*
[94] World Bank *Stock-take on Market and Compliance Gap* (March 2005).

Furthermore, the Canadian Government has indicated that it will devote more of its climate change resources to domestic abatement activities. What this means for CER/ERU/AAU demand remains unclear.

Others

In addition to the big three discussed above, a further 150–200 million AAUs may be required by other countries (for example, Norway and New Zealand) to meet their expected AAU shortfalls.

6.3.2 Total Market for Kyoto-Compliant Units

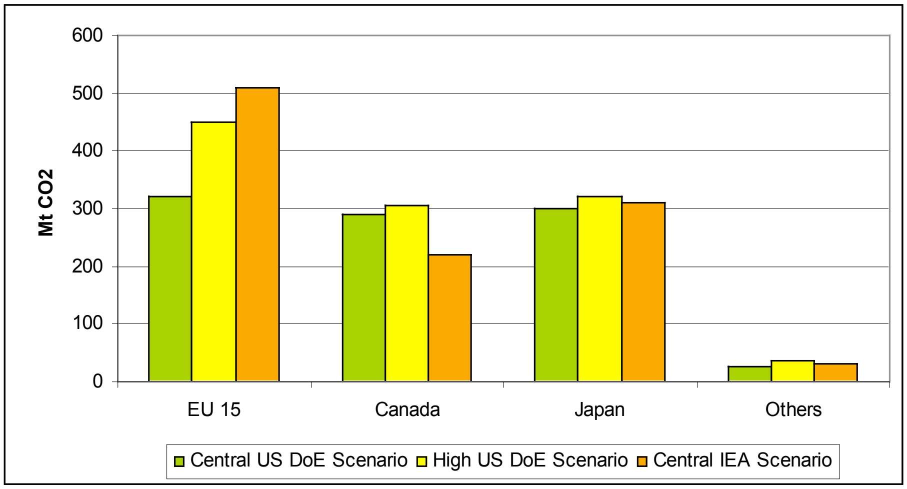
The above analysis, as well as a range of estimates from various other studies, indicates that the most likely scenario is that market demand for Kyoto-compliant units (i.e. AAUs, CERs, and ERUs) will be in the range of 3–5 billion by 2012, depending on the extent that Canada is active in the market. If Canada chooses not to purchase Kyoto-compliant units, total demand is likely to be at the lower end of this range.

Private carbon funds already have allocated around US$4.6 billion to purchase CERs and ERUs up to 2012.[95] A range of EU countries have also indicated that they intend to purchase at least 500 million CERs and ERUs up to 2012.[96] Japan has announced that it will purchase around 100 million CERs/ERUs by 2012.[97] Regardless of the final figure, it is clear that there will be a significant market for Kyoto-compliant emission reductions over the period to 2012.

Figure 6.5 illustrates three different emission shortfall scenarios produced by the IEA and US DoE. They estimate that emission shortfalls are likely to be higher than 5 billion AAUs, but they assume a much lower impact for domestic emission reduction measures in these countries.

[95] Environmental Finance, April 2006.
[96] EU Commission, Plenary Session, Carbon Expo May 2006.
[97] IETA/World Bank, *State and Trends of the Carbon Market 2006*.

Figure 6.5: Estimated Shortfalls for EU, Canada, and Japan



Source: World Bank.

6.3.3 Supply of Surplus AAUs

Much conjecture surrounds the availability of tradable surplus AAUs during the first commitment period. In theory, there will be more than sufficient AAUs to easily satisfy the expected shortfalls of Annex 1 countries, with as many as 6.5 to 7.0 billion[98] AAUs available for trade (although figures are not very reliable). However, it is unclear that surplus countries will be willing to trade this amount, for several reasons.

- Post-2012 uncertainty: The willingness to trade will in part depend on whether there is likely to be a post-2012 emissions limitation agreement, and on what basis targets or limits will be agreed to. Many countries may wish to bank their surplus AAUs, or a significant proportion of these, to assist in meeting any future targets or commitments.
- Annex 1 Trading Eligibility: The eligibility criteria for AAU trading have yet to be met by some countries, and they will be unable to trade AAUs until they have done so.
- Surplus Annex 1 AAU supply restrictions: It is likely that countries with surplus AAUs (mainly Russia and Ukraine) will want to achieve as high a price as possible, and therefore may seek to limit supply in order to influence market prices.

On the buyers' side, many potential deficit countries have indicated that they will not purchase AAUs that are not 'greened'. Considerable effort is being directed towards Green Investment Schemes, but the likely availability of 'greened' AAUs up to 2012 is not yet clear. The resolve of countries not to purchase 'hot air' will certainly be tested.

[98] World Bank.

6.3.4 Overall Supply-Demand Outlook 2008-2012

As outlined above, the supply-demand balance in the Kyoto carbon market will be influenced by a wide range of variables. Much market uncertainty still remains in relation to the extent to which Russia and Ukraine are willing to trade surplus AAUs; eventual final demand for AAUs from countries that have exceeded their targets; and, the supply of CERS and ERUs.

Aggregate supply of Kyoto-compliant CERs and ERUs (excluding AAUs) during the period 2008–2012 could be in the range of of 1,000–1,500 million units, with an annual average supply of around 150–250 million units. This amounts to 20–30 percent of the expected aggregate demand for Kyoto-compliant units from Annex 1 countries. Thus, AAU trade will need to be significant in order to clear the market.

6.4 CER Prices

Estimating future CER market prices is like picking winning horses at the race track: while much can be gleaned from past form, there are too many variables to be sure of a given outcome. Considerable uncertainty surrounds the supply-demand balance in the Kyoto-compliant carbon market over the next 5 years. As a result, a similar level of uncertainty surrounds CER prices, which will be largely influenced by how the supply-demand equation unfolds. There is likely to be significant price volatility over the period to 2012.

There is no single market indicator price for CERs, as prices have usually been negotiated on a project-by-project basis and secondary markets are only just emerging. Price information on actual CER market transactions is limited. Based on publicly available information, prices up to 2005 were generally in the US$4–7 range. However, since mid-2005, prices have firmed considerably and the most recent CER prices have ranged from US$6–10 for standard off-take contracts (where buyers accept the delivery risk), to US$11–15 for CERs from projects where the seller or financial intermediary guarantees delivery.[99] According to the most recent IETA/World Bank analysis, market average prices for CERs over the last 3 years have been US$5.15 (2004), US$5.51 (2005), and US$7.51 (2006, 1q).[100] (For those interested in trends in CER transactions and prices, the IETA/World Bank report provides a good market overview.)

In the absence of a well-established secondary market for CERs, prices will remain project specific. The price buyers are willing to pay generally depends on the project type, the level of project CER delivery risk, and the quantity of CERs generated by the project. However, the secondary CER market is likely to grow in importance when the International Transaction Log is fully established, which is expected in the first half of 2007.[101] Furthermore, as the volume of CERs issued to unilateral CDM projects increases, and the CER market achieves a higher liquidity level, market price transparency should increase. Until such time as a significant secondary market emerges, it will be difficult to determine a

[99] Point Carbon: *CDM and JI Monitor* (13 December 2005). (Amounts have been converted from Euros to US$.). Also see ‘EUA and CER Price Differentials’, Claire Byers, Fortisbank.
[100] IETA/World Bank, *State and Trends of the Carbon Market 2006*.
[101] The International Transaction Log (ITL) will operated by the UNFCCC and will log all transactions of AAUs, ERUs and CERs moving into and out of each Annex 1 national registry. This log will ensure that there is a consistent balance of Annex 1 greenhouse gas accounts during the first commitment period (2008–2012).

reliable CER market price. The Point Carbon price indicator may provide a useful reference benchmark in the interim.

In theory, the price of CERs, ERUs and AAUs should, all other things being equal, be roughly similar, as they all equate to one tonne of CO_2e. However, there are differences in the product, particularly in relation to buyers' risk perceptions. While AAUs already exist, only a very small quantity of CERs have been issued (14.4 million as of 20 August 2006), and no ERUs. There is also little certainty in relation to how many CERs and ERUs will be available over the period to 2012; projects may deliver the tonnages expected but then again they may not. One thing is certain: an actual CER in the hand is likely to be worth much more than the promise of a CER in the future.

As mentioned earlier, the volumes of AAUs that are allowed to enter the market during the first commitment period will be a major determinant of CER prices. CDM and JI may be able to create a relative value base for AAUs, but the small supply volumes limit their market price influence. To illustrate the market power of surplus AAU countries in influencing CER prices, we can use the following example. First assume that:

- all Kyoto parties honor their emission commitments;
- the flow of CERs and ERUs is around 1 billion units by 2012;
- Annex 1 shortfall countries need, and are willing to purchase, 3 billion AAUs, greened or 'hot air' (the lower end of the range);
- Canada participates in the market; and,
- surplus AAU countries are willing to sell sufficient AAUs to just clear the Kyoto market by 2012.

In this situation, and at US$10 per AAU, the value of the Kyoto carbon market is US$30 billion over the period 2008–2012. At US$5 per AAU, the market is worth US$15 billion, but at US$20 per AAU, it would be worth US$60 billion. At US$50 per AAU, the AAU market could be worth US$150 billion—a serious amount of money. Thus, the opportunity cost of selling AAUs before they hit their market maximum could be substantial. Countries with surplus AAUs have a clear incentive to time their trades so as to achieve the best price possible without losing too much market share.

Note that if AAU prices climb too high, Annex 1 countries have a stronger incentive to default on their Kyoto commitments. Also, as AAU prices rise, the attractiveness of domestic abatement and CDM increases (though these are less flexible and more time constrained). If there is no post-2012 commitment period (a possible scenario), then one option for Annex 1 countries would be to default and meet the non-compliance penalty.

Given these uncertainties, there is, understandably, considerable reluctance on the part of most market analysts to predict the price of Kyoto-compliant units during the commitment period. CER prices are even more uncertain. This report does not offer any predictions of CER market prices in 2008–12, but it does appear to be in everyone's interest to keep CER and ERU prices at a level that will stimulate project flow (to provide an alternative to AAUs) but not at a level where the costs of honoring Kyoto commitments become excessive. At market prices of US$10–20, the cost of purchasing Kyoto compliance units remains quite modest for Annex 1 countries. At these prices, many CDM projects also remain financially quite attractive, ensuring a continued flow of projects.

In sum, the carbon markets have matured rapidly in recent years and there is now much greater certainty and awareness on the part of both buyers and sellers on how carbon trading works. However, considerable uncertainty surrounds many aspects of the market and it may be several years before more clarity emerges on the market supply-demand balance during the period 2008-2012. The big questions are whether there will be a post-2012 compliance market, the level of emission reductions the project-based mechanisms will be able to deliver up to 2012, and whether surplus AAU countries will be willing to trade the market-clearing quantity.

7 HOST-COUNTRY EXPERIENCES

The host country plays an important role in the CDM project cycle. Evidence suggests that host-country institutional and administrative capabilities bear importantly on CDM project flow and the speed with which projects enter the market. Efficient project approval processes and transparent project review procedures are essential factors that help encourage private-sector participation and investor interest. Host countries also play a key role in ensuring that the CDM contributes to sustainable development by screening potential projects to ensure that they are compatible with national sustainable development objectives.

This chapter reviews the experience to date with creating a suitable environment in host countries for the generation of viable CDM projects. Specific topics covered include: the types of functions and structures established for designated national authorities (DNAs) in host countries and how well these have worked; project review procedures and processing times; extent to which the CDM has been integrated with national sustainable development objectives in host countries; and, constraints faced by private-sector entities in host countries in developing and implementing projects.

The information presented here draws upon UNDP experience and key 'lessons learned' from recent CDM activities in developing countries. It also incorporates the experiences of other multilateral and bilateral agencies as well as information from carbon brokers and other CDM market analysts. (Note that the country examples presented below are for illustrative purposes only and do not imply that the approach adopted in these countries is best practice or otherwise.)

7.1 Host-Country DNAs and their Functions

A total of 86 Non-Annex 1 DNAs are registered with the UNFCCC (see section 3.6). Issuing Letters of Approval (LoAs), which are required for project registration with the CDM Executive Board, is the only compulsory function of a DNA.[102] However, many host-country DNAs also perform a range of other functions, such as:

- linking CDM policy and strategies to national climate change and sustainable development agendas;
- providing supporting data and information to project proponents (for example, establishing emission factors for the electricity grid and identifying national CDM sector priorities);
- making available information on the CDM project cycle, DNA structures, and project review procedures (through the use of a websites, newsletters, and other sources);
- facilitating the development of administrative capacity at state/provincial levels to screen projects and promote CDM project activity;

[102] For unilateral CDM projects, only a host-country LoA is required. Bilateral CDM projects must also have an LoA issued by the DNA of the participating Annex 1 Party DNA.

- establishing links between project proponents, potential financiers, and CER buyers; and,
- CDM promotional and marketing activities.

(Note that, although governments can play an important role in facilitating access to the CDM, host governments should endeavor to keep CDM promotional and support activities separate from the project approvals process, in order to avoid conflicts of interest.)

Many countries have established specific project screening and review procedures to ensure that CDM projects meet national development priorities and objectives, particularly with respect to sustainability criteria. These procedures vary, according to the needs of the particular country and the available resources and technical skills base. (See section 7.5 for more information on sustainability screening.)

Box 7.1 provides, as an illustrative example, an overview of the functions and role of Morocco's DNA.

Box 7.1: Functions of the Moroccan DNA

Role and Status:

- Serves as the official State CDM representative vis-à-vis the organizations and national operators involved or having a relationship with CDM;
- Serves as the official State CDM representative vis-à-vis the international organizations in charge of CDM, in particular the CDM Executive Board;
- Delivers written approval confirming that the project is voluntary, conforms to national criteria, and contributes to the country's sustainable development.

Activities:

- Sets the rules and procedures for CDM project evaluation and approval (prerequisites for subsequent validation and certification). This activity is necessary for the country to conform to international CDM rules;
- Promotional activities centered on capacity building (related to project identification and formulation, baseline definition, emissions quantification, and monitoring or project performance) and marketing (developing a diversified, high-quality CDM project portfolio for a highly competitive market).

Structure:

- CDM National Council;
- Permanent Secretariat of the National Council, operating as the climate change focal point.

Source: http://www.mdpmaroc.com/English/cdm_dna.html.

7.2 Structure of Host-Country DNAs

Apart from the requirement that DNAs must be registered with the UNFCCC, there are no rules, procedures, or guidelines on what form a DNA should take. As such, there is significant diversity in DNA structures across host countries.

In most cases, the establishment of a DNA is supported by national legislation. However, in some countries, DNAs have been established by presidential decree or an administrative order issued by a government agency or department.

DNAs can have either single-unit or multi-tiered structures. For example, a DNA can take the form of a:

- single unit or body located within an existing government department or ministry (for example, Bolivia and several African and small island countries);
- separate agency or committee with representatives from several different government departments and/or ministries (for example, the National CDM Authority in India); or
- multi-tiered structure consisting of two or more institutional components (such as a central committee or office supported by project review units, an advisory body, and/or a secretariat).

Appendix 6 provides information on the structure and functions of different DNA bodies for selected countries.

7.2.1 Single-Unit DNAs

Some countries (for example, Bolivia) have established simplified, single-unit DNA structures. In theory, these simplified structures offer advantages in terms of lower administrative costs, faster project processing times, and reduced coordination requirements. For countries with limited resources and technical skills, the adoption of streamlined DNA structures can be a sensible way to proceed, particularly if CDM project flow is expected to be relatively limited for some time. In these circumstances, countries can establish simpler structures to begin with, and build capacity and experience over time. Such an approach can help minimise the risks associated with investing resources in elaborate structures that might be underutilised, at least initially.[103]

This is by no means to suggest that countries wishing to access the CDM should adopt a simplified single-unit structure, but merely that countries should tailor DNA structures and processes according to their resources and expected needs. Upfront expenditure for more elaborate DNA capacities and structures may be a wise long-term investment if it generates larger flows of technology and foreign direct investment.

[103] Indeed, in assessing the diversity of DNA structures across countries, UNDP considers that there may have been over-investment in some countries, relative to the actual project flow that has eventuated. For instance, of the 25 DNAs established in sub-Saharan countries, only five have projects that have reached the validation or registration stage. Thus, it could be argued that engaging in CDM activities has been a net cost to some countries so far.

