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OVERCOMING BARRIERS TO CLEAN DEVELOPMENT MECHANISM PROJECTS

Jane Ellis, OECD & Sami Kamel, Unep Risø Centre

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FOREWORD

This document was prepared by the OECD and IEA Secretariats, and UNEP Risø Centre, in response to the Annex I Expert Group on the United Nations Framework Convention on Climate Change (UNFCCC). The Annex I Expert Group oversees development of analytical papers for the purpose of providing useful and timely input to the climate change negotiations. These papers may also be useful to national policy-makers and other decision-makers. In a collaborative effort, authors work with the Annex I Expert Group to develop these papers. However, the papers do not necessarily represent the views of the OECD or the IEA, nor are they intended to prejudge the views of countries participating in the Annex I Expert Group. Rather, they are Secretariat information papers intended to inform Member countries, as well as the UNFCCC audience.

The Annex I Parties or countries referred to in this document are those listed in Annex I of the UNFCCC (as amended at the 3rd Conference of the Parties in December 1997): Australia, Austria, Belarus, Belgium, Bulgaria, Canada, Croatia, Czech Republic, Denmark, the European Community, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Latvia, Liechtenstein, Lithuania, Luxembourg, Monaco, Netherlands, New Zealand, Norway, Poland, Portugal, Romania, Russian Federation, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, Ukraine, United Kingdom of Great Britain and Northern Ireland, and United States of America. Korea and Mexico, as OECD member countries, also participate in the Annex I Expert Group. Where this document refers to “countries” or “governments”, it is also intended to include “regional economic organisations”, if appropriate.

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Questions and comments should be sent to:

Jane Ellis
OECD Environment Directorate
2, rue André-Pascal
75775 Paris Cedex 16
France
Email: jane.ellis@oecd.org

All OECD and IEA information papers for the Annex I Expert Group on the UNFCCC can be downloaded from: **www.oecd.org/env/cc/aixg**

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Executive Summary

The market for Clean Development Mechanism (CDM) projects is continuing to grow rapidly, with the current portfolio expecting to deliver 2 billion tons of CO_2-eq greenhouse gas (GHG) emission reductions by 2012, equivalent to 17% of Annex I Parties' base year GHG emissions. In total, governments and companies have earmarked over USD11 billion for CDM funding to 2012. This study analyses the various barriers to CDM market expansion in developing countries, and makes recommendations on how some of them can be removed or reduced. It also examines the distribution of CDM projects amongst regions and sectors.

Different types of barriers can impede the development of CDM projects. These include:

- National-level barriers not related specifically to the CDM such as the policy or legislative framework within which a CDM project operates, e.g. electricity-related regulations that constrain generation by independent power producers;

- National-level CDM-related barriers such as institutional capability/effectiveness or lack of awareness about CDM potential. For example, delays in host country approval of CDM projects can dampen interest in CDM project development;

- Project-related issues including availability (or not) of underlying project finance, or other country or project-related risks that render the performance of the project uncertain;

- International-level barriers such as constraints on project eligibility (e.g. on land use and forestry projects), available guidance and decisions (e.g. with respect to the inclusion of carbon capture and storage projects), etc.

Thus, barriers to CDM development can arise at different parts of the CDM project cycle. The relative importance of particular barriers varies between countries as well as over time. A combination of factors is needed to drive growth in a country's CDM activity. This includes the presence of attractive CDM opportunities, a positive investment climate, and an enabling policy and legislative framework (in general, as well as CDM-specific).

Overcoming national-level barriers

Governments can help increase interest in CDM project development within their country by undertaking a variety of actions to improve the general investment and policy framework, as well as on improving CDM-specific frameworks and institutions. Such actions can vary widely in scope, time-lag and difficulty/cost of implementation. For example, ensuring that laws are stable and enforced, improving general governance and providing an appropriate tax and incentive framework is of key importance. However, this cannot necessarily be achieved quickly, even if funding is available. Capacity building and awareness-raising for key stakeholders is also an important ingredient, particularly to help in project identification. However, these actions are also time and resource-intensive.