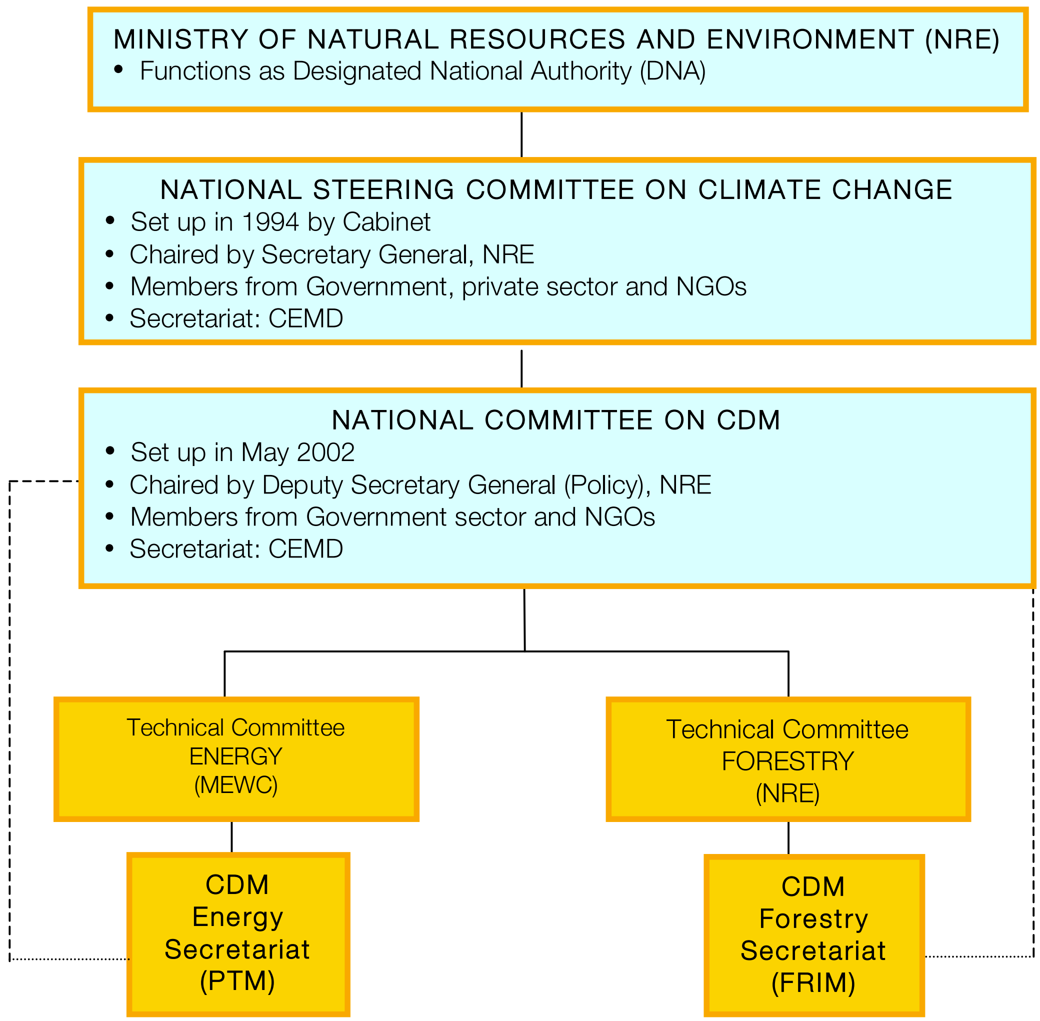
7.2.2 Multi-Tiered DNAs

Most host countries have adopted a multi-tiered DNA structure that incorporates a broader range of government entities, NGOs, academic institutions, and private-sector representatives. With multi-tiered structures, there is usually a Secretariat that coordinates the activities of the various entities involved in CDM approval and review processes, and takes responsibility for DNA administrative matters. The Secretariat normally supports a national committee or advisory body that acts as the main focal point for project discussion and review, CDM strategy and policy development, and stakeholder inputs.

The multi-tiered approach enables a much broader integration of the CDM into national development priorities and decision-making processes. It also offers the opportunity to bring in a larger set of specialist skills and experience on specific sectors. Many CDM projects involve multiple sectors, or raise cross-cutting issues in sectors such as energy, forestry and agriculture, water, trade, economics and finance, health, and environment. A multi-tiered structure allows multiple ministries and actors to participate in the project review and approval process.

Malaysia provides a good example of a multi-tiered DNA, with clear links to a range of relevant agencies (see Figure 7.1). Malaysia's DNA is headed by the Ministry of Natural Resources and Environment. Reporting to the Ministry is the National Steering Committee on Climate Change, which comprises private-sector representatives and NGOs as well as government officials. Reporting to the Steering Committee is the National Committee on CDM, which includes several technical subcommittees that review projects. As shown in Figure 7.1, these subcommittees enable Malaysia's DNA to access a wide range of technical skills in screening and reviewing project proposals.

Figure 7.1: Malaysia's DNA Structure



The multi-tiered approach also enables broader stakeholder participation in the CDM. Some countries have made a concerted effort in this direction; for example, Bangladesh, Brazil, Cambodia, Morocco, and South Africa have formal structures that include representatives from universities, research institutes, NGOs, and the private sector (usually national banks, business associations, chambers of commerce, and/or export consortia). For instance, the Moroccan CDM Council consists of 20 representatives from a wide range of ministries, departments and government agencies as well as industry associations, NGOs and research centers.

Although establishing broad stakeholder participation takes time and effort, it is essential for ensuring that CDM activities are integrated into broader sustainable development initiatives as well as for incorporating social and community concerns into CDM decision-making. In several countries, stakeholder participation in DNAs has increased understanding of the CDM among the private sector, stimulated the engagement of national research institutes in R&D on sustainable technologies and climate change issues, and led to increased cooperative partnerships between the public and private sector, including foreign investors.[104]

One potential disadvantage of broad-based stakeholder participation in DNAs is that it may lead to higher administrative costs, increased coordination requirements, and time delays in project approvals. In several countries, inter-ministerial rivalries and disagreements are known to be an issue and have delayed project approvals, resulting in higher transaction costs and increased uncertainty for project proponents. Thus, it is important that DNAs with multi-tiered structures establish clearly defined decision-making rules in order to avoid delays and/or inconsistencies in project approvals, which can be powerful disincentives to private-sector involvement and depress project flow.

While the multi-tiered approach offers important potential benefits, it can be difficult to achieve these advantages in practice. Doing so requires a reasonably well-developed understanding of CDM and climate change issues as well as a willingness of DNA participants to devote the necessary time and resources—factors that are lacking in many developing countries. There is no clear-cut evidence to suggest that any particular DNA structure is better than another: they all have advantages and disadvantages. When establishing their DNA structures, countries need to balance the cost and benefits of different approaches against their perceived national requirements, available resources, and level of stakeholder engagement. Regardless of the DNA structure selected, establishing transparent processes for project approval and decision-making, and making the private sector and general public aware of these processes, is of the utmost importance.

7.2.3 Sub-National DNA Functions

Apart from centralised DNA structures and functions, some countries are decentralising selected CDM activities to state and provincial levels. Initiatives that increase the role of state- and provincial-level agencies in CDM project screening, review, and facilitation. are partly directed at reducing DNA work loads at the national level, but are also aimed at building broad-based institutional capacity at the state level. Although state-level agencies can help screen and review projects, the national DNA retains the responsibility for issuing Letters of Approval.

Both Brazil and India have begun to evaluate options for decentralising some DNA functions. UNDP has been involved in one such capacity building project, with the Government of India (see Box 7.2).

[104] These were important conclusions drawn from country-level CDM studies conducted by UNDP in Brazil, Morocco, and South Africa.

Box 7.2: Building State Government Institutional CDM Capacity Development In India

UNDP has been assisting India for several years in CDM capacity development activities. Building on this experience, UNDP is presently working with the Indian DNA through a project, 'CDM Capacity Building in India', which assists five selected state-level agencies (project partners) in developing localized DNA cells to help expand India's CDM project pipeline.

In Phase 1 of the project, each partner agency agreed to establish a 'CDM cell' in its respective state, and to identify three projects for the development of PDDs (Project Design Documents). This exercise helps the partner agencies develop their own capacity to assess CDM projects through hands-on 'learning by doing'. Partner agencies were also encouraged to identify small projects that may be suitable for bundling to assess whether this could reduce project transaction costs.

By July 2005, the partner agencies had all established 'CDM cells' in their respective offices and each had facilitated the development of several PDDs (mostly renewable-energy-based power generation projects). However, during Phase 1 the agencies were not able to identify any group of projects that could be bundled together into a single viable CDM project.

Based on the success of Phase 1, the project is now in the process of extending this capacity development activity to 10 additional state agencies, bringing the total to 15 agencies. These will be selected through a national competitive bidding process.

Expected outcomes of the project are:

- Capacity building of 15 state-level agencies to identify and facilitate CDM project development
- Three or more approval-ready PDDs from each participating agency
- Identification of requirements for developing viable bundled CDM projects
- Increased success rate for registration of projects from different states
- Stimulation of project finance for CDM projects

7.3 Project Review and Approvals

7.3.1 Review Procedures

Like DNA structures, host-country approval processes also vary from country to country. Most host countries have established websites and other published materials that outline their project screening and approval processes. For the most part (at least in those countries that UNDP has surveyed), these procedures are well documented and follow a reasonably logical sequence.

Many countries offer a preliminary screening of potential projects by allowing project proponents to submit a Project Idea Note (PIN) describing the project and its sustainable development benefits. If the PIN is acceptable, the DNA often issues a 'letter of no objection'.[105] PIN screening is common practice in many DNAs (see Appendix 6 for an overview of PIN procedures in selected countries) and it certainly offers many advantages. PIN screening can provide project proponents with valuable feedback on whether the project is likely to comply with the host country's requirements and save the considerable expense of proceeding with PDD development if the project is deemed unacceptable by the DNA. It also provides the host country with an indication of the types of projects that are likely to come forward in the future. Figures 7.2 and 7.3 present an overview of the project approval process, including PIN screening, in Morocco and Malaysia.

South Africa provides an example of a project review process that includes a voluntary option for early project review as well as mandatory review procedures and the availability of an appeals process for unsuccessful project proponents. Procedures and timeframes are as follows:

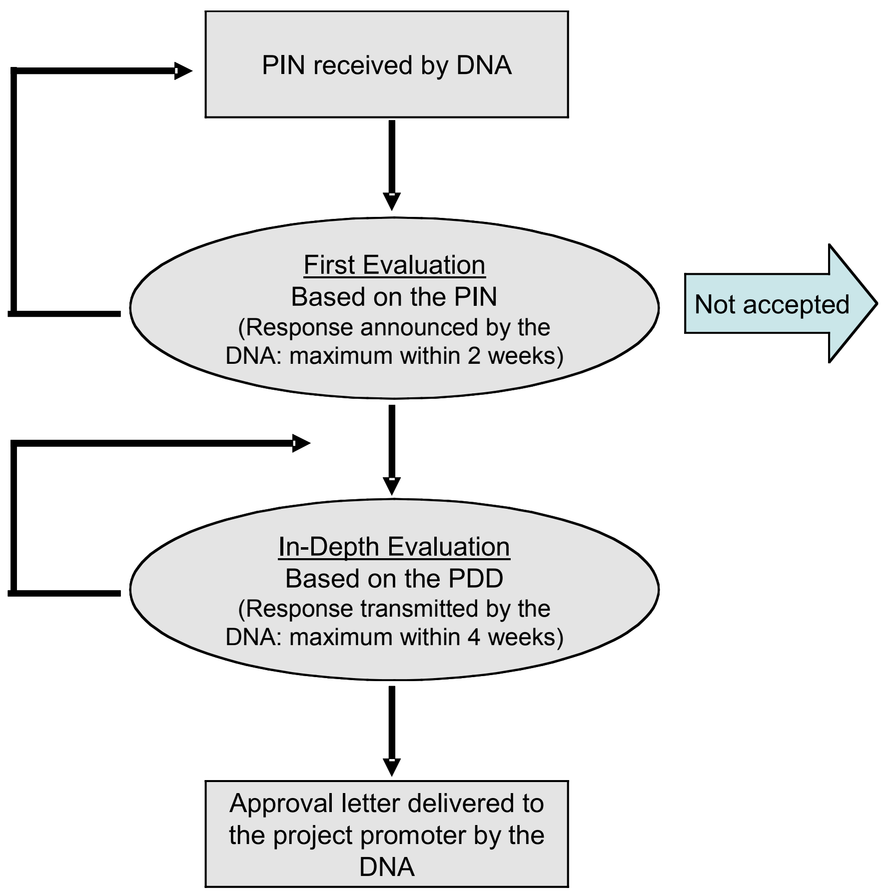
- All prospective CDM projects are required to undergo mandatory review of PDDs in order to obtain host-country approval. In addition to a PDD, the project proponent must also submit an application form. The project should have undergone validation by a DOE prior to submission to the DNA for review. Public consultation is carried out by posting the PDD on the DNA website for 30 days of comment. Following this, the DNA reviews the comments and takes them into account (along with the results of project screening for congruence with national sustainable development criteria, as described in section 7.6) in making its decision to approve or reject the project. If successful, a 'Letter of Approval' is granted. The timeline for project approval (from PDD submission to Letter of Approval) is 45 days.
- In addition, the DNA also provides a voluntary option for early project review, via submission of a PIN. The results will be provided within 30 days, complete with comments and justification of concerns.
- An appeals process is also available, in which an unsuccessful project proponent can appeal the rejection with the Minister of Minerals and Energy. There is a 60-day timeframe for this appeals process.

UNDP's country assessment activities, as well as information from private-sector project developers, indicate that the establishment of well-defined, transparent, consistently applied project approval procedures is of paramount importance to project proponents. With increasing information on and experience with DNA structures and approval processes, new entrants to the CDM market can find a wealth of proven approaches from which to choose.

[105] The 'Letter of No Objection' advises the project proponent that, based on the submitted PIN, the project is likely to meet national project approval requirements. It differs from a 'Letter of Approval' in that it has no formal status as a host-country approval document with the CDM Executive Board.

Figure 7.2 Morocco Project Approval Process

Approval and Evaluation Procedure of CDM Projects By Morocco DNA



Source: Morocco website, http://www.mdpmaroc.com/English/projet_evaluation.html#.

7.3.2 Project Processing Times

Host-country administrative requirements can be quite lengthy, depending on the country and the type of project. Recent experience suggests that project development and approval times have fallen, but in some countries it can still take up to a year to complete the necessary procedures. Given private-sector concerns about the length of the overall CDM project cycle, it is useful to assess some of the experience with project processing times in host countries.

Published project processing times are generally in the range of 30 days for PIN processing and 30-60 days for PDD processing (see Appendix 6). For instance, Brazil, India, South Africa, and many others have adopted these timeframes. Figure 7.3 provides a schematic overview of the project processing procedures for Malaysia and indicates the expected time to complete various tasks. Malaysia has capped the time required for project processing (including initial screening and PDD assessment) at 12 weeks. A country assessment report prepared by UNDP reveals that Malaysia initially had difficulty in adhering to this schedule (mainly due to delays in convening review meetings), but processing efficiency has since increased.