Fortunately, some barriers to CDM development can be reduced relatively simply and cheaply. These include CDM-specific actions such as establishing a simple, timely and transparent CDM project approval process and a clear policy on CDM-relevant issues such as ownership of CDM credits or the national-level eligibility of certain project types. Other, more general, actions can also help to reduce barriers. These include reducing participation/ownership restrictions on foreign investment and ownership in sectors liable to CDM investments. Enabling actions could also include sector-specific reform/legislative changes. For example, changes that would allow independent power producers to sell electricity to the grid could particularly help the development of renewable energy and supply-side energy-efficiency projects.

Overcoming international-level barriers

A number of barriers to further CDM project development exist at the international level. In some cases this reflects ongoing negotiations on project eligibility for certain project types, for example new HCFC-22 production facilities. Barriers can also reflect limits that countries have agreed internationally to place on the use of particular project types, such as forestry and land use activities. Decisions on the post-2012 CDM framework and on project eligibility will also influence the demand and supply of CDM credits, as increased certainty that there will be a demand (and price) for CDM credits post-2012 will reduce barriers to CDM projects with a long lead-time. These include projects involving "greenfield" renewable electricity systems and re/afforestation projects, where potential mitigation projects are widespread. Continued pre-2012 efficiency improvements in CDM governance, e.g. through rapid clarification of key concepts or tools by the CDM's Executive Board, can also help reduce delays between agreeing on a project and implementing it.

Overcoming finance-related barriers

CDM projects can have widely varying capital cost requirements, depending both on the project type, and whether or not the CDM costs encompass the entire project, or just a CDM "add-on". As with other types of investment, a positive national investment climate is highly important to attract CDM funding (particularly, inward investment) for capital-intensive projects. This entails an enforceable contracts system; simple and transparent governance procedures; good access to financing; and low levels of corruption.

Mainstreaming carbon finance into bi/multilateral development assistance to infrastructure or technology development, and into national or sectoral programmes such as clean energy promotion, would encourage an increased uptake of GHG-friendly projects, potentially as CDM projects. Greater use of increasingly-available products to reduce CDM-related financial risks (e.g. on credit issuance and delivery) can also help reduce the financial uncertainty associated with developing CDM projects.

Transaction costs associated with completing the CDM project cycle are also a common hurdle facing many project developers, especially for small-scale projects and in poor developing countries. Buyers of CDM credits, especially large institutional or national carbon funds, can help to overcome this barrier by offering different types of in-advance payments to project developers, e.g. on a grant basis.

Distribution of CDM projects between sectors and regions

The majority of CDM credits, and projects, are concentrated in China, India, Brazil, Korea and Mexico. These countries currently account for 84% of total expected credits by 2012 and 79% of total proposed projects. China alone accounts for 53% of expected credits to 2012. Some sectors also dominate. In particular, mitigating emissions of HFC23 and industrial sources of N_2O account for 40% of expected credits to 2012. These project types are popular as they have a short lead-time, offer large volumes of credits for a low capital investment and mitigation cost, and additionality assessments are relatively straightforward.

In some cases, there is a link between the predominant project types and regions. For example, it is not surprising that the most popular CDM project type in terms of credit generation (HFC23 reduction) is predominantly located in China – as this is where the most potential for this project type is. Further, some countries seem to apply CDM systematically within a sector, whereas others do not. Thus, more than two-thirds of Chinese wind farms installed in 2006 applied for the CDM. Provisional figures for Chinese wind farms to be commissioned in 2007 indicate that the proportion applying for CDM in this year could be significantly higher. In contrast, less than 2% of Indian wind farms commissioned in 2006 applied for CDM status. This illustrates that a project-based mechanism like the CDM can be applied sector-wide, even though it is not always done so.

The concentration of CDM projects in a small number of countries has led to concern about the regional distribution of CDM projects, culminating in a COP/MOP1 request for views on "systematic or systemic barriers to the equitable distribution" of CDM project activities. There are many reasons why some countries (and sectors) are more common CDM "destinations" than others. These include countries' different potential for CDM-eligible emission-reduction activities, and the varying levels of abatement costs – and hence profitability – from different CDM project types.