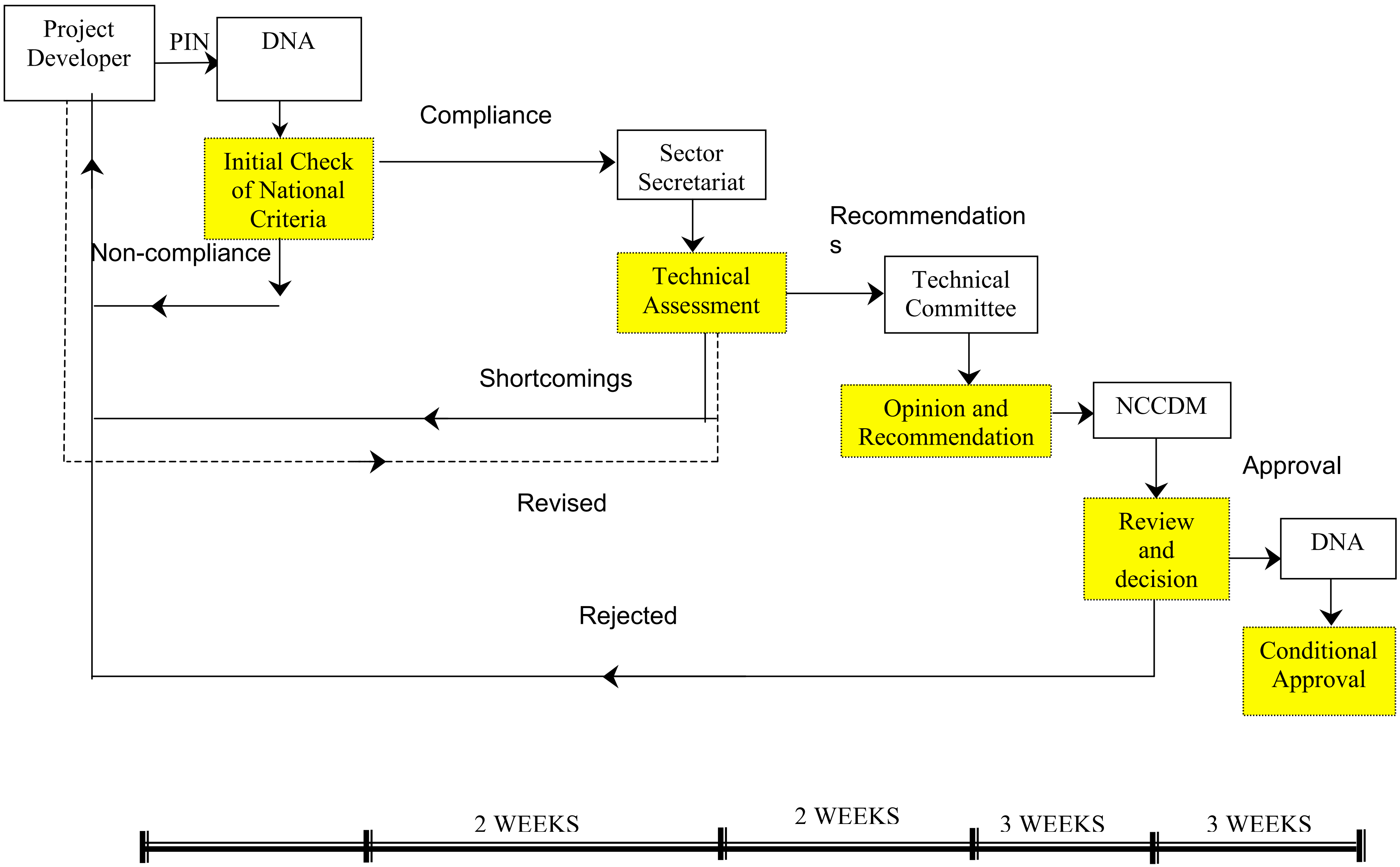
Indeed, processing times generally exceeded published approval times in most countries prior to 2005. This is to be expected as countries with little experience in CDM project screening and approval activities move up the learning curve and refine their procedures. Limited resources and technical skills, unclear sustainability criteria, and inter-ministry disagreements have all contributed to delays.

For example, in Brazil initial approval delays were mainly due to: problems encountered with inter ministry communication and integration; insufficient resources to perform the necessary functions; lack of clarity on project screening and assessment criteria and procedures; project prioritization and standards; and Portuguese-English communication constraints (CDM project documentation must be submitted in English). The quality of some of the project proposals being submitted was also an issue. Early on, some projects took over a year to gain approval. More recently, however, approval times have fallen as experience with project processing increased and as the technical skills and understanding of the project screening and assessment personnel expanded.

For most countries, actual project approval times tend to be in the range of 3–6 months, including preliminary PIN assessments. However, the time required will vary according to the experience and structure of the DNA, the quality of the PDD, and the complexity of the project (particularly if it is a controversial project or one that involves input from a wide range of ministries). Poor quality PDDs can take longer to process and may require proponents to supply additional information.

In sum, the main lesson learnt from the experience across countries is that it takes time to establish an efficiently functioning DNA and build technical skills in project screening and assessment. It is unrealistic to expect the project approval process to operate perfectly from the first day. For countries that have gained significant project processing experience, it is clear that project processing times tend to fall over time. This highlights the importance of hands-on experience with actual project processing and fine tuning procedures. Project proponents can expect to face somewhat longer approval times in countries that have little or no experience in processing CDM projects.

Figure 7.3: Malaysia CDM Approval Process



Source: regserver.unfccc.int/seors/file_storage.

7.4 DNA Resources and Technical Capacity Constraints

Resource limitations, both financial and technical, are major constraints faced by many DNAs. In fact, financial sustainability of DNAs and the need for ongoing training and capacity development are the most frequently identified issues in UNDP's CDM country assessment studies and advice provided by UNDP Country Offices.

7.4.1 Financial Resources

Establishing and operating host-country approval processes and administrative structures takes time and money: it is not costless. Estimating the costs is difficult, as these will vary considerably with the type of DNA structure established and the number of projects processed. The difficulty is compounded by the fact that some DNA costs are absorbed by various ministry budgets, and detailed cost breakdowns of their budget contributions to DNA functions are not publicly available. No reliable, country-sourced data on DNA costs and resource requirements was available during the preparation of this report.[106] Nevertheless, the main sources of funds available to support DNA operations are: resources provided by the host country; donor funds for institutional support; and fees from project proponents.

Resources provided by the host country

Host-country governments provide the overwhelming majority of resources and personnel for DNAs. Participating ministries and departments supply staff resources in kind, and usually absorb the costs through regular departmental/ministerial budgets. Government-sourced DNA staff often have other regular full-time positions and responsibilities; performing DNA and project screening tasks is usually additional to their everyday duties. Some DNAs have dedicated full-time positions (for example, South Africa) and others have donor-funded positions.

The resource requirements, particularly when there are few projects to process and approve, are likely to be quite modest (some DNAs have yet to process an actual project). However, in countries where project flow is significant (for example, Brazil, China, and India), there are likely to be considerable demands on DNA resources. India, for example, granted approval to 52 projects in December 2005 alone,[107] indicating that well-resourced DNA activities can function very efficiently. Nevertheless, increased project flows will raise demands on DNA resources and will likely have implications for future financial sustainability of DNA functions, unless national governments are willing to accommodate the increasing work loads within their regular budgets. Note that, although most discussion of transaction costs concentrates on the costs incurred by project proponents, processing and approving CDM projects also entails transaction costs, which are borne by the host-country government.

[106] In its report, *Institutional Strategy to Promote the Clean Development Mechanism in Peru,* the UNEP Risoe Centre assesses the expected costs of project processing. Although costs vary, in Peru it is estimated that processing costs are on the order of US$5,000–6,000 per project.

[107] *CDM and JI Monitor* (10 Jan 2006).

Donor funds for institutional capacity development
Both bilateral and multilateral donors have been very active in DNA capacity development activities over the past 5 years. Active donors include CIDA, DANIDA, Japan, the Netherlands, Norway, UNDP, UNEP, the World Bank, and several others. Many of these programs have often included funding to support part- or full-time positions in DNAs. In India, for example, the project screening work has been undertaken with assistance from consultants hired through the GTZ (i.e. the German bilateral development cooperation agency) and UNDP's DNA technical assistance programs. Unfortunately, in some countries, when donor funding expired, the positions were discontinued, raising implications concerning the financial sustainability of some DNAs.

Fees from project proponents
Surprisingly, host-country project approval processes are largely performed free of charge to project proponents. While several countries have considered, or are considering some kind of fee or levy to cover DNA costs (for example, Bolivia, Brazil, Egypt, and Morocco), as yet no DNA is known to levy fees at the project approval stage. Many countries consider that the introduction of project processing and approval fees could discourage CDM project developers and make their country less attractive.

It remains to be seen how long host-country approval activities can be continue to be performed free of charge, particularly in countries where project flow is increasing. Host countries need to be aware of the resource implications involved and balance these against the potential longer-term benefits that CDM projects could provide. As many developing-country governments have limited resources, particularly for environment-related activities, cost-recovery mechanisms may be needed to enhance the financial sustainability of DNAs and ensure that CDM approval processes do not divert scarce resources from other important development needs (for example, health, education, and other public services).

One cost-recovery mechanism that countries could consider is levying taxes or fees at a later stage in the CDM project cycle, such as after CERs have been issued. Such an approach avoids the disincentives associated with upfront payments (an issue of particular concern for small-scale project developers), but ensures that the host country shares in the financial benefits flowing from CDM projects (especially highly profitable ones, such as HFC, N_2O and landfill gas projects) and thus is able to recover some or all of its CDM administration expenses. Currently, the only country that levies a fee or tax on CDM projects is China, which has announced the introduction of a levy on project CER streams.[108] The revenue will flow to a national Clean Development Fund to help finance projects considered to have high sustainable development benefits.

7.4.2 DNA Human Resource Constraints

It is evident that many developing-country DNAs face significant human resource constraints. The level of technical skills and human resources available to DNAs varies

[108] China's DNA recently instituted the following tax structure for CER proceeds: (i) 65 percent of revenues from HFC and PFC projects; (ii) 30 percent of revenues from N2O projects; and (iii) 2 percent of projects from all energy efficiency, renewable energy, methane capture, and afforestation/reforestation projects.

considerably among countries (some DNAs have access to very competent staff). However, several common constraints have been identified, including:

- Lack of understanding of the procedural steps and requirements of the CDM project cycle and the PDD review process;
- Low understanding of project eligibility for the CDM, particularly concerning issues related to baseline methodologies and project additionality;
- Difficulties in developing and applying sustainable development criteria, including lack of political and policy direction on host-country sustainable development priorities;
- Limited understanding of broader climate change issues, the Kyoto Protocol, and the CDM's potential contribution to national development objectives;
- Relatively low levels of awareness among senior officials about the CDM and its potential role in sustainable development; and,
- Lack of experience and/or relevant technical skills to review projects and assess them against national selection criteria.

Many host-country governments recognise the need for further technical capacity development within their DNAs and related institutions, and some are taking steps to augment the level of experience and understanding among their personnel. These steps include: technical training programs (often with ODA support); 'learning by doing' training on real projects; study tours; attending workshops run by national and international experts and agencies; participating in CDM-related discussions at UNFCCC meetings; and, working directly with bilateral and multilateral organizations to develop and implement technical assistance activities in their countries. UNDP and other agencies have contributed to building DNA capacities and CDM awareness in several countries; nevertheless, many other countries need, but have not yet received, technical assistance.

Field experience indicates that it normally takes 2–3 years after DNA establishment before its skills and experience are sufficient to operate effectively. However, UNDP country assessments suggest that DNA skills can increase quite quickly with actual hands-on project processing experience (this has been particularly evident in Brazil). Since many DNAs have limited project processing experience (and in some cases none), ongoing training and capacity development is a significant need in most countries.

It is clear that financial support from donors will be required to establish DNA institutional capacity in countries that have not yet been able access the CDM to any great extent. However, even in some of the more advanced and well-established DNAs, there remains a heavy reliance on ODA funds and other external sources of assistance to meet the costs of DNA capacity building programs. Those countries that have been major recipients of projects may need to take on greater responsibility by investing their own resources in building capacity, perhaps financed via a cost-recovery mechanism.

7.5 Host-Country Sustainable Development Criteria

This section reviews the experience to date with the application of host-country sustainable development criteria to CDM projects. Host countries play an important role in ensuring that CDM projects contribute to achieving sustainable development objectives in non-Annex 1 countries (as well as assisting Annex 1 Parties in complying with their GHG emission reduction commitments). The overall aim should be to use CDM to facilitate market transformation in order to create less greenhouse-gas-intensive development pathways. The formulation and application of host-country sustainable development criteria are a key means by which host countries are able to link CDM activities to national sustainable development objectives and help ensure that CDM projects contribute to market transformation.

Although sustainable development has been an integral part of the environment and development lexicon since the late 1980s, the concept remains somewhat vague and all encompassing. The determination of what constitutes sustainability clearly involves value judgments on the part of decision-makers and will vary according to who is making the decision and their assessment of development priorities. Where CDM projects are concerned, one interpretation of a project's contribution to sustainable development might be that it reduces GHG emissions without causing any social, economic, or environmental harm. An alternative interpretation might be that projects must provide positive economic, environmental, and social benefits, not just reduced greenhouse gas emissions.

7.5.1 A Review of Host-Country Approaches

As stipulated by the Marrakech Accords, it is up to each host country to define and interpret sustainable development according to their own national circumstances and priorities—there are no predetermined criteria, rules, or guidelines. As a result, sustainable development criteria, and how they are applied to CDM projects, vary across countries. Many use checklists and multi-criteria analysis, some attach weighting and point-scoring systems, and others take a more qualitative view.

Amidst the diversity of country approaches, several common themes have emerged—namely, that projects should:

(i) provide a **net environmental benefit** (such as reduced GHG emissions, improved air quality, reduced waste generation, etc.) to the country or community in which it is located, or at least not result in a net adverse environmental impact;

(ii) deliver a **net contribution to economic development** (including the transfer of more efficient and environmentally benign technologies, increased employment, decreased dependence on energy imports, positive financial flows, etc.), or at least not result in net economic loss;

(iii) contribute to an **improvement in social conditions** (poverty alleviation, equitable distribution of benefits), or at least does not discriminate against a particular community or result in a less equitable distribution of rights or benefits.

Across different countries, the most common interpretation seems to be the 'on balance, net benefit' approach. Different stakeholders will undoubtedly attach different weights to sustainability criteria and specific commercial interests could skew decisions. Unlike GHG emission reductions, which in the CDM context is a market commodity, other social and environmental benefits—which do not flow through markets and hence are unpriced—often are undervalued in the CDM decision-making process.

South Africa provides an example of a well-articulated sustainable development framework (see Box 7.3), which defines sustainable development in terms of environmental, economic, and social criteria as measured by 25 indicators. The DNA does not assign numerical values to the qualitative goals, but instead evaluates projects on balance in terms of their net benefits. (As mentioned earlier, South Africa also provides the option of an early project review based on submission of a PIN, and will issue a 'no objection' letter if the project seems to fit the sustainable development criteria.)

Box 7.3: UNDP Case Study – South African DNA and Sustainable Development Criteria

In 2004–2005, UNDP implemented a Canadian-funded technical assistance program to help the Government of South Africa build its DNA project-approval procedures and refine its sustainable development criteria. A key project objective was to road-test these procedures against a sample of actual projects. The project also aimed to increase stakeholder awareness of SD criteria and their application to projects.

The DNA evaluates all projects according to the overall balance of their contribution to sustainable development and provides a detailed analysis of its decision to approve or reject a PDD. The DNA clearly defines sustainable development in terms of environmental, economic, and social criteria, as reflected by 25 indicators. Given the complexity of assigning numerical values to qualitative goals, the DNA does not provide a formal project-rating scheme, but instead evaluates projects on balance, according to environmental, social, and economic criteria. A key factor that cuts across the criteria is the idea of not causing environmental, economic, or social harm. CDM projects that are approved by the DNA must have more positive than negative benefits across these categories, which are described below.

- Environmental Criteria: The environmental criteria derive from South Africa's National Environmental Management Act (NEMA). The overall intention of these criteria is to ensure that the project produces net environmental benefits. There may be some negative aspects, such as waste emanating from the project, but these must be offset with positive benefits. Also, projects should not alienate resources, deny resource access, or cause natural resource damage, particularly to biodiversity, land, water, or air resources.
- Economic Criteria: Projects should have net economic benefits. Particularly important factors are the ability to positively impact foreign direct investments and the avoidance of excessive increases in consumer energy prices. Projects are reviewed to ascertain who benefits from the project and the resultant affordability to consumers. In addition, the project should enhance local skills development and technology transfer, and avoid technology 'dumping' (i.e. obsolete and/or inefficient technology should not be introduced through CDM projects).
- Social Criteria: Projects should be aligned with different policies at the national, provincial, and local levels. Projects involving relocation should undertake adequate consultation with affected communities to evaluate alternatives as well as compensation (if necessary). Overall, projects should contribute to poverty alleviation, increased employment, and enhanced social equity through a fair distribution of project benefits.

Source*: UNDP South African Project Evaluation Report.*

India is an example of a country that appears to base its sustainable development screening of projects on a ‘no harm, no objections’ basis. In other words, the DNA approves the project provided that it does not actually harm the environment or jeopardise development objectives. This definition of sustainable development has meant that project rejection rates in India have been low. Their interpretation and application of project approval criteria is somewhat broader than some other countries, and their main aim is to ensure that projects do not actually contribute to unsustainable practices.

Some stakeholders, particularly amongst the NGO community, have asserted that CDM host countries have an incentive to adopt lax sustainable development criteria in order to attract more investment—the ‘race to the bottom’ effect. These charges have been occasioned by the recent registration of several large HFC and N_2O industrial gas capture and destruction projects, with limited sustainable development benefits for the host country. However, little evidence is available to support this assertion, as the amount of information on how countries are actually interpreting and applying SD criteria is too limited to draw definitive judgements. Nevertheless, a recent review by the UNEP Risoe Centre concludes that tradeoffs exist between cost-effective emission reductions and other project benefits, and that ‘the initial assumption that the win-win relationship between the dual aims of the CDM does not hold for many projects studied in the literature’.[109] Other studies also point to the apparent disconnect between the objective of emission reductions and the other sustainability benefits that CDM projects may provide, with the former taking preference.

It has been difficult to source publicly available information on the number of projects that have been rejected by host countries, as information on rejected projects is not usually made public. However, there are some countries that are known to have done so. For example, two projects were rejected by Morocco’s DNA on the grounds of having strong potential to cause environmental harm (both were in the LULUCF and agriculture sectors).[110]

In general, there appear to be few examples of projects being rejected on sustainability grounds. If left purely to market forces, it is likely that sustainable development benefits would be given a low weighting in the decision-making process. However, China provides an example of establishing a policy that clearly signals the preference for CDM projects that are more directly linked to sustainable development and national objectives. This has been achieved through the levying of differential taxation rates on different project types, with higher rates on projects with fewer sustainable development benefits.[111]

[109] Karen Holm Olsen, *The Clean Development Mechanism’s Contribution to Sustainable Development* (UNEP Risoe Centre, 2005). For those interested in further details on sustainable development and the CDM, this report is recommended reading.
[110] UNDP Morocco, *CDM Country Assessment Study* (2004).
[111] HFC-23 projects will be taxed at 65 percent (www.cdm.ccchina.gov.cn).

7.5.2 Integrating CDM with National Sustainable Development Policies and Objectives

For the CDM to be an effective vehicle for promoting host countries' sustainable development objectives, it must be integrated with other policies and programs. If CDM projects are reviewed and assessed in isolation, it is unlikely that the full potential benefit of the CDM will be realised. UNDP's experience indicates that many countries are endeavouring to build these linkages.

- For example, the Philippines has national and sector-based sustainable development criteria and indicators, which were established through nationwide consultation and the use of modeling and decision analysis (multi-attribute) tools. Through this process, they have begun to assess long-term needs and objectives and link these to their national CDM strategy.
- In Morocco, the government has stressed CDM projects that draw on and develop national expertise, meet national technology development priorities, and are compatible with ongoing policies and programs.
- Malaysia's target area for the CDM is renewable energy (particularly biomass), which links to their national goal of supplying 5 percent of national energy demand from renewables. Malaysia has also targeted energy efficiency projects as a priority for the CDM.
- Brazil is very much driven by market requirements, but has indicated a strong preference for cogeneration projects involving sugar mill residues as well as small-scale CDM projects, with the goal of increasing the CDM's contribution to rural development and poverty alleviation.
- Colombia also gives preference to certain types of CDM projects through preferential tax treatment. Under Colombian law (Decreto 2755), a range of allowances and tax breaks are available for projects that utilise wind power, biomass, and agricultural residues. Colombia also offers a 15-year tax exemption on electricity sales from these types of projects.

Although building clear links to other national policy priorities and programs offers potential advantages to both governments and potential project investors, it is evident that many host countries have not yet established these connections. Moreover, even for those countries that have developed clear links, implementation and adherence to these policies is difficult to achieve in reality. Many developing countries are faced with severe financial, technical, and administrative constraints that will impinge on their ability to implement sector programs and policies. Bilateral and multilateral agencies have devoted, and will need to continue to supply, considerable resources (particularly in the form of official development assistance) to achieving these outcomes in developing countries. It is an important and ongoing task that will take many years, especially in the least developed countries.

7.5.3 Options for Establishing Sustainable Development Criteria

A growing body of material that has begun to emerge on the development and application of sustainable development criteria, which new entrants to the CDM market can draw on to learn from the approaches adopted by countries with more CDM experience. The UN Commission on Sustainable Development Criteria (CSD 1995) can provide a useful starting point, as will reference to the Millennium Development Goals (MDGs) (UN 2000). Support from NGOs and donor-funded CDM technical assistance programs have played an important role in helping countries to develop tailored sustainable development checklists to target key areas of interest (social, economic, and environmental). Appendix 7 provides a checklist of some of the key variables to consider in assessing projects against sustainability criteria.

Various tools have been created to help countries in sustainable development screening of projects. (Note that there is no single, generalized tool that can accommodate all project types.) SouthSouthNorth has produced a 'SouthSouthNorth Matrix Tool' that uses checklists and other screening methods to derive an overall project score, based on both qualitative and quantitative factors.[112] The tool helps identify key variables that countries may need to consider during project screening. This approach was applied to the Kuyasa Project in Cape Town, which is a good example of a project with clear sustainable development attributes. While adopting a scoring approach is potentially useful, it still requires subjective value judgments about the importance of different criteria, which will vary between countries.

Another framework for assessing sustainability outcomes is the Gold Standard, used mainly for renewable energy projects. The Gold Standard sets out requirements, beyond those required by the CDM Executive Board, that project proponents voluntarily adopt. The Climate, Community and Biodiversity (CCB) Project Design Standard is an approach not specifically related to the CDM, but which provides some useful sustainability checklists (included in the project design framework) that could be applied to forestry projects.

UNDP recently launched the MDG Carbon Facility, which will specifically target, through the CDM and other carbon market instruments, projects that directly contribute to sustainable development and the MDGs. UNDP will draw on existing tools and approaches for assessing sustainable development outcomes and is developing additional tools to assist in screening for specific MDG impacts.

Although carbon is the only item assigned a monetary value by the CDM market, other emerging markets for ecosystem services could expand the array of financial mechanisms accessible by projects and increase the economic attractiveness of projects with large sustainable development benefits. Giving weight to other project benefits, even if there is no real financial incentive to do so, is something countries should consider in the project screening process.

The International Institute for Sustainable Development has initiated a multi-stakeholder task force to further explore some of the issues outlined in its report, *Realizing the*

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[112] See SouthSouthNorth, 'CDM Toolkit. Module 1' (2004).

Development Dividend: Making the CDM Work for Developing Countries.[113] The project was launched to explore how the CDM can provide host countries with socio-economic and environmental gains—a 'development dividend'—while simultaneously meeting investors' need for low-cost emission reduction opportunities. UNDP is an active participant in this process and the work and findings of this Task Force may help guide thinking on the longer-term (i.e. post-2012) development of the CDM.

7.5.4 Potential Contribution of CER Buyers to Sustainable Development

At present, the main driving force in the CER market from the buyers' side is to source as many CERs as possible and as cheaply as possible, irrespective of the associated development benefits. Few purchase decisions are currently being made on the basis of project type or development benefits delivered. This may be understandable given that the Kyoto deadlines are quickly approaching, but hardly seems to be in the spirit of the CDM.

There are, however, some examples of commitments by Annex 1 buyers to purchasing CERs with greater development outcomes. Austria and Japan have established facilities, managed by Ecosecurities, for purchasing CERs from small-scale CDM projects. The World Bank has established the Community Development Carbon Fund, which pays a premium for projects with a clear sustainable development benefit (though these premiums are generally less than US$1/CER). The Dutch Government's CERUPT program also bases prices paid according to the project type and the technology used. And, as noted above, UNDP is in the process of establishing the MDG Carbon Facility, which will target projects that contribute directly to achievement of the MDGs in developing countries.

Nevertheless, on the whole there is very little buyer focus on the development dividend from the CDM. This is somewhat surprising, given the significant emphasis on climate and development issues in the COP/MOP discussions.

7.6 Private-Sector Issues in Host Countries

The private sector plays a central role in the development of CDM projects. While foreign investors, brokers, and consultants can be integral to project development, engaging the host country's private sector is paramount, as the decisions they make about technology and energy source options, building design, waste management arrangements, and land use will bear importantly on the development pathways and emission trajectories of developing countries for decades to come. It is here—investment decision-making and market transformation—where the CDM needs to have an impact.

This section reviews some of the key private-sector issues and constraints that have emerged in host countries in recent years. The observations provided in this section are based largely on UNDP's experience and there are undoubtedly variations from this experience. However, several common themes have emerged: level of private-sector

[113] For further details on this initiative, refer to the IISD website, http://www.iisd.org/climate/global/dividend.asp.

awareness of CDM requirements and procedures; technical capacity constraints; access to project finance; and, host-government support for the CDM.

7.6.1 Private-Sector Awareness

Much of the technical assistance provided by bilateral and multilateral agencies has been targeted at developing public-sector institutions and capacity: in many countries, the private sector has been largely ignored. In all but a few countries, the overall level of private-sector CDM awareness remains relatively low. A common finding emerging from UNDP country assessments is that private-sector awareness and engagement are closely correlated with the number of CDM projects the country has developed. While this may seem obvious, it highlights the importance of the demonstration effect and 'learning by doing'. Potential project proponents tend to be influenced by what they see, and the experience of others in similar situations, rather than what they read in general CDM information documents.

The availability of showcase projects in the country, combined with hands-on project training experience, has proven to be the most effective means of increasing private-sector interest in and understanding of the CDM. Brazil, India, Mexico, and more recently, China are good examples of the benefit of demonstration projects in raising awareness. Such projects can is also be a useful means of building the awareness of public-sector officials concerning private-sector issues and needs in their country.

However, even in countries with a significant level of CDM project experience, overall understanding of CDM rules and procedures can still be low. Box 7.4 provides an overview of the outcomes of a private-sector capacity development activity implemented by UNDP in Brazil in 2004–2005. The key outcome from this project was the recognition that interactive capacity building initiatives and information seminars can play an important role in raising stakeholder awareness and skills.

Case Study – Brazil

Box 7.4: Brazil: UNDP private-sector CDM capacity building

In 2004–05, UNDP implemented a Canadian-funded technical assistance project in Brazil, directed at raising private-sector awareness of the CDM in the State of Bahia. In particular, the project aimed to increase private-sector interest in developing small-scale CDM projects in rural areas of Brazil by increasing understanding of the simplified CDM procedures established to facilitate development of such small-scale projects.

The main project activities were:

- Development of contacts between state and federal government officials with Brazilian private-sector stakeholders in order to evaluate the CDM barriers and issues they face;
- Preparation of background information papers on key CDM issues;
- Convening a CDM Workshop in Salvador de Bahia, 24th-25th February 2005, to discuss project potential and private-sector barriers;
- Documenting the views of stakeholders on the key issues and barriers they faced, particularly in relation to small-scale CDM projects and possible options for addressing these issues.

The main observations from the workshop and stakeholder discussions were that:

- CDM procedures and modalities, particularly those related to small-scale projects, were not well understood by many private-sector project developers;

- High upfront transaction costs associated with CDM projects were a major disincentive for small-scale projects;
- Attracting investor funds could be difficult due to perceptions of high risk associated with CDM projects;
- Key areas of difficulty were in understanding baseline methodologies as well as monitoring and validation/verification requirements; understanding the concept of additionality, and accessing skilled service providers; and,
- Experience in negotiating carbon contracts with CER buyers was lacking.

Following the workshop and the completion of other project activities, participants gained a much better understanding of:

- Carbon markets and CDM rules and modalities for small-scale projects;
- Project approval procedures and administrative requirements in Brazil;
- Potential barriers and issues that project developers should be aware of;
- Key attributes that are likely to make CDM projects, particularly small-scale projects, attractive.

One of the most important and positive outcomes of the project was that it created a new and useful dialogue between project developers, federal and state officials, and NGOs. This facilitated a much better understanding of the current prospects for CDM and small-scale CDM projects, and what needs to be done to improve their future prospects. Brazilian government officials noted the concerns of developers and indicated that these would be taken into consideration in formulating Brazil's future CDM strategy.

Activities such as briefing seminars, information dissemination, training programs, and the development of public-private partnerships can all contribute to building private-sector understanding and capacity. However, these activities cost money and take time to produce outcomes. For the ten or so countries most active in the CDM market to date (particularly in Brazil, India, Mexico, Morocco, and the Philippines), multi-stakeholder efforts—involving government, industry associations, NGOs, carbon brokers, and bilateral and multilateral development agencies—are showing clear benefits in terms of increasing private-sector awareness and facilitating private-sector involvement. Countries that are just commencing CDM activities can learn from the experience of these countries and benefit from the considerable amount of relevant material already available.

Understanding the political environment for CDM and capacity building also is critical. For example, in South Africa, the first phase of the UNDP CDM project was hampered by concerns about the political sensitivity of climate change mitigation in South Africa, and the need for capacity building projects to identify all of the key stakeholders up front and get clear agreement on the role each will play in the process.

7.6.2 Technical Capacity Constraints

Access to appropriate and cost-effective technical skills is an important determinant of CDM project flow. Technical capacity constraints were frequently cited in the countries surveyed. However, field experience suggests that in countries where there has been a reasonable level of project activity, the local technical skills base and the range of competent technical consultants can actually be established quite quickly. Brazil, India, and more recently, the Philippines are good examples of this.

Box 7.5 provides a brief overview of UNDP's experience in facilitating private-sector participation and awareness in Brazil and South Africa. These activities have proved very successful, but they required considerable commitment (from private-sector project participants, government, and the donor agency) and sufficient resources to provide the necessary back-up support and technical assistance to have an impact.

With the rapid expansion of the CDM knowledge base over the past few years, web-based training materials and guidance documentation can play a significant role in assisting project proponents in different countries. Web-based facilities can provide project case studies, links to methodology databases, guidance on PIN and PDD development, and direct access to the field experience of others. The learning curve for new entrants is still significant, but it is becoming much easier to access relevant information. The development of multi-language web-based tools, combined with hands-on training, is clearly an important means of bringing private-sector participants up to speed relatively quickly. The work of the UNEP Risoe Centre in particular has been important in expanding web-based CDM knowledge products. Host-country government agencies (including DNAs) also have played an important role in establishing links to databases and guidance documentation.

Case Studies from Brazil and South Africa

Box 7.5: Engaging the private sector in CDM project activities: Brazil and South Africa

From 2000–2004, UNDP, in collaboration with the United Nations Conference on Trade and Development (UNCTAD), the United Nations Industrial Development Organization (UNIDO), and the World Business Council on Sustainable Development (WBCSD), implemented a United Nations Foundation-funded project to facilitate private-sector engagement in CDM activities in Brazil and South Africa. The project's goal has been to promote private-sector understanding of the CDM and encourage dialogue between various stakeholders. The project also involved government representatives and other stakeholders to increase their understanding of private-sector perspectives on CDM activities, while at the same time allowing them to provide their views to the private sector, thus enriching the overall level of awareness and national-level dialogue on CDM.

Project Objectives:

- Facilitate dialogue on the processes and structures necessary to make CDM successful.
- Seek better understanding of what it really takes to get a project through to the issuance of CERs.
- Develop a successful public-private sector interface on CDM.
- Develop a demonstration CDM project (jointly, with a private-sector developer) up to the point of a draft Project Design Document.
- Involve an additional 6-8 potential project developers and build their capacity to a level where they can initiate CDM project development on their own.
- Assess the efficiency of the DNA structure and project review processes.

Activities:

- In Brazil, the first activity was to organise a project developers' forum, which was held in 2000.
  - After assessing various CDM project options, the decision was made to focus on a biomass project, Project Bio-Energia – Cogerador, with Bioenergia as project developer. The project reduces emissions through cogeneration using sugar cane bagasse as fuel, and then sells surplus energy to the local grid.
  - A supplemental objective was to contribute to the development of a consistent methodology for biomass projects, which are a national priority for Brazil, given the importance of sugar production.
- In South Africa, a project developers' forum was convened in May 2002, involving UNDP, WBCSD, and the Government of South Africa, with representation from the various UN agencies involved in the

project, private-sector participants, and the CDM Executive Board.
   - The project chosen for demonstration purposes was a landfill gas project. Pikitup, Ltd. was selected as a project developer and was able to develop a project design document (PDD).

Lessons Learned:

- Engaging private-sector participants with a hands-on demonstration project significantly enhances the level of understanding of CDM project processes and requirements—more so than seminars or workshop with a more theoretical approach.
- Private-sector participants are much more willing to engage in CDM activities when there are clearly defined government approval processes and selection criteria.
- The delivery of a series of training and technical assistance activities over time has a more discernible impact on building private-sector awareness and capabilities than one-off, ad hoc information seminars.
- Choosing a good potential project developer takes time and effort. Investing the time to do sufficient due diligence regarding a company's capacity and commitment reduces future problems. Furthermore, potential project developers have a greater willingness to drive the process if they have technical assistance support mechanisms and the interest of other private-sector participants in the same sector.