Barriers to CDM projects of particular sizes or types can also influence the overall sectoral and regional distribution of the CDM. For example, some large buyers of CDM credits focus on large (>50 thousand CERs/year) projects in particular countries or sectors. Creating entities that can bundle several small CDM projects together could thus help smaller countries increase their CDM activity. International negotiations on project eligibility also influence the geographical distribution of the CDM. For example, if agreement is reached that new HCFC-22 production facilities will be eligible for the CDM, this would be likely to further increase China's share of the market, whereas any agreement that carbon capture and storage activities are eligible would raise the share of some countries in Africa and the Middle East. In the longer term, any post-2012 changes to the eligibility of forestry and land use activities could increase the CDM potential for countries with low emission levels but potential opportunities for GHG mitigation in this sector, such as in Africa.

Actions by national governments, the international community, multi-lateral and financial organisations can all help prospective host countries tap their CDM potential more efficiently by strengthening weak links in the CDM development chain. These actions will not necessarily lead to an even geographical distribution of CDM projects or credits, as cost-effective emission reduction potential varies widely by country. However, the CDM was designed to seek out market-based – not geographically-balanced -- emission mitigation opportunities.

1. Introduction

Since the first project was registered towards the end of 2004**,** there has been extremely rapid progress in implementing the Kyoto Protocol's Clean Development Mechanism (CDM)[1]. By April 30, 2007, more than 640 CDM projects have been registered, and another 1200 are undergoing validation. Combined, these projects expect to reduce greenhouse gas (GHG) emissions by more than 2 billion tons CO_2-eq to 2012[2].

The majority of CDM credits, and projects, are concentrated in a handful of countries: China, India, Brazil, Korea and Mexico. These countries have dominated the CDM portfolio since early 2005 (Ellis 2005) and at present account for 84% of expected credits to 2012 and 79% of proposed CDM projects. This has led to concern about the regional distribution of CDM projects, and to barriers to CDM development in "under-represented" CDM countries.

Barriers to developing a CDM project can be related specifically to the CDM, such as delays in national or international CDM approval processes. There can also be very significant barriers to CDM project development that are not related exclusively to the CDM. These include the political and economic stability of a particular country and the availability of project finance – as well as a country's regulatory framework. Some of these barriers can be removed or lessened by national governments, e.g. by changing domestic legislation or approval processes. Other barriers are more difficult to overcome, such as political and economic stability.

This paper focuses on potentially "removable" barriers to CDM project development, both at the national and international level. Section 2 outlines some context and background to the CDM market, and explains why an even distribution of credits across countries should not be expected. National-level barriers to CDM developments are examined in section 3 (for general policy/legislative barriers) and section 4 (for CDM-specific barriers). Section 5 highlights financial barriers to CDM project development, and section 6 examines international-level barriers at a national level. Conclusions are presented in section 7.

2. Context and Background

There are many different ways of cutting the CDM "pie". How these different assessments of CDM developments are made affects analyses on how successful, or otherwise, different countries are in terms of the CDM. For example, the picture varies depending on whether CDM "success" is measured in terms of numbers of projects underway, number of expected credits, or recent transactions. Other potential ways of measuring CDM "success" include e.g. examining the investment (or inward investment) generated by the CDM, or comparing the potential with actual CDM development within a country/sector. However, since data on total CDM-related investments and potentials is very patchy, assessments of the CDM market are often based on the publicly-available information on project numbers and expected credits.

This section examines the current geographical distribution of CDM projects and expected credits, and contrasts these figures with the geographical distribution of non-Annex I GHG emissions and with private direct investment. It also highlights the different investment cost requirements of different CDM project types, using currently-proposed CDM projects as examples.

[1] The CDM was established in the Kyoto Protocol. It has two purposes: to assist Parties not included in Annex I to the UN Framework Convention on Climate Change (UNFCCC) in achieving sustainable development, and to assist Parties included in Annex I to the UNFCCC in achieving compliance with their emission commitments.

[2] In comparison, base year GHG emissions from Annex I Parties to the Kyoto Protocol were approximately 11.7 billion tons.