Another important means of increasing the skills base has proven to be linking capacity building activities directly to showcase demonstration projects and hands-on, 'learning by doing' exercises. The results in some countries—where such exercises have been staged over an extended period, incorporating various types of activities—have been promising.

Dependence on expensive foreign consultants, both for project development and validation/verification, has been a issue for many project proponents. In countries with relatively large project flows, there is a need for a greater domestic base of specialist skills demanded by the CDM market. However, expanding the technical skills base takes time. In the coming years, South-South cooperation will be an important vehicle for providing cost-effective technical services, and some examples of this are already beginning to emerge.

In fact, many DOEs are establishing branches in non-Annex 1 countries and this should, over time, reduce some of the costs associated with the provision of project validation and verification services. Given the time it takes to build specialist skills, it will be some years before host countries' dependence on foreign consultants can be eliminated. There are opportunities for bilateral and multilateral assistance, in conjunction with industry associations and existing consulting groups, to enhance project proponents' ability to access the relevant skills.

7.6.3 Access to Finance

Access to finance, for both the preparation of project proposals and underlying project finance, is a common constraint for CDM project providers. In nearly all countries surveyed by UNDP, access to finance to develop and implement CDM projects featured as a key issue. Even in countries that are major project providers (such as Brazil and India), access to finance is still a key problem facing project proponents.

While the availability of funds to purchase CERs has increased substantially (reaching more than US$3 billion by 2005), the underlying financing to develop, construct, and implement CDM projects has been much more difficult to secure. Some carbon funds and investors are willing to advance funding to cover initial transaction costs or take on responsibility for meeting CDM transaction costs on behalf of the project proponent. This can be a significant benefit to project developers, particularly for small-scale projects. Several carbon funds and brokers also offer commercial finance or direct links to third-party providers.

Nevertheless, the primary vehicle for carbon market finance is through emission reduction purchase agreements (ERPAs); direct equity investments by carbon funds are not common. Having a signed ERPA can increase the project proponent's chance of securing underlying project finance, particularly as carbon revenues will be in the form of hard currency. However, having a signed ERPA does not guarantee that finance will be secured.

Public-sector funds (government procurement programs) are still the main source of carbon finance, accounting for about two thirds of current investment. While the private sector traditionally contributed a very small share of carbon funds, the amount of private funds under management has increased rapidly since 2004. This has marked a major shift in the market and an increasing number of private-sector financial entities (banks, insurers, hedge funds, and trading houses) are entering the market, both in terms of purchasing CERs and providing financing for projects.[114]

The key variables influencing the ability to attract underlying project finance are the:

- financial sustainability of the project, particularly its ongoing financial viability in the absence of carbon revenue streams;
- length of time required to recoup CDM-related investments costs;
- existence of an ERPA signed by a buyer;
- risks of non-delivery of project emission reductions; and,
- credit rating of the project developers.

Based on UNDP's CDM experience, it has been evident that many developing-country financial institutions have a very low level of understanding of the carbon market and the financial returns available from CDM projects. As a result, many project proponents have had difficulty accessing project finance locally. Given that the CDM market is only in its early stages, and that considerable uncertainty surrounds the existence of a post-2012 market for emission reduction credits, commercial financial institutions are understandably cautious about lending money to CDM project developers. Until CDM market risks and uncertainties are reduced, access to finance will remain an issue.

The financial barriers are greater for small-scale project proponents and those without direct links to foreign investors. For small-scale project proponents, the costs of developing a proposal to the point of being a bankable project can be a significant hurdle. Increasing the availability of seed financing, particularly in countries where CDM project activity has been limited, could play an important role in increasing the flow of CDM projects and building private-sector capacity and engagement. In the absence of private-sector finance, the role of bilateral and multilateral technical assistance funds could be important in getting projects to a stage that can attract potential private-sector investments.

[114] *CDM and JI Monitor* (10 January 2006), p.1.

Related to the issue of capacity development in the private sector is the role of official development assistance (ODA) in establishing the CDM. The treatment of ODA under the CDM continues to be a relatively grey area and one subject to some confusion and misinterpretation. The Marrakech Accords state that:

> 'Public funding for clean development mechanism projects from parties in Annex 1 is not to result in the diversion of official development assistance and is to be separate from and not counted towards the financial obligations of Parties included in Annex 1.'

What constitutes a diversion of ODA funds is not specified, leaving considerable room for interpretation.

The proposed OECD approach for the treatment of ODA fund reporting essentially means that ODA funds cannot be used to pay for CERs and/or if ODA funds are used to generate CERs through a CDM project, then the value of the CERs generated must be deducted from ODA expenditure.[115] Based on this interpretation, it is clear that ODA funds can be used to facilitate the development of host-country capacity, both in the public and private sector. ODA assistance can also be used to facilitate the development of CDM project ideas, particularly where they are linked to capacity building activities. Activities clearly eligible for ODA support include: development of technical support networks; creating tools and information services to assist project developers: supporting industry networks and institutions in developing methodologies and monitoring and reporting frameworks; and, building host-country validation and verification capacity.

Governments and bilateral/multilateral agencies can play an important role in 'kick-starting' private-sector engagement in CDM activities. UNDP has played an active role in stimulating public-private sector partnerships to increase the level of involvement of private-sector organizations. The channeling of ODA funds towards the promotion of market-based mechanisms such as the CDM would appear to be a worthwhile activity, particularly for those countries in the early stages of CDM engagement. This could be a means of overcoming some of the financial barriers, particularly in relation to upfront transaction costs for project identification and PDD preparation.

7.6.4 Host-Country Administrative and Political Support for CDM

Another factor influencing the level of private-sector engagement in different countries is the extent to which the host government actively supports CDM activities and the administrative and regulatory frameworks they have put in place. The transparency and efficiency of DNA procedures, clarity of sector-development priorities, government promotional and support activities, and the existence of clear regulatory and legal frameworks have all been shown to have a major influence on private-sector interest and project development. Lack of clearly defined legal frameworks and property rights remains an issue in many countries.

[115] OECD reporting guidelines specify that 'ODA expenditures must be net of any funds earned by the ODA expenditure' and that 'the value of CERs generated from ODA investment in a CDM project must be deducted from reported ODA finance'.

Clear policy guidance and government institutional structures for CDM are essential for building private-sector confidence. Private-sector project developers have been hesitant to invest time and money in CDM project development when the policy and regulatory signals from government were unclear. There are both push- and pull-forces at work. While the development of good public-sector enabling environments has been important in stimulating private-sector interest (Morocco, India, Mexico and Chile are good examples), it is also apparent that project developers and the existence of 'bankable' projects can speed up government policy decisions. Private-sector pressure (particularly if they have prospective projects) has led some governments to move quickly to establish the necessary approval procedures and administrative arrangements.

High-level political support for establishing host-country structures can make an important contribution to successfully accessing the CDM market, and its absence can slow down project approvals. For example, in both Malaysia and Bangladesh, there were initial difficulties in raising sufficient interest and commitment amongst different ministries to actually meet and decide on projects. This led to considerable frustration and delays for some project proponents.

8 CONCLUSIONS

This report has discussed a range of aspects associated with the Clean Development Mechanism. The intention has not been to provide a comprehensive analysis of every facet or issue, but rather to review progress to date with the CDM's establishment and to highlight key trends and constraints.

The purpose of this final chapter is to draw conclusions, based on the material presented in this report, about a range of issues confronting the CDM. The following conclusions are based largely on the experience of UNDP, but also incorporate the observations of other commentators and analysts. Undoubtedly, some stakeholders will disagree with some observations and conclusions, but the intent of this report is to present as balanced and objective an analysis as possible, based on the information available.

Delivering on the CDM's Main Objectives

Will the CDM deliver on the two main objectives outlined in Article 12 of the Kyoto Protocol—namely, to (i) provide alternative emission abatement options for Annex 1 countries and (ii) contribute to sustainable development in non-Annex 1 countries?

- **The CDM is likely to provide a significant volume of cost-effective CERs for Annex 1 purchasers during the 2008–12 commitment period and beyond.** If the estimates prepared for this report prove accurate, the CDM may generate approximately 1,000 million CERs over this period. There is a degree of uncertainty concerning the ability of projects to be implemented and to generate the expected number of CERs, but the 1,000 million figure can be considered a 'realistic' central estimate, based on project performances to date This predicted CER generation is equivalent to about 15 to 25 percent of the expected market demand for Kyoto-compliant emission reduction credits, and the CDM could thus become an important contributor to meeting the projected shortfall in GHG emission reductions in some Annex 1 countries.

  Since the average cost of CERs generated by CDM projects has been in the US$5–10 range, it appears that the CDM will provide a cost-effective abatement option for Annex 1 countries.

- **Given trends in the existing project pipeline, the benefits of the CDM are likely to be unevenly spread among countries through 2012, and it remains to be seen whether the CDM can deliver a broad-based sustainable development dividend.** There is, as yet, very little documented evidence and analysis of whether and how the CDM projects will deliver sustainable development outcomes. However, in the medium term, only a small number of countries are expected to account for most CDM projects, and the bulk of the revenues produced through sales of CERs will flow to just five countries.

If the CDM is to have a discernible impact on sustainable development outcomes, there must be a significant increase in the number of projects, a broader geographic distribution of carbon revenue flows (especially to the least developed countries), and a fundamental, lasting market transformation. This will not happen overnight, nor will it happen by 2012. Nevertheless, the CDM appears to have significant long-term potential as an effective market instrument for promoting sustainable development.

Delivering the Right CDM Project Mix

- **The CDM project mix appears to be evolving in the right direction, but it will be some time before the complete range of project types is fully represented.** While most of the projects registered with the EB thus far have used technologies that may promote sustainable development as well as providing emission reductions, the range of technologies used has not been very large. Moreover, several key project types—such as transport, non-industrial scale energy efficiency, and afforestation/reforestation—have not figured significantly in the project mix. This is in part due to the market framework in which the CDM presently operates: the drivers tend to favor quick payback activities.

  If more market certainty emerges, it will most likely lead to longer contracting periods and, combined with an increasing number of approved methodologies, will undoubtedly expand the range of technologies used by CDM projects. However, there are some options and actions that could accelerate the process, including:

  - More proactive (top-down) investment in the development of new baseline methodologies (both small- and large-scale) that are pre-approved by the Executive Board, reflecting the 'public good' nature of methodology development (possibly utilising some of the growing revenues from the EB administrative fee);
  - Further development of guidelines and procedures pertaining to programmatic CDM projects;
  - Expanding the types of land use, land use change, and forestry projects that are eligible under the CDM, particularly projects (such as sustainable agricultural practices and the rehabilitation of degraded lands) that offer a range of carbon mitigation, climate change adaptation, and development benefits;
  - Investing more effort in expanding the number of small-scale methodologies, particularly in areas where there has been little project activity to date; and,
  - Revising the small-scale project classification system to provide a more equitable treatment across different project types.[116]

- **Achieving a project mix that encompasses the full range of sustainable technologies will require fundamental changes in CDM market drivers.** Some stakeholders have expressed concern that a majority of emission reductions and associated revenue flows will come from a small number of large industrial gas projects

[116] As outlined in Chapter 5, revising the small-scale classification to introduce a standard benchmark of 30,000 or even 50,000 CERs per year for all types of small-scale projects could increase the development dividend component of the CDM without undermining the credibility of the system.

delivering limited development benefits. However, the early development of these highly profitable projects reflects market forces at work, and the large number of CERs they generate will play an important role in increasing CDM market liquidity in the short term, as well as helping to build a stable, mature market in the longer term.

One option for addressing stakeholder concerns and ensuring that long-term CDM outcomes are not dominated by projects with limited sustainable development impacts would be to limit post-2012 crediting of emission reductions from such projects (for example, by introducing sunset clauses). Another option is for other countries to adopt approaches similar to that recently announced by China, in which the lucrative revenue flows associated with these projects are taxed, and the resulting revenues used to fund development of projects with greater sustainable development impacts.

Impact of Post-2012 Uncertainty

- **Uncertainty concerning the post-2012 climate framework and its implications for the continued existence of a broad-based international carbon market is the single most important factor influencing the outlook for CDM growth and evolution over the next 5 years.** Even though the EU is committed to continuing its Emission Trading System beyond 2012, the broader international uncertainty over carbon trading affects both the *volume* and the *types* of projects entering the CDM project pipeline. This lack of medium-term stability and predictability makes the CDM a high-risk market for many investors, and serves to shorten the investment horizon for CDM projects.

  Unless greater clarity emerges by 2008, this market uncertainty will most likely lead to reduced project flow and delivery of fewer CERs during the first commitment period and beyond. Conversely, if a clearer picture develops, the flow of projects and CERs could ramp up quickly, and delivery of CERs could exceed 200 million per year by 2012.

CDM's Role in Reducing Global Greenhouse Gas Emissions

- **With a significant scaling up of project activity, the CDM could have a meaningful impact on the trajectory of GHG emissions over the next few decades in non-Annex 1 countries.** To a large degree, the CDM is a 'zero-sum game' with respect to GHG emissions, shifting abatement from one jurisdiction to another rather than bringing about reductions in the absolute level of global emissions per se.

  However, the CDM could deliver an estimated 180–230 million CERs per year during the 2008–2012 commitment period, which is equivalent to lowering the trajectory of carbon emissions in non-Annex 1 countries by approximately 0.5 percent relative to business as usual. This is not a dramatic shift, but it is a start. To make a dent in global GHG emissions, the CDM must succeed in transferring technology, giving impetus to technology innovation, and delivering market transformation in developing world.

Impact of CDM Transaction Costs on Project Development

- **Transaction costs do not appear to be a major deterrent for most CDM projects.** Empirical evidence does not support the contention that transaction costs are a barrier to CDM project development and implementation. Indeed, many CDM transaction costs are likely to fall over time as market participants gain experience and as more information on the experiences and lessons learnt by 'early movers' is made available to newer market entrants. This trend has already been observed.

  A notable exception is small-scale projects generating less than 5,000 CERs per year, which face a range of disadvantages that may not be easy to remedy. Evidence suggests that many small-scale projects tend to focus on technologies with more discernible development benefits, particularly in the smaller, less developed countries, and thus may warrant special efforts designed to 'level the playing field'. Although the EB has taken steps to lower upfront transaction costs for small-scale projects, unless CER prices rise significantly above current levels, many of these projects are likely to remain unattractive as CDM investment options.

- **Additional action could lower transaction costs even further, particularly for village- and rural-based projects that deliver important environmental, economic, and social benefits.** UNDP's experience indicates that many such projects could contribute importantly to alleviating poverty and environment issues and help countries achieve the Millennium Development Goals. However, with current CDM rules, procedures, and transaction costs, most are not viable from a CDM point of view. Some possible options for further reducing the transaction cost barrier for such projects are:

  - allowing more streamlined validation and verification procedures (particularly spot sampling verifications for bundled projects) and less frequent full verifications to substantiate project emission reductions; and
  - clearly defined automatic additionality provisions for small projects using certain types of technologies (for example, all solar PV projects would be automatically be deemed additional).

Status of the CDM International Administrative Infrastructure

- **The international administrative infrastructure set up to support the CDM is, for most of the steps in the project cycle, operating reasonably efficiently, although areas for further improvement remain.** By its very nature as a baseline-and-credit type of emissions trading system, the CDM is bound to be administratively complex and require considerable time and effort to establish the necessary administrative infrastructure. Given the limited resources that have been available to the EB, and the steep learning curve faced by all actors, progress has actually been quite good.

  Ensuring the credibility of the system is fundamental to its success, and thus taking the time, resources, and effort to get it right is of paramount importance. Although fine tuning will no doubt be needed over time, the existing infrastructure appears quite sound. To help ensure that the system continues to evolve in the right direction, further interaction and dialogue between the EB and other CDM participants (such as project proponents, carbon brokers, the business community, etc.) could be useful. In addition, the EB will likely have access to increased financial flows over the next few years (through donor funding commitments as well as project fees), which may provide options for greater investment in improving the efficiency of the system.

Capacity of Non-Annex 1 Countries to Access the CDM

- **Although some countries have established the necessary capabilities, the capacity of most non-Annex 1 countries to access the CDM remains limited.** In general, establishing adequate host-country capacity takes 3–5 years of experience in developing projects and seeing them through each stage of the CDM project cycle. This means that a truly broad-based level of participation will not be achieved before 2012, even if the issues surrounding post-2012 crediting of emission reductions are quickly resolved.

  If the CDM is to have ongoing political support in the developing world, and if it is to deliver a broad-based development dividend, the capacity constraints of non-Annex 1 countries must be addressed as a priority issue. As experience with the CDM grows, and as more web-based decision tools and knowledge products are made available to new market entrants, the steepness of the learning curve should lessen. However, much more needs to be done to build broad-based capacity in non-Annex 1 countries to effectively access the CDM and enable it to deliver sustainable development outcomes.

Role of Donors and Development Assistance

- **To expand the base of countries capable of successfully accessing the CDM, donors will need to provide considerable amounts of additional assistance to build host-country capacity, especially in the least developed countries.** Market forces will drive CDM project development and generation of CERs, but left to its own devices, the market is unlikely to invest in developing institutional and technical capacity in host countries. Thus, the role of bilateral and multilateral donors is large and important, particularly in the least developed countries and other low-income countries that have not yet been able to effectively access the CDM.

  Donor assistance provided to date has, at times, been limited in scope, ad hoc in nature, focused on the public sector, and directed toward a limited number of countries. If the CDM is to gain traction in the poorest and least developed countries, donors will need to implement broad-based technical assistance strategies and programs over the next 5-10 years, targeting private- as well as public-sector capacity. To this end, UNDP intends to focus increased attention on building broader, near-term engagement by a greater number of countries.

Thus, the CDM does appear likely to both deliver a reasonable quantity of cost-effective emission reductions and increase the flow of technologies and finance to some non-Annex 1 countries during the first commitment period. It is also evident that the CDM could prove to be a useful market instrument for promoting sustainable development. However, for the CDM to realize its full potential, several key constraints will need to be overcome, particularly increasing the breadth of developing-country engagement and the ability of these countries to effectively access the carbon market.

APPENDIX 1:
Emission reduction targets under Annex B of the Kyoto Protocol

Country	Target*	Country	Target*	Country	Target*
Australia***	108	Greece	92	Norway	101
Austria	92	Hungary**	94	Poland**	94
Belgium	92	Iceland	110	Portugal	92
Bulgaria**	92	Ireland	92	Romania*	92
Canada	94	Italy	92	Russian Federation**	100
Croatia*	95	Japan	94	Slovakia**	92
Czech Republic**	92	Latvia**	92	Slovenia**	92
Denmark	92	Liechtenstein	92	Spain	92
Estonia*	92	Lithuania**	92	Sweden	92
European Community	92	Luxembourg	92	Switzerland	92
Finland	92	Monaco	92	Ukraine**	100
France	92	Netherlands	92	UK and Northern Ireland	92
Germany	92	New Zealand	100	United States***	93

* Percentage of base year of 1990
** Countries that are undergoing the process of transition to a market economy.
*** Australia and the US chose not to honor their commitments and did not ratify the Kyoto Protocol.

APPENDIX 2:
CDM Investment Funds as of June 2006

NAME	PARTICIPANTS	DETAILS
Asian Development Bank's Clean Development Mechanism Facility	Funded by: Various ADB members Coordinated by: ADB	• Launched in 2003; pilot for 3 years • ADB to provide US$800,000 for administration • Estimated to support 40 projects for total of 20 Mt.
http://adb.org/CDMF/default.asp		
Austrian CDM Small-Scale Project Facility	Funded by: Austrian Ministry of Agriculture, Forestry, Environment and Water Management Coordinated by: Ecosecurities and Kommunalkredit Public Consulting (KPC)	• Launched in November 2004 • Focus on small-scale CDM projects. • Goal is to secure 1.25 Mt by 2012 via 7-15 projects, mainly in Latin America and the Caribbean • Sinks projects are excluded
http://www.kommunalkredit.at/up-media/1376_ssc-cdm-facility_(eng).pdf		
Austrian JI/CDM Programme	Funded by: Austrian Ministry of Agriculture, Forestry, Environment and Water Management. Coordinated by: Kommunalkredit Public Consulting (KPC)	• Launched in 2003 • Total budget of ~ US$43 million allocated for the period 2003-2012 (some funds are allocated for the CDCF) • As of September 2005, 4 projects have been contracted • A third call for tenders is open until January 2006
http://www.ji-cdm-austria.at/en/programm/programm.php		
BioCarbon Fund (BioCF)	Funded by: Governments of Canada , Italy, Luxembourg, & Spain, as well as Okinawa Electric, Tokyo Electric, Eco-Carbone, Agence Francaise de Developpement, Sumitomo Joint Power Coordinated by: Carbon Finance Unit (World Bank)	• Launched in 2004 • Currently capitalized at around US$53.8million • Project type focus on sequestration or conservation of carbon in forest and agro-ecosystems. • Contracted prices for ERs are expected to be in the range of US$3 to $4 per tonne of CO_2e.
http://carbonfinance.org/biocarbon/home.cfm		
Carboncredits	Funded by: Dutch Government Coordinated by: Carboncredits.nl (SenterNovem)	• CERUPT (CDM) tender program was launched in 2002 • SenterNovem pays approx. € 3-5 (US$3.5-6) per tonne, though exact prices are determined through competitive bidding.
http://www.senternovem.nl/carboncredits/index.asp		

NAME	PARTICIPANTS	DETAILS
Clean Power Income Fund	Funded by: Various Coordinated by: Clean Power Income Fund	• Launched in 2001 • Provide capital for renewable energy projects • Works mainly in Canada with some interest in Mexico
http://www.cleanpowerincomefund.com/home/index.htm		
Climate Fund (Canada)	Funded by: Government of Canada Coordinated by: TBD	• Announced in 2005; currently under development • Purchase of domestic (offset) credits and Kyoto units (CDM, JI, GIS) • International units must contribute to Canada's broader sustainability interests
http://www.climatechange.gc.ca/kyoto_commitments/report_e.pdf		
Climate Investment Partnership (CIP)	Funded by: Various European private-sector firms, none of which need ERs for compliance. Coordinated by: CIP	• Provides upfront financing for projects that reduce GHG emissions in return for ERs
http://www.climateinvestors.com/home.php		
Community Development Carbon Fund (CDCF)	Funded by: Governments of Austria, Belgium, Canada, Italy, Luxembourg and the Netherlands and Spain, as well as BASF (Germany), Daiwa Securities SMBC Co. Ltd (Japan), Electricidade De Portugal (Portugal), Endesa (Spain), Fugi Photo Film Co (Japan), Gas Natural (Spain), Goteborg Energi AB (Sweden), Hidroelectrica del Cantabrico (Spain), Idemitsu Kosan Co. Ltd. (Japan), KfW (Germany), Nippon Oil Corporation (Japan), Okinawa Electric Power (Japan), Rautaruukki (Finland), Statkraft Carbon Invest AS (Norway), Statoil ASA (Norway) and Swiss Re (Switzerland) Coordinated by: Carbon Finance Unit (World Bank)	• Launched in 2003 • Investment of US$128.6 million in contributions from 15 participants • Project type focus is on small-scale projects in the poorer rural areas of the developing world. • No more than 10 percent of the Fund's assets will be contributed to projects in the same country. A minimum of 25 percent of the Fund will be contributed to eligible projects located in developed countries and other poor developing countries, with a special focus on Africa. • CDCF prices will likely be higher than average
http://carbonfinance.org/cdcf/home.cfm		
Danish Carbon Fund	Funded by: The Danish Ministry of the Environment, the Danish Ministry of Foreign Affairs, and the power companies E2Energy and Elsam (additional investors being sought) Coordinated by:	• Launched in 2005 and set to run for five years • Target is to invest US$35 million in a portfolio of 5-7 projects for a total reduction of 5-6 Mt (approx. US$5 million will be placed in the CDCF).

NAME	PARTICIPANTS	DETAILS
	Carbon Finance Unit (World Bank)	• Includes CDM & JI projects
http://carbonfinance.org/router.cfm?Page=html/danishcarbonfund.htm		
E+Co Carbon Access	Funded by: Various investors and through individual donations Coordinated by: E+Co	• Focus on projects under 15MW • Buy and sell CERs • E+Co provides early stage investment in the form of debt of equity ranging from US$25,000-$250,000.
http://www.energyhouse.com		
EcoSecurities-Standard Bank Carbon Facility	Funded by: Danish Ministry of the Environment, with participation of Danish industry Coordinated by: EcoSecurities	• Launched in 2002 • Target is to invest €7.9 million (US$9.3m) to obtain 1.2-1.7 Mt in the first round. • Geographic focus on Central and Eastern Europe, Caucasus and Central Asia • Projects must be minimum of 50,000 tonnes (sinks projects ineligible) •
www.DanishCarbon.dk		
European Bank for Reconstruction and Development (EBRD) - Multilateral Carbon Credit Fund (MCCF)	Funded by: Various, yet to be determined Coordinated by: EBRD	• Expect to launch in 2005 • CDM geographic focus is Central Asia, Caucasus, and Macedonia
http://www.ebrd.com/country/sector/energyef/carbon/index.htm		
European Carbon Fund	Funded by: Caisse des depots et consignations (CDC) and Fortis Bank & others Coordinated by: IXIS Environnment & Infrastructures (wholly owned subsidiary of IXIS Corporate & Investment Bank)	• Set to run from 2005-2012 as CO_2 mutual fund • Target audience is financial institutions and fund managers looking to invest in new class of assets. • Target is €100 million (US$118m) • Sellers submit project proposals directly; ERs are paid on delivery
http://www.europeancarbonfund.com/		
FE Clean Energy Group's Funds	Three distinct funds funded by: 1) Dexia Bank, EBRD and others, including Maubeni Corporation, Mitsui & Co, Kansai Electric Power and J-Power (Japan) 2) Tokyo Electric Power Company, Sumitomo Corporation, IADB, Banobras and NAFIN	All funds are equity funds designed to provide capital financing rather than purchase Ers. 1) Dexia-FondElec Energy Efficiency and Emissions Reduction Fund • JI projects only

NAME	PARTICIPANTS	DETAILS
	(Mexican banks) 3) Mitsubishi Corporation, Chubu Electric Power, Japanese Bank for International Cooperation (Japan), Société de Promotion et de Participatior pour la Coopération Economique (France). Coordinated by: FE Clean Energy Group Inc	2) FondElec Latin America Clean Energy Services Fund, L.P. • Set to run from 2001 – 2006 • Investment: US$31.6 million • Geographic focus: Mexico, Central and South America. • Eligible projects: energy efficiency and renewable energy 3) Global Asia Clean Energy Services Fund, L.P • Set to run from 2004-2008 • Investment: US$46 million • Geographic focus: China, India, Philippines, Thailand, Central and Eastern Europe • Eligible projects: energy efficiency and renewable energy •
http://www.fecleanenergy.com/		
Finnish CDM/JI Pilot Programme	Funded by: Ministry for Foreign Affairs of Finland and the Ministry of the Environment of Finland Coordinated by: Steering Committee of the Pilot Programme	• Launched in 1999 with total € 20 million (US$24m) – this includes € 10 million (US$12m) for the PCF. • Estimated credits during the first commitment period is 1–1.4 Mt CO_2e (incl. both CDM & JI) • Price per ton is estimated at € 2.5–6 (US$3-7)
http://global.finland.fi/english/projects/cdm/		
Greenhouse Gas Credit Aggregation Pool (GG-CAP)	Funded by: The Chugoku Electric Power Co., Inc.; Cosmo Oil Co. Ltd.; Electricity Supply Board (Ireland); Endesa Generacion; E.ON UK; EPCOR; Hokuriku Electric Power Company; Hokkaido Electric Power Co., Inc.; Iberdrola; Norsk Hydro ASA; The Okinawa Electric Power Co., Inc.; Public Power Corporation S.A.; Repsol YPF; Sergey Brin; Suntory, Ltd.; and Tokyo Gas Co., Ltd. Coordinated by:	• Launched in 2005 • Closed at US$550 million, with 26 participants • Set up as private-sector buyer's pool

NAME	PARTICIPANTS	DETAILS
	Natsource Asset Management	
http://www.natsource.com/markets/index_sub.asp?s=178		
ICECAP	Funded by: Cumbria Energy Limited, Investec Bank (UK) Limited and Less Carbon Limited Coordinated by: Less Carbon	• Launched in 2004 • Target is 40Mt • Will act as a carbon credit clearinghouse
http://www.lesscarbon.com/icecap.asp		
Italian Carbon Fund (ICF)	Funded by: Ministry for the Environment and Territory (Italy) Coordinated by: Carbon Finance Unit (World Bank)	• Launched in 2003 • Target is US$80 million • Preference given to projects that generate at least 60 percent of contracted emission reductions by 2012. • No more than 50 percent of the contributions of the ICF capital will be committed to projects located in the same country. No more than 50 percent of the assets of the ICF will be invested in any one project.
http://carbonfinance.org/router.cfm?Page=html/icf.htm		
Japan Carbon Fund	Funded by: Japan Bank for International Cooperation (JBIC), Development Bank Japan and private-sector companies Coordinated by: JBIC	• Launched in 2004 • Size is approx. US$100 million • Applies to CDM & JI • Includes limits on number of projects from particular sector and geographic area as well as total size
http://www.cdmegypt.org/Djerba/20-JBIC%20Presentation.pdf		
Japan Greenhouse Gas Reduction Fund	Funded by: Toyota, Sony, Sharp, Terumo, Tokyo Electric Power, Tohoku Electric Power, Hokuriku Electric Power, Kansai Electric Power, Chugoku Electric Power, Okinawa Electric Power, Nippon Oil, Japan Energy, Kyushu Oil, Taiheiyo Cement, Tokyo Gas, Mitsui, Mitsubishi Corp, Sumitomo, Marubeni, Itochu Corp, Sojitsu, JGC and the Japan Iron and Steel Federation Coordinated by Japan Bank for International Cooperation (JBIC) and the Development Bank of Japan (DBJ)	• Total investment of US$141.5 million • Target of 10-20 Mt (by 2012). • Projects must have a minimum annual volume of 50,000 tCO_2e • The fund will invest no more than US$30 million in projects in any one country or more than US$35 million in one project sector.
http://www.oneworld.net/external/?url=http%3A%2F%2Fwww.enn.com%2Fbiz.html%3Fid%3D92		

NAME	PARTICIPANTS	DETAILS
KfW Carbon Fund	Funded by: KfW (additional investors being sought)	• Launched in June 2004 • Target is € 50 million (US$59m); KfW pledged € 10 million (US$12m)
http://kfwgruppe.net/EN/Die%20Bank/KfWUpdates60/TheKfWCarb68/Inhalt.jsp		
Netherlands Clean Development Facility (NCDF)	Funded by: Ministry of Housing, Spatial Planning and the Environment (VROM) Coordinated by: Carbon Finance Unit (World Bank).	• Launched in May 2002 • Currently capitalized at €136 million (US$160 million) • CDM projects only • Target to purchase 31 million tCO_2e. • Price paid per tonne generally lower than € 5.5 (US$6.50).
http://carbonfinance.org/Router.cfm?Page=NLClean		
Prototype Carbon Fund (PCF)	Funded by: Governments of Canada, Finland, Norway, Sweden, the Netherlands and the Japan Bank for International Cooperation as well as British Petroleum (UK, Ireland), Chubu Electric Power Co. (Japan), Chugoku Electric Power Co. (Japan), Deutsche Bank (Germany), Electrabel (Belgium), Fortum (Finland), Gaz de France (France), Kyushu Electric Power Co. (Japan), MIT Carbon (Japan), Mitsubishi Corp. (Japan), Norsk Hydro (Norway), RaboBank (Netherlands), RWE (Germany) and Shikoku Electric Power Co. (Japan) Coordinated by: Carbon Finance Unit (World Bank)	• Launched in 1999 • Closed at US 180 million • Projects will be paid at approx. US$5/tonne • As of September 2003, the PCF had ERPAs signed for approximately 30.5 Mt of CERs totalling about US$126 million.
http://carbonfinance.org/pcf/Home_Main.cfm		
Spanish Carbon Fund	Funded by: Government of the Netherlands. Coordinated by: EBRD	• Investment of €170 million (US$201 million). • Target is 34 Mt. • Includes CDM and JI projects • Geographic focus on Latin America, North Africa and Europe
http://www-wds.worldbank.org/servlet/WDS_IBank_Servlet?pcont=details&eid=000009486_20050111144627		
Swedish International Climate Investment Programme (SICIP)	Funded by: Government of Sweden Coordinated by: Swedish Energy Agency	• Launched in 2002 • 5 projects selected expected to generate 2 Mt SEK 350 million for international climate policy initiatives during the period 1997-2004.
http://www.stem.se/		