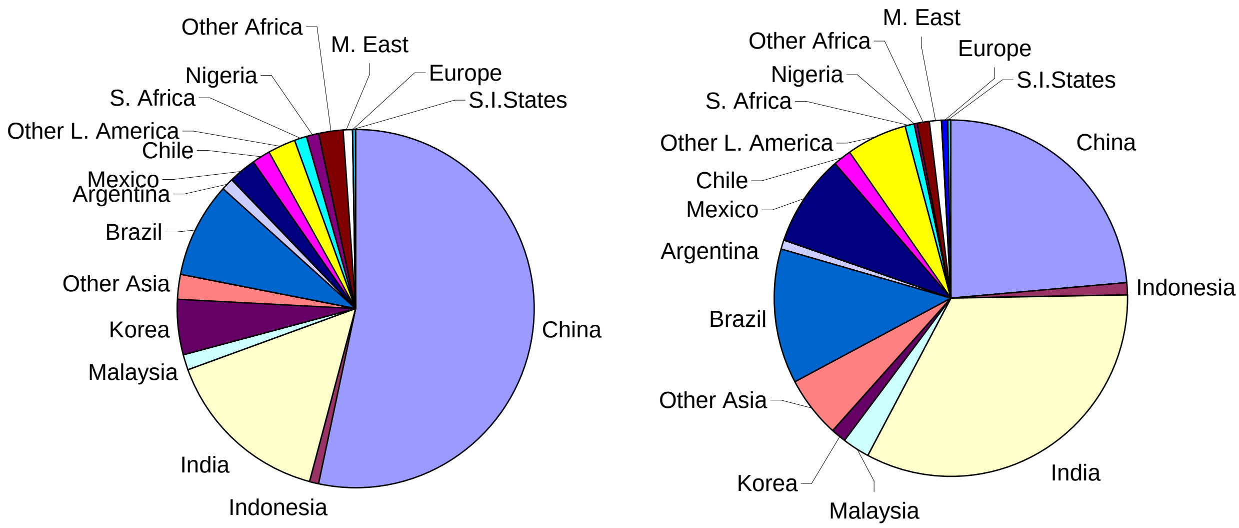
2.1 Geographical distribution of CDM projects

The geographical distribution of the CDM is uneven, both in terms of project numbers and the volume of credits expected to be generated. An uneven distribution is not surprising, given that countries vary widely in terms of their size, GHG emissions, GHG-reduction potentials, cost of GHG reductions, investment climate/risk and policy towards the CDM.

Nevertheless, the current geographical distribution of proposed CDM projects is striking. This is illustrated in Figure 1, which shows the dominance of China and – to a lesser extent - India. Together, these two countries account for 68% of expected credits from proposed CDM project activities to 2012[3], and more than 62% of proposed CDM projects (UNFCCC 21.04.07).

Figure 1: Geographical distribution of proposed CDM projects (i.e. projects registered or at validation)

Volume of expected credits* (total = 327 m CERs/y) Number of proposed projects (total = 1845)



Source: UNFCCC project list, 21.04.07, * This figure is the number of expected credits per year during 2008-12. In addition, many CDM projects anticipate generating credits pre-2008.

A large share (40%) of expected yearly credits from the current CDM pipeline (projects under validation or registered) is expected to be generated from CDM projects that reduce end-of-pipe emissions of HFC23 or N_2O in industry[4]. It is not surprising that these project types are popular, as they have a short lead-time, offer large volumes of credits for a low capital investment and mitigation cost, and additionality assessments are relatively straightforward.

However, there is a limited potential for these HFC23 and industrial N_2O projects. A significant proportion of that potential is already in the CDM pipeline. Further, the potential for such projects is concentrated in a handful of countries. For HFC23 projects this is China, which alone is estimated to account for more than half of global emissions of HFC23 (USEPA 2005). To a lesser extent, India and Korea are also important

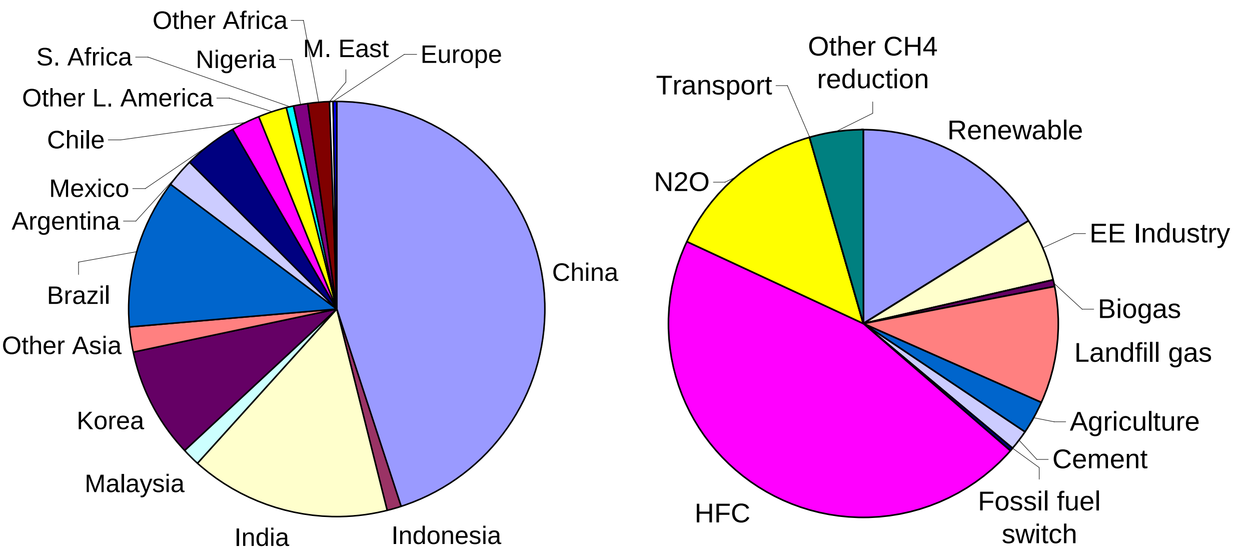
[3] This is calculated from proposed CDM projects that have been submitted for validation (including those subsequently registered).

[4] HFC23 is generated as a by-product of HCFC22 (R22) manufacture, which is used as a refrigerant or as a feedstock e.g. in Teflon manufacture. Industrial N_2O emissions are generated as a by-product of adipic acid (used in nylon manufacture) and nitric acid production (used in e.g. fertiliser production).

HFC23 emitters (IPCC/TEAP 2005). For industrial N_2O reduction projects, the largest emitters and thus the greatest potential for reductions are China, India, South Korea and Brazil.

The scale and relative ease/short lead-times of developing CDM projects that reduce industrial emissions of HFC23 and N_2O is illustrated by examining the distribution of registered project by sector. Figure 2 shows the sectoral and geographical breakdown of registered CDM projects. HFC23 and industrial N_2O projects account for a much higher proportion (60%) of expected credits from registered projects (compared to 40% of credits for projects registered or at validation). Indeed, the eight Chinese HFC23 projects alone account for 35% of the total expected credits from registered CDM projects[5]. In contrast, credits from the more than 200 registered wind electricity CDM projects over several non-Annex I countries account for 12% of total expected annual CDM credits.

Figure 2: Distribution of expected credits from registered CDM projects by country and sector



Source: UNFCCC, 24.04.07

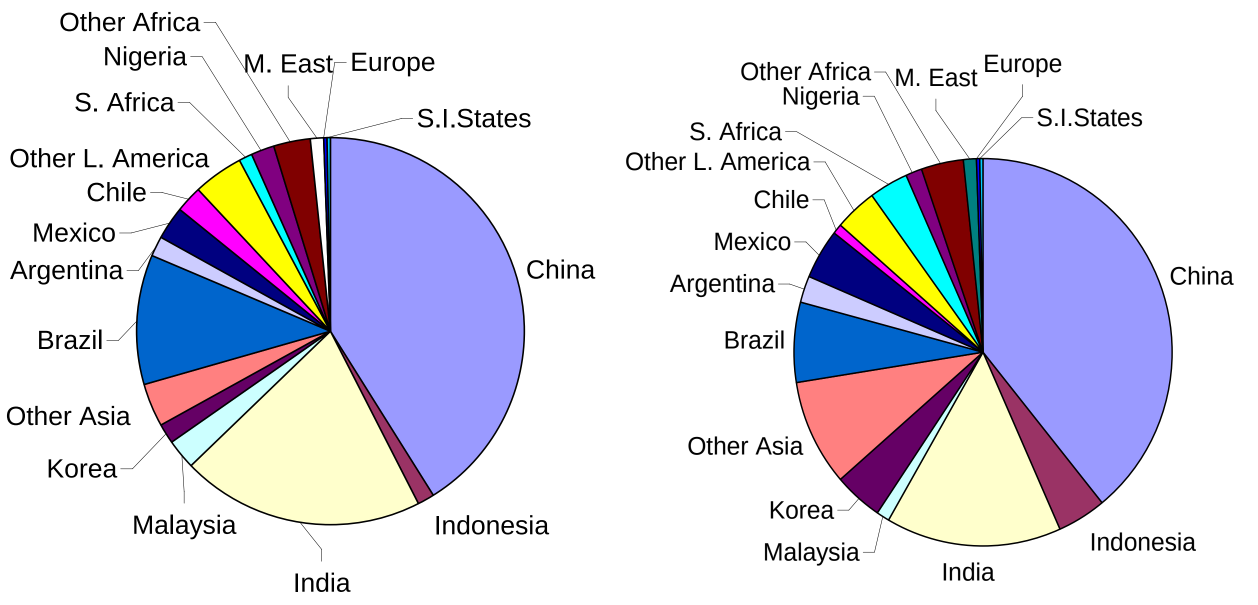
Including "low hanging fruit" CDM projects such as HFC23 reduction in an analysis of geographical distribution of expected CDM credits or projects gives an accurate picture of the current CDM portfolio. However, it may not necessarily give an accurate indication of what the geographical distribution of CDM credits/projects will be in future, but the potential "crop" of these projects is limited, and has already been partly harvested. Further, the potential for – and location of – such projects is concentrated in a handful of countries. Thus, excluding industrial HFC23 and N_2O project types from an analysis of the CDM portfolio may better reflect the longer-term "success" of different CDM host countries.