APPENDIX 3:
Countries' status of Kyoto Protocol ratification, Annex classification and DNA establishment (as of 20 September 2006)

Country	Ratified Kyoto Protocol	Annex 1	Annex II	Least Developed Country	Non Annex 1	Established DNA
Afghanistan				x	x	
Albania	x				x	x
Algeria	x				x	
Angola				x	x	
Antigua and Barbuda	x				x	x
Argentina	x				x	x
Armenia	x				x	x
Australia		x	x			
Austria	x	x	x			x
Azerbaijan	x				x	x
Bahamas	x				x	
Bahrain	x				x	
Bangladesh	x			x	x	x
Barbados	x				x	x
Belarus	x	x				
Belgium	x	x	x			
Belize	x				x	x
Benin	x			x	x	x
Bhutan	x			x	x	x
Bolivia	x				x	x
Bosnia and Herzegovina					x	
Botswana	x				x	
Brazil	x				x	x
Bulgaria	x	x				
Burkina Faso	x			x	x	x
Burundi	x			x	x	
Cambodia	x			x	x	x
Cameroon	x				x	x
Canada	x	x	x			x
Cape Verde	x			x	x	
Central African Republic				x	x	
Chad				x	x	
Chile	x				x	x
China	x				x	x
Colombia	x				x	x
Comoros				x	x	

Congo					x	
Cook Islands	x				x	
Costa Rica	x				x	x
Côte d'Ivoire					x	x
Croatia		x				
Cuba	x				x	x
Cyprus	x				x	x
Czech Republic	x	x				
Democratic People's Republic of Korea	x				x	
Democratic Republic of the Congo	x			x	x	x
Denmark	x	x	x			x
Djibouti	x			x	x	
Dominica	x				x	
Dominican Republic	x				x	x
Ecuador	x				x	x
Egypt	x				x	x
El Salvador	x				x	x
Equatorial Guinea	x			x	x	
Eritrea	x			x	x	
Estonia	x	x				
Ethiopia	x			x	x	x
Fiji	x				x	x
Finland	x	x	x			x
France	x	x	x			x
Gabon					x	
Gambia	x			x	x	
Georgia	x				x	x
Germany	x	x	x			x
Ghana	x				x	x
Greece	x	x	x			
Grenada	x				x	
Guatemala	x				x	x
Guinea	x			x	x	x
Guinea Bissau	x			x	x	
Guyana	x				x	x
Haiti	x			x	x	
Honduras	x				x	x
Hungary	x	x				
Iceland	x	x	x			
India	x				x	x
Indonesia	x				x	x
Iran (Islamic Republic of)	x				x	
Ireland	x	x	x			
Israel	x				x	x

Italy	x	x	x			x
Jamaica	x				x	x
Japan	x	x	x			x
Jordan	x				x	x
Kazakhstan					x	
Kenya	x				x	x
Kiribati	x			x	x	
Kuwait	x				x	x
Kyrgyzstan	x				x	
Lao People's Democratic Republic	x			x	x	x
Latvia	x	x				
Lebanon					x	x
Lesotho	x			x	x	
Liberia	x			x	x	x
Libyan Arab Jamahiriya					x	
Lichtenstein	x	x				
Lithuania	x	x				
Luxembourg	x	x	x			
Madagascar	x			x	x	x
Malawi	x			x	x	x
Malaysia	x				x	x
Maldives	x			x	x	x
Mali	x			x	x	x
Malta	x				x	
Marshall Islands	x				x	
Mauritania	x			x	x	
Mauritius	x				x	x
Mexico	x				x	x
Micronesia (Federated States of)	x				x	
Monaco	x	x				x
Mongolia	x				x	x
Morocco	x				x	x
Mozambique	x			x	x	
Myanmar	x			x	x	
Namibia	x				x	
Nauru	x				x	
Nepal	x			x	x	x
Netherlands	x	x	x			x
New Zealand	x	x	x			x
Nicaragua	x				x	x
Niger	x			x	x	x
Nigeria	x				x	x
Niue	x				x	
Norway	x	x	x			x

Oman	x				x	
Pakistan	x				x	x
Palau	x				x	
Panama	x				x	x
Papua New Guinea	x				x	x
Paraguay	x				x	x
Peru	x				x	x
Philippines	x				x	x
Poland	x	x				
Portugal	x	x	x			
Qatar	x				x	x
Republic of Korea	x				x	x
Republic of Moldova	x				x	x
Romania	x	x				
Russian Federation	x	x				
Rwanda	x			x	x	x
Saint Kitts and Nevis					x	
Saint Lucia	x				x	x
Saint Vincent and the Grenadines	x				x	
Samoa	x			x	x	
San Marino					x	
Sao Tome and Principe				x	x	
Saudi Arabia	x				x	
Senegal	x			x	x	x
Serbia and Montenegro					x	x
Seychelles	x				x	
Sierra Leone				x	x	
Singapore	x				x	x
Slovakia	x	x				x
Slovenia	x	x				x
Solomon Islands	x			x	x	
South Africa	x				x	x
Spain	x	x	x			x
Sri Lanka	x				x	x
Sudan	x			x	x	x
Suriname					x	
Swaziland	x				x	
Sweden	x	x	x			x
Switzerland	x	x	x			x
Syrian Arab Republic	x				x	x
Tajikistan					x	
Thailand	x				x	x
The former Yugoslav Republic of Macedonia	x				x	x
Togo	x			x	x	

Tonga					x	
Trinidad and Tobago	x				x	x
Tunisia	x				x	x
Turkey		x				
Turkmenistan	x				x	
Tuvalu	x			x	x	
Uganda	x			x	x	x
Ukraine	x	x				
United Arab Emirates	x				x	x
United Kingdom of Great Britain and Northern Ireland	x	x	x			x
United Republic of Tanzania	x			x	x	x
United States of America		x	x			
Uruguay	x				x	x
Uzbekistan	x				x	
Vanuatu	x			x	x	
Venezuela	x				x	
Viet Nam	x				x	x
Yemen	x			x	x	x
Zambia				x	x	x
Zimbabwe					x	x

APPENDIX 4:
Breakdown of CERs Issued as of August 2006

Number	Project Type	Host Country	Volume of CERs
CDM0057	Agriculture	Brazil	1,897
CDM0030	Agriculture	Chile	285,360
CDM0031	Agriculture	Chile	453,528
CDM0032	Agriculture	Chile	243,678
CDM0162	Agriculture	Mexico	1,719
CDM0163	Agriculture	Mexico	5,984
CDM0170	Agriculture	Mexico	2,860
CDM0143	Biogas	India	84,648
CDM0037	Biomass energy	Brazil	179,397
CDM0069	Biomass energy	Brazil	35,689
CDM0070	Biomass energy	Brazil	32,993
CDM0073	Biomass energy	Brazil	50,033
CDM0077	Biomass energy	Brazil	63,221
CDM0078	Biomass energy	Brazil	36,791
CDM0091	Biomass energy	Brazil	38,921
CDM0092	Biomass energy	Brazil	37,086
CDM0094	Biomass energy	Brazil	39,927
CDM0099	Biomass energy	Brazil	55,056
CDM0103	Biomass energy	Brazil	72,461
CDM0176	Biomass energy	Brazil	115,849
CDM0224	Biomass energy	Brazil	72,256
CDM0287	Biomass energy	Brazil	43,486
CDM0424	Biomass energy	Brazil	207,298
CDM0044	Biomass energy	India	78,598
CDM0065	Biomass energy	India	12,680
CDM0119	Biomass energy	India	18,362
CDM0152	Biomass energy	India	59,155
CDM0216	Biomass energy	India	55,716

Number	Project Type	Host Country	Volume of CERs
CDM0305	Biomass energy	India	58,642
CDM0306	Biomass energy	India	42,337
CDM0139	Energy efficiency	India	61,468
CDM0261	Energy efficiency	India	66,536
CDM0566	Energy efficiency	India	111,570
CDM0001	HFC reduction	India	2,125,166
CDM0134	HFC reduction	India	5,911,253
CDM0002	HFC reduction	South Korea	2,901,549
CDM0097	Hydro power	Brazil	136,727
CDM0104	Hydro power	Brazil	46,920
CDM0273	Hydro power	Guatemala	111,367
CDM0274	Hydro power	Guatemala	51,184
CDM0019	Hydro power	Honduras	33,926
CDM0020	Hydro power	Honduras	547
CDM0021	Hydro power	Honduras	803
CDM0024	Hydro power	Honduras	2,210
CDM0246	Hydro power	India	54,577
CDM0247	Hydro power	India	10,527
CDM0248	Hydro power	India	17,430
CDM0295	Hydro power	India	71,066
CDM0388	Hydro power	India	71,678
CDM0089	Hydro power	Sri Lanka	14,469
CDM0003	Landfill gas	Brazil	45,988
CDM0128	Landfill gas	China	26,921
CDM0285	Wind power	India	10,971
CDM0396	Wind power	India	17,648
CDM0398	Wind power	India	57,004

Source : UNEP Risoe Centre

APPENDIX 5: A) Confirmed Projects by Host Country

Host country	Projects		kCERs/year		kCERs Up To 2012	
	Number	%		%		%
Argentina	7	2%	2,137	2%	16,651	2%
Armenia	2	1%	160	0.1%	930	0.1%
Bangladesh	2	1%	276	0.3%	1,858	0.3%
Bhutan	1	0.3%	1	0.0005%	4	0.001%
Bolivia	1	0.3%	83	0.1%	696	0.1%
Brazil	82	21%	14,672	13%	102,233	14%
Cambodia	1	0.3%	52	0.05%	293	0.04%
Chile	15	4%	2,219	2%	15,984	2%
China	31	8%	45,939	42%	287,188	39%
Colombia	4	1%	104	0.1%	758	0.1%
Costa Rica	2	1%	162	0.1%	1,511	0.2%
Dominican Republic	1	0.3%	124	0.1%	299	0.04%
Ecuador	7	2%	335	0.3%	2,372	0.3%
Egypt	2	1%	1,437	1%	9,055	1%
El Salvador	2	1%	360	0.3%	2,393	0.3%
Fiji	1	0.3%	25	0.02%	164	0.02%
Guatemala	3	1%	140	0.1%	1,201	0.2%
Honduras	10	3%	205	0.2%	1,488	0.2%
India	129	33%	15,236	14%	123,659	17%
Indonesia	6	2%	886	1%	6,076	1%
Israel	1	0.3%	93	0.1%	719	0.1%
Jamaica	1	0.3%	53	0.05%	456	0.1%
Malaysia	12	3%	1,699	2%	10,146	1%
Mexico	32	8%	6,438	6%	41,971	6%
Moldova	3	1%	47	0.04%	278	0%
Mongolia	1	0.3%	194	0.2%	1,358	0.2%
Morocco	3	1%	223	0.2%	1,371	0.2%
Nepal	2	1%	94	0.1%	696	0.1%
Nicaragua	2	1%	337	0.3%	2,357	0.3%
Nigeria	1	0.3%	1,497	1%	10,521	1%
Pakistan	1	0.3%	1,050	1%	6,300	1%
Panama	3	1%	60	0.1%	473	0.1%
Papua New Guinea	1	0.3%	279	0.3%	1,836	0.2%
Peru	3	1%	199	0.2%	1,066	0.1%
Philippines	2	1%	153	0.1%	963	0.1%
South Africa	5	1%	225	0.2%	1,539	0.2%
South Korea	7	2%	11,086	10%	73,682	10%
Sri Lanka	3	1%	110	0.1%	875	0.1%
Tunisia	1	0.3%	370	0.3%	2,218	0.3%
Vietnam	2	1%	681	1%	6,933	1%
TOTAL	395	100%	109,443	100%	740,569	100%

APPENDIX 5:
B) Combined Projects by Host Country

Host Country	Projects		kCERs/year		kCERs Up To 2012	
	Number	%		%		%
Argentina	11	1%	3,693	2%	26,731	2%
Armenia	3	0.3%	173	0.1%	1,002	0.1%
Bangladesh	3	0.3%	288	0.2%	1,952	0.2%
Bhutan	1	0.1%	1	0.0003%	4	0.0003%
Bolivia	5	0.4%	621	0.3%	4,598	0.4%
Brazil	187	16%	21,271	11%	146,329	12%
Cambodia	1	0.1%	52	0.03%	293	0.02%
Chile	25	2%	3,804	2%	26,718	2%
China	158	14%	76,738	40%	470,789	37%
Colombia	8	1%	724	0.4%	5,076	0.4%
Costa Rica	4	0.3%	211	0.1%	1,870	0.1%
Cuba	1	0.1%	344	0.2%	3,383	0.3%
Cyprus	2	0.2%	75	0.04%	407	0.03%
Dominican Republic	2	0.2%	144	0.1%	420	0.03%
Ecuador	9	1%	470	0.2%	3,302	0.3%
Ecuador	2	0.2%	72	0.04%	451	0.04%
Egypt	4	0.3%	1,717	1%	10,572	1%
El Salvador	6	1%	520	0.3%	3,673	0.3%
Fiji	1	0.1%	25	0.01%	164	0.01%
Guatemala	13	1%	1,012	1%	7,187	1%
Honduras	19	2%	449	0.2%	3,628	0.3%
India	410	36%	35,808	19%	264,034	21%
India	1	0.1%	8	0.004%	60	0.005%
Indonesia	11	1%	1,691	1%	11,057	1%
Israel	3	0.3%	115	0.1%	854	0.1%
Israel	1	0.1%	71	0.04%	495	0.04%

Host Country	Projects		kCERs/year		kCERs Up To 2012	
	Number	%		%		%
Ivory Coast	1	0.1%	944	0.5%	5,661	0.4%
Jamaica	1	0.1%	53	0.03%	456	0.04%
Kyrgyzstan	1	0.1%	73	0.04%	513	0.04%
Lao PDR	1	0.1%	7	0.004%	44	0.004%
Malaysia	19	2%	2,053	1%	12,503	1%
Mexico	103	9%	8,426	4%	53,715	4%
Moldova	4	0.3%	109	0.1%	766	0.1%
Mongolia	3	0.3%	254	0.1%	1,668	0.1%
Morocco	4	0.3%	318	0.2%	1,991	0.2%
Nepal	2	0.2%	94	0.05%	696	0.1%
Nicaragua	3	0.3%	399	0.2%	2,914	0.2%
Nigeria	2	0.2%	4,029	2%	25,026	2%
Pakistan	1	0.1%	1,050	1%	6,300	0.5%
Panama	5	0.4%	123	0.1%	824	0.1%
Papua New Guinea	1	0.1%	279	0.1%	1,836	0.1%
Peru	9	1%	1,596	1%	8,917	1%
Philippines	26	2%	482	0.3%	2,938	0.2%
Qatar	1	0.1%	1,458	1%	9,120	1%
South Africa	12	1%	1,992	1%	10,615	1%
South Korea	20	2%	14,626	8%	94,881	8%
Sri Lanka	7	1%	161	0.1%	1,199	0.1%
Tajikistan	1	0.1%	51	0.03%	305	0.02%
Tanzania	1	0.1%	103	0.1%	672	0.1%
Thailand	13	1%	1,306	1%	9,872	1%
Tunisia	2	0.2%	688	0.4%	4,125	0.3%
Uganda	1	0.1%	29	0.02%	245	0.02%
Uruguay	2	0.2%	236	0.1%	1,475	0.1%
Vietnam	8	1%	937	0.5%	8,181	1%
TOTAL	1,145	100%	191,971	100%	1,262,509	100%

APPENDIX 6:
Information on DNAs of Selected CDM Host Countries

Country	DNA and time of establishment	Structure	Main Functions	Non-Govt reps.	PIN and PDD process and times
Bangladesh	Department of Environment (by decree 13 Oct 2003)	- Secretariat in DoE - CDM Board (headed by principal secretary to PM - thus ensures high level attention and coordination between ministries - CDM Committee	- Secretariat – clearinghouse – just receives project applications - CDM Board – final endorsement letter, sort out inter-ministerial issues - CDM Committee – reviews and recommends projects for approval, defines SD criteria, technology options and geographical distribn of projects	Heavy involvement of universities and NGOs in the CDM Committee - almost as if university and NGOs (i.e. Waste Concern, BUET) are doing all the technical work	15 days for PIN; 30 days for PDD
Bolivia	Vice Ministry for Natural Resources and Environment is DNA	National Program on CC under Vice Ministry for NRE; National CDM Office	National CDM Office – technical entity to promote and facilitate CDM pjts in country		
Brazil	Interministerial Commission on Global Climate Change – CIMGC (7 July 1999, followed by 2 resolutions: No. 1 – Sept 2003 No.2 – Aug 2005	- CIMGC - Science and Technology Ministry (MCT is Chair, Envt Ministry is Vice-Chair - Tech Sec	- CIMGC – overall policy on mitigation and adaptation; letter of approval - Tech Sec – day to day operations and initial review of projects	No, but Brazil Climate Change Forum (pres decree of 20 June 2000) serves as bridge to civil society (NGOs as well as state govts and mayors)	Unclear
Cambodia	Cambodian Climate Change Office – Min of Environment	- DNA Board (chaired by Minister of Environment) - DNA Secretariat (CCCO acts as Secretariat) - Energy Technical Working Group - Forestry Technical Working Group	- DNA Board – assess and approve projects; issue approval letters - DNA Sec- screens PDDs for completeness, coordinates WG activities, hires consultants, stakeholder consultations, cannot approve projects - Tech WG – prepares project technical assessment reports to send to Board, assess projects against SD criteria	Technology institute and royal universities involved in Technical Working Groups	55 working days in total (10 for initial PDD screening by Sec, 30 for PDD review by WG, technical assessment report, prepared by WG and DNA Sec, and 15 for review of technical assessment report and letter of approval prepared by DNA Board)

Country	DNA and time of establishment	Structure	Main Functions	Non-Govt reps.	PIN and PDD process and times
China	NDRC (30 June 2004 – Interim Measures). Priority areas: energy efficiency, renewable energy, methane recovery and utilisation	NDRC, NCCC, National CDM Board, National CDM project management institute	- National Climate change committee review national CDM policies, rules, standards. - National CDM Board: reviews project proposals including CER price and make recommendations to NDRC - National CDM project management institute	None	PIN not needed but PDD is. 60 days in total (30 days for review; 30 days for decision by NDRC)
Egypt	Egyptian Environment Affairs Agency (EEAA) in Ministry of State for Environmental Affairs (2005) (Min Decree No.42 on 14/03/05)	- Egyptian Council for CDM (EC-CDM) - Egyptian Steering Committee for CDM - Egyptian Bureau for CDM (EB-CDM) - Climate Change Unit (CCU-EEAA)	- EC-CDM - meet on quarterly basis, establish project review process, criteria, application guidelines, ensure project conforms to international standards; Also market the program to attract potential investors - EB-CDM – national and international spokesperson for CDM, maintain relations with CDM EB; one-stop-shop for project operators	NGOs, Commercial Bank	2 weeks for PIN; 4 weeks for PDD
India	National CDM Authority (NCDMA) chaired by Ministry of Environment and Forests (MoEF)	NCDMA	Presentation by Project developers during NCDMA meeting	No	60 days total
Indonesia	National Commission for CDM (NC-CDM). Plays both regulatory and promotional role (i.e. facilitates communication between investors and project proponents, capacity building for Indonesian institutions, and provides information on available CERs	NC-CDM, aided by Secretariat and Technical Team, Expert Group may also be involved	Approve projects, promotional role, organise stakeholders forum	Stakeholder forums: 1) Electronic forum and 2) in-person special meetings	11 weeks

Country	DNA and time of establishment	Structure	Main Functions	Non-Govt reps.	PIN and PDD process and times
Malaysia	Conservation and Environmental Management Division (CEMD) at Ministry of Natural Resources and Environment (NRE) (2002)	- National Steering Committee on Climate Change (chair: SG of NRE, sec: CEMD) - National Committee on CDM (chair: deputy SG of NRE, sec: CEMD) - Technical Committee Energy - Technical Committee Forestry - CDM Energy Secretariat (PTM) - CDM Forestry Secretariat (PTM)	- NSCC: CC policies on mitigation and adaptation, rep to UNFCCC - NC CDM: To meet at least 4 times per year. To receive, evaluate and recommend CDM project proposals after obtaining comments from Tech Committees - Technical Committees: to review to make sure projects comply with sector guideline and SD criteria and recommend CDM proposals to NC CDM for approval - marketing strategy: provide advisory services to foreign/local investors in identification and development of projects	NC CDM: Centre for Environment, Technology and Development Tech Committee Energy: Malaysia Palm Oil Board, Federation of Malaysia Manufacturers, Association of Banks	10 weeks for PIN; 2 weeks for PDD after validation by DOE
Morocco	MATEE (Ministry of Natural Resources, Water and Environment) (2002) internal regulations set out in 2005	- National Council for CDM (CDM NC) - Permanent Secretariat (PS CDM)	- PS does most of the work in terms of project review, one-stop-shop, marketing, getting in touch with investors - NC gives out final approval	NGOs, commercial banks	2 weeks for PIN; 4 weeks for PDD (times seem to be the same in reality although it took longer for the 2 rejected projects)
Philippines	Department of Environment and Natural Resources (DENR) (designated DNA on 25 June 2004 by Exec Order No.320) and to carry out functions by Exec Order No. 2005-17 of 31 Aug 2005	CDM Steering Committee (CDM SC), Technical Eval Committee for Energy, Tech Eval Committee for Waste Management, and CDM Secretariat	Regular functions	Yes, one representative of the private sector and one from NGOs in on CDM SC	20-25 days for non-small-scale and 15-20 days for small-scale projects
South Africa	DME (22 July 2005 by Govt Notice No. R.721)	DNA, Steering Committee; sub-committee on promotion of projects	- DNA: makes final decision, letter of approval/rejection -Committee: review projects - Sub-committee – projects promotion	None	

APPENDIX 7:
Examples of Sustainability Indicators that have been used for CDM

Sustainable Development Criteria	Sectoral/Project Level Indicator	Measurement Standard of Indicator	
		Quantitative	Qualitative
Economic			
Growth (impact on national / regional budgets)	GDP FDI	GDP Total financial costs	
Employment	Employment	Change in the rate of unemployment	
Investments	Net costs, financial flows Activity in energy sector, industry, agriculture	Foreign exchange requirements ($ and share of investment)	
Sectoral development	Technology access Market creation	Physical measures like energy demand and supply, economic measures, energy efficiency and affordability, energy security	
Technological innovation	Learning	No. of technologies Price of technologies and maintenance cost Development over time	
Environmental			
Climate change	GHG emissions	GHG emissions	
Air pollution	Local air pollution, particulates	Emissions of SO_2, NOx and particulates	
Water	Rivers, lakes, irrigation, drinking water	Emissions in physical units Damages in physical and monetary units	
Soil	Exposure to pollutants	Emissions in physical units Damages in physical and monetary units	
Waste	Waste discharge and disposal	Emissions in physical units Damages in physical and monetary units	
Exhaustible resources	Fossil fuels	Physical units	
Biodiversity	Specific species	Number, monetary values	
Social			
Legal framework	Regulation, property rights	Physical regulation standards, tax value and revenue Land area distribution	Outline of major rules and property rights
Governance	Implementation of international agreements, Enforcement	Cost of administrating and enforcing agreements and project management No. of infringements and sanctions	Characteristics of formal and informal authorities Quality of bureaucracy Contract enforceability
Information sharing	Institutions, markets, formal and informal networks	New institutions created No. of institutional units participating in policy implementation (companies, households, public sector, NGOs, individuals)	Description of networks; members, roles, interests
Equity	Distribution of costs and benefits, income distribution, local participation	Cost and benefits in economic units related to stakeholders, income segments, gender, geographical area Income generation adjusted with distribution weights -Gini coefficient	Mapping local stakeholders and their participation Gender aspects

Source: United Nations Environment Programme (UNEP), *CDM: Information and Guidebook*. June 2004

APPENDIX 8:
Information on Project Approval Process of Selected CDM Host Countries

Country	EIA needed	PIN needed	PIN tem-plate exist	Projects submitted	Projects approved	Projects rejected	Project in / were in validation	Website and who's supporting it	Financing for DNA / Tax on CERs
Bangladesh	No, EIA not required - Heavy emphasis on technology transfer - projects with adaptation co-benefits are desired - both simplified SD criteria checklist and detailed checklist exist	No		8 projects in works			2 projects registered, 1 validated	UNDP TTF project hosted by Waste Concern	Possible tax incentive for green projects. Also, there is a fee that needs to be paid to the DNA Secretariat
Bolivia							3 in validation		
Brazil	Unclear	Yes	Yes	41 in host-country review			105 with 82 registered	CIGMC	Business as usual – no extra-budget through cap building of taxation on CERs
Cambodia	Yes. Need to follow Law on Investment, Law on Environmental Protection and NRM, Sub-decrees on water pollution, solid waste management, air pollution, electricity law and forestry law	No		2 PINs, 1 PDD, 1 letter of endorsement			1 registered	Possibly UNEP CD4CDM project	Possibly through UNEP CD4CDM – no tax on CERs
China	No, but certificate of	No	No	3 in pipeline,	8		127 in	By UNDP and	Govt

Country	EIA needed	PIN needed	PIN tem-plate exist	Projects submitted	Projects approved	Projects rejected	Project in / were in validation	Website and who's supporting it	Financing for DNA / Tax on CERs
	enterprise status needed in addition to PDD. Chinese holding enterprises (51% majority Chinese). Rule that foreign buyers need to enter in negotiation.			12 with letter of no-objection			validation, 31 registered	UNF-funded project	ownership of CERs according to the following: - 2% of proceeds from RE, EE, methane and forestation - 30% for N20 - 65% for HFC and PFC projects
Egypt	No, but NEAP must be followed	Yes	Yes	24 submitted (all with PINs)	2 contracted	unknown	2 in validation	Ministry of State for Environment Affairs budget; also cap development from CD4CDM project	EC-CDM budget comes from Min of Env't. Possible thinking on having fees-for-services to be indexed to CER revenue.
India	Unknown	Yes	Yes	92-100			284 in validation with 129 registered	MoEF through UNDP TTF proj	No tax or financing from other means through UNDP TTF project
Indonesia	EIA may be needed. Also stakeholder forum special meeting may also be needed	Yes	Yes	Unknown			5 in validation, 6 registered	Pelangi supported this (NGO)	Not indicated; tax system not known

Country	EIA needed	PIN needed	PIN tem-plate exist	Projects submitted	Projects approved	Projects rejected	Project in / were in validation	Website and who's supporting it	Financing for DNA / Tax on CERs
Malaysia	Yes (3 steps: prelim assessment, detailed assessment, and review); also requirement that RM 100,000 is needed as minimum paid up capital for companies (reg with Treasury) and majority ownership in projects; obtain approval from relevant depts;	Yes	Yes	13	unknown	unknown	8 in validation, 12 registered	PTM (Pusat Tenaga Malaysia) hosts the website	Initial financing by DANIDA capacity development project
Morocco	Unknown	Yes	Yes		21 (6 PDDs. 15 PINs)	2	1 in validation, 3 registered	UNDP TTF project and also UNEP's CD4CDM project	Resource needs have mostly been met through MATEE; some possibility of taxation is in the works
Philippines	Unknown	Unknown		29			24 in validation, 2 registered	KLIMA through UNEP's CD4CDM project	A small fee exists
South Africa	Not unknown	Yes	Yes	10			7 in validation, 5 registered	UNDP, DANIDA, JICA funds for DNA capacity building	

ACRONYMS

Acronym	Name	Definition
AAU	Assigned Amount Unit	One AAU equals the right to emit one tonne of CO_2e. AAUs are assigned to Annex 1 countries as a form of a quota on emissions.
CER	Certified Emission Reduction	The formal commodity transferred to project entities in Annex 1 or/and Annex B states for the amount of emissions reductions achieved in the process of CDM project implementation, provided they meet certain eligibility criteria. CERs generated under the CDM will be recognized only after emissions reductions are proven additional (see the definition of additionality above), the project specifics meet all the requirements of the host-country, and the CDM adaptation levy has been paid.
CDM	Clean Development Mechanism	Article 12 of the Kyoto Protocol allows Annex 1 Parties to implement projects that reduce emissions in non-Annex 1 Parties in return for certified emissions reductions (CERs) and to assist the host Parties in achieving sustainable development and contributing to the ultimate objective of the UNFCCC.
DNA	Designated National Authority	A body appointed by a CDM host country to oversee CDM implementation within this jurisdiction.
DOE	Designated Operational Entity	According to the UNFCCC, the DOE is either a domestic legal entity or an international organization accredited and designated, on a provisional basis until confirmed by the COP/MOP, by the CDM Executive Board (EB). Every DOE has two functions: 1. To validate and subsequently request registration of a proposed CDM project activity; and 2. To verify emission reduction of a registered CDM project, to certify it as appropriate and to requests the CDM Board to issue CERs.
EB	Executive Board	Supervisory committee of the CDM, which is composed of 20 members and is responsible for approval of all CDM projects and methodologies as well as accreditation of Designated Operational Entities.
ERU	Emission Reduction Unit	Under the Kyoto Protocol, a specified amount of greenhouse gas emissions reductions (usually one ton, as measured in carbon dioxide equivalents) achieved through a Joint Implementation project.
ERPA	Emissions Reduction Purchase Agreement	A contract guiding the transfer of emissions reduction credits (CERs or ERUs) from one party to another in CDM or JI regimes.
GHGs	Greenhouse gases	Gases that contribute to global warming by increasing the ability of the atmosphere to retain heat. Greenhouse gases covered by the Kyoto Protocol include carbon dioxide, methane, nitrous oxide, hydroflourocarbons, perflourocarbons, and sulphur hexaflouride.
GWP	Global warming potential	Global warming potential is an index defined as the cumulative radiative forcing between the present and some chosen time horizon caused by a unit mass of gas emitted now, expressed relative to a reference gas such as carbon dioxide. Hence, CO2 been designated a GWP of 1, methane (CH4) has a GWP of 23, etc.
IET	International emissions trading	The trading of AAUs between Annex 1 countries (those with emission reduction targets).

JI	Joint Implementation	Defined in Article 6 of the Kyoto Protocol. Joint Implementation allows Annex 1 Parties to implement projects that reduce emissions, or remove carbon from the air, in other Annex 1 Parties, in return for emission reduction units.
lCERs	Long-term CERs	A long-term certified emission reduction or lCER is a unit issued pursuant to Article 12 of the Kyoto Protocol for an A/R CDM project activity, which expires at the end of the crediting period of the A/R CDM project activity under the CDM for which it was issued. It is equal to one metric tonne of carbon dioxide equivalent. Where project participants have chosen the lCER approach to address non-permanence, a request to the Executive Board has to be made for issuance of lCERs equal to the verified amount of net anthropogenic GHG removals by sinks achieved by the A/R CDM project activity since the previous certification.
LoA	Letter of Approval	The letter required from each DNA involved in a CDM and necessary for project registration.
LULUCF	Land use, land use change and forestry	Refers to the following types of projects: Afforestation & Reforestation; Deforestation; Revegetation; Forest management; Cropland management; Grazing land management, and results in units called RMUs (Removal unit).
MDG	Millennium Development Goals	A set of eight development goals with 18 specific targets adopted by the 2000 Millennium Declaration committing to the eradication of extreme poverty and hunger, achievement of universal primary education, promotion of gender equality and empowerment of women, reduction of child mortality, improvement of maternal health, combating of HIV/AIDS, malaria and other diseases, ensuring environmental sustainability, and promotion of global partnerships for development.
ODA	Official development assistance	Flows to developing countries and multilateral institutions provided by official agencies, including state and local governments, or by their executive agencies (OECD).
PP	Project Participant/Proponent	Project proponents are those involved in the development of a CDM project. According to the EB, a project participant is (a) a Party involved, and/or (b) a private and/or public entity authorized by a Party to participate in an SSC A/R CDM project activity.
PDD	Project Design Document	A document required by the CDM Executive Board for project approval and registration. PDDs can be prepared in a simplified and standardized format for small-scale CDM projects (see the small-scale CDM definition below) and in the non-standardized expanded format for other CDM projects.
PIN	Project Identification Note	A draft document outlining all project realization steps including responsible parties, temporal framework of project implementation, budgetary deviations, specific asset management requirements, etc. Generally used for marketing a project investment
tCERs	Temporary CERs	A temporary certified emission reduction or tCER is a unit issued pursuant to Article 12 of the Kyoto Protocol for an SSC A/R CDM project activity under the CDM, which expires at the end of the commitment period following the one during which it was issued. It is equal to one metric tonne of carbon dioxide equivalent.