Figure 3 illustrates the geographical distribution of more widely-replicable CDM project activities, i.e. excluding HFC23 and industrial N_2O projects. This distribution is only very slightly more even, with China, India, Brazil, Korea and Mexico accounting for 78% of all expected non-HFC/industrial N_2O credits generated per year, compared to 84% of expected credits from the entire CDM portfolio. China's share in the CDM portfolio has grown extremely rapidly over the last few months, with more than 200 proposed projects submitted for validation in the first four months of 2007. The majority of these projects, and credits, are in the energy sector (primarily renewable energy and energy efficiency).

[5] The speed and extent of CDM uptake in this sector is remarkable in China, with 13 plants now being developed as CDM projects. This represents an overwhelming majority of currently-eligible plants. (Only HCFC-22 plants with at least 3y of production data by the end of 2004 are currently eligible.). If HFC23 reduction from new HCFC22 plants also become eligible for the CDM, a further 30-40 million CERs/year could be generated from this sector in China (Lu 2006).

Figure 3: Geographical distribution - CDM portfolio excluding HFC23 and industrial N_2O projects, national 2000 GHG emissions*

Volume of expected credits (195 m CERs/y) National GHG emissions excluding LULUCF



Sources: UNFCCC, 24.04.07, WRI CAIT.
* National GHG emissions from Non-Annex I Parties who are hosting CDM projects.

Figure 3 also shows different CDM host countries' importance in terms of non-Annex I GHG emissions. This sheds a different light on the geographical distribution of CDM credits. In particular, it is not surprising that China and India account for a large proportion of expected CDM emission reductions. China and India are the world's most populous countries, and are also the largest emitters[6] of greenhouse gases amongst non-Annex I countries. Because CDM credits are generated from "certified emission reductions" it is not surprising that countries with larger emission levels have attracted larger levels of emission-reducing activity.

Nevertheless, some countries' share of the CDM "pie" are significantly different from their share of non-Annex I greenhouse gas (GHG) emissions. For example, India accounts for 20% of expected non-HFC/N_2O CDM credits, but less than 12% of non-Annex I GHG emissions (excluding LULUCF emissions). Chile, Guatemala, Panama and several other Latin American countries also account for a much larger proportion of the CDM "pie" than of non-Annex I emissions. Selected countries who expect to generate a greater proportion of CERs[7] than non-Annex I emissions are presented in Table 1. This shows that some countries such as Equatorial Guinea, Guatemala, Chile and Armenia have a share of the CDM market that is several times greater than their share of non-Annex I GHG emissions. Conversely, Indonesia accounts for 3% of non-Annex I GHG emissions excluding LULUCF (or 13% of emissions including LULUCF) but only 1.5% of expected CDM credits. In addition, there are several countries that produce significant levels of GHG emissions, such as Iran and Saudi Arabia, but that are not yet CDM host countries.

[6] At a national level, and excluding emissions from land-use and forestry.

[7] Excluding CERs from HFC23 and industrial N_2O reduction activities.

Table 1: Selected countries' share of non-Annex I GHG emissions and CDM importance

	Expected annual CDM credits from projects under validation or registered (excluding HFC, industrial N_2O), 21.04.07		% Non-Annex I GHG emissions excluding LULUCF	Number of proposed/actual CDM projects
	CERs	% of total		
Equatorial Guinea	2,356,027	1.21%	0.01%	1
Chile	4,435,299	2.27%	0.28%	31
Armenia	338,496	0.17%	0.02%	6
Panama	483,136	0.25%	0.04%	8
Guatemala	1,206,634	0.62%	0.09%	13
Qatar	1,457,811	0.75%	0.11%	1
El Salvador	481,337	0.25%	0.04%	5
Republic of Moldova	361,878	0.19%	0.04%	7
Nicaragua	398,920	0.20%	0.04%	3
Malaysia	4,905,437	2.51%	0.54%	42
Papua New Guinea	278,904	0.14%	0.03%	1

Sources: UNFCCC, WRI CAIT, authors' calculations

The question that this table raises is whether countries that have a larger share of the CDM market than they do of non-Annex I GHG emissions represent "successful" CDM countries, or whether their performance is the result of opportunities that may either not succeed (e.g. if proposed projects are subsequently rejected by the national government or the CDM EB), or may not be replicable. The answer depends partly by country. For example, Chile's CDM portfolio is made up of several projects in replicable areas (e.g. biomass energy, landfills, manure management), many of which (17) have been registered. Conversely, Equatorial Guinea's CDM project portfolio comprises just one project (use of associated gas, previously flared), and is still at the validation stage.

Whether or not a country is a CDM success or not also depends on how "success" is measured. Another metric which might be equally valid – particularly when assessing the technology transfer component of the CDM - could be how much inward investment has been brought into the host country from the CDM. The confidentiality of investment details of many CDM projects makes this much more difficult to estimate. However, the issue of the investment requirements of different CDM project activities is examined below.

2.2 Investment requirements of different CDM project activities

There are huge variations in the total investment requirements, and mitigation costs, associated with different types of CDM project activities. Table 2 illustrates the investment costs of different proposed CDM projects. These range from USD28,000 (per unit) for a manure management system in Brazil[8] to USD1.2 billion for a 2GW ultra-supercritical coal-fired power station in China. This variation in capital investment requirements

[8] The project is made up of 24 units.

reflects the different sectors, technology requirements and volume of different types of CDM projects activities. It also reflects that the investment costs for some CDM project types include the ***entire*** project costs, whereas costs for other CDM project are only the cost of a CDM "add-on".

Thus, for a wind electricity project that is being built under the CDM instead of a more GHG-intensive option, investment requirements correspond to the construction, installation and implementation of the whole wind farm. The economic benefits of such a project include electricity-related income, as well as CERs. Conversely, investment costs for CDM projects that involve improving the environmental performance of an already-existing facility ("brownfield projects") such as a factory or landfill can be much lower. The economic benefits of such projects may sometimes be CERs only.

Table 2 also shows that there is no link across different CDM project types between the level of investment required and the number of credits produced by this investment. Indeed, there is a thousand-fold variation in the level of yearly credits generated per dollar invested. Thus, a dollar invested in the Colombian N_2O-reduction project will generate 0.99 CERs per year. A dollar invested in the Ulsan HFC23-reduction project is expected to generate almost half a CER per year[9]. Fuel switching can lead to 0.06 of a credit per dollar invested. A dollar invested in renewable electricity generation systems generally leads to only 0.002-0.004 credits per year (as well as electricity-related revenue). Some projects expect as little as 0.001 credits per year per dollar invested. At a carbon price of USD7/CER, this would mean that a dollar invested in an N_2O-reduction project could generate almost USD70 CER-related revenue in the project's crediting period. In contrast, a dollar invested in a renewable electricity project would generate between USD0.06 and 0.26 of CER-related revenue over the same time period (as well as electricity-related revenue, presumably).

If the initial project costs presented here are typical[10], it would imply that although China accounts for the largest share of expected CDM credit generation, it could account for a much lower share of CDM project-related investment. Indeed, combined investment costs for 10 HFC23-reduction projects underway in China that between them expect to generate 62 million credits per year are likely to be similar to that for a 27 MW wind farm expecting to less than a thousandth the volume of credits.

The variation in investment/equity requirements of different potential CDM project types will influence where such projects are initiated, and by whom. For example, the risk/reward profile of N_2O-reduction projects is very different to that of a renewable or natural gas-fired electricity plant. Table 2 shows that for many project types, CER revenue is more likely to be the "icing on the cake" than the reason for undertaking the CDM project in the first place. This means that the underlying project may need to be economically attractive enough even in the absence of the CDM in order to attract sufficient investment capital. The ease of attracting such capital will vary depending on the risk rating of the host country and the credit rating of the investor – as well as by sector/project type.

[9] Because of the large volumes of credits generated by such projects, the effect of HFC23-reduction projects on a company's financial performance can be significant. For example, CER revenues accounted for 27% of total revenue in Q3 2006 for the Indian company involved in an HFC23-reduction project. This revenue contributed to a 418% increase in profits compared to the previous year (SRF 2007).

[10] Publicly-available information on investment costs is only available for a small number of proposed CDM projects.

Table 2: Initial investment costs for selected CDM projects

Project name, location	Project type	Initial investment cost, mUSD	Economic value other than CERs?	Expected CERs (000 CER / y)	Credits per year per dollar invested	Expected value of CERs to 2012, mUSD
HFC Decomposition Project in Ulsan, Korea	HFC23 reduction	3.0*	No	1,400	0.47	98.0
Catalytic reduction of N_2O from nitric acid plant, Israel	N_2O reduction	0.56	No	83.6	0.15	3.36
Catalytic reduction of N_2O from nitric acid plant, Colombia	N_2O reduction	0.32	No	316.8	0.99	11.31
Fuel Switching at Atocongo Cement Plant, Peru	Fuel Switch	5.4	No	308.7	0.06	18.08
Anding Landfill Gas recovery and utilization project, China	Landfill gas	1.93	No	75.6	0.04	4.23
Lara Landfill Gas to Energy, Brazil	Landfill gas	14.0	Yes	751.1	0.05	0.42
Lusakert Biogas Plant (LBP), methane capture and combustion from poultry manure treatment, Armenia	Biogas	2.53	No	62.8	0.02	2.64
Swine manure system, BRA-01-2005, Brazil	Manure management	0.672	No	78	0.12	3.83
First farmers holding corporation, Philippines	Bagasse co-generation	60	Yes	120	0.002	3.71
Água Bonita Bagasse Cogeneration Project, Brazil (replacing boilers with generators)	Bagasse co-generation	12	Yes	20.3	0.002	0.99
Reforestation on degraded land for sustainable wood production of woodchips, Madagascar	Reforestation	18	Yes	106.3	0.01	1.45
Coalmine methane utilization project at Nanshan, China	Coal mine methane	2.5	Yes	204.5	0.08	6.37
Al-Shaheen Oil Field Gas Recovery, Qatar	Associated gas recovery	260	Yes	2,500	0.01	105
Ninguo Cement Plant 9100KW Waste Heat Recovery and Utilisation for Power Generation Project, China	Energy efficiency	2.15	Yes	55.9	0.03	2.42
Reduction in Steam Consumption, IFFCO, India	Energy efficiency	90	Yes	295	0.003	11.36
Jendarata Steam & Power Plant (boiler replacement), Malaysia	Energy efficiency	4.14	Yes	8.8	0.002	0.37
Bundled Wind power project in Jaisalmer, India	Wind	26	Yes	98.2	0.004	5.85
Shandong Changdao 27.2 MW Wind Power Project, China	Wind	30.0 #	Yes	53.7	0.002	2.32
Andhra Hydro Electric Project, phase II, India	Hydro	5.68	Yes	13.7	0.002	0.58
La Higuera 155 MW hydro project, Chile	Hydro	225	Yes	447.6	0.002	16.72
Northern Negros Geothermal Plant, Philippines	Geothermal	140	Yes	175	0.001	6.13
Huaneng Yuhuan Ultra-supercritical Coal, China	Coal	1211	Yes	956.7	0.001	40.2
1147.5 MW Natural gas based grid connected Combined cycle power project at Akhakhol, Gujarat, India	Natural Gas	683 #	Yes	3,173	0.005	111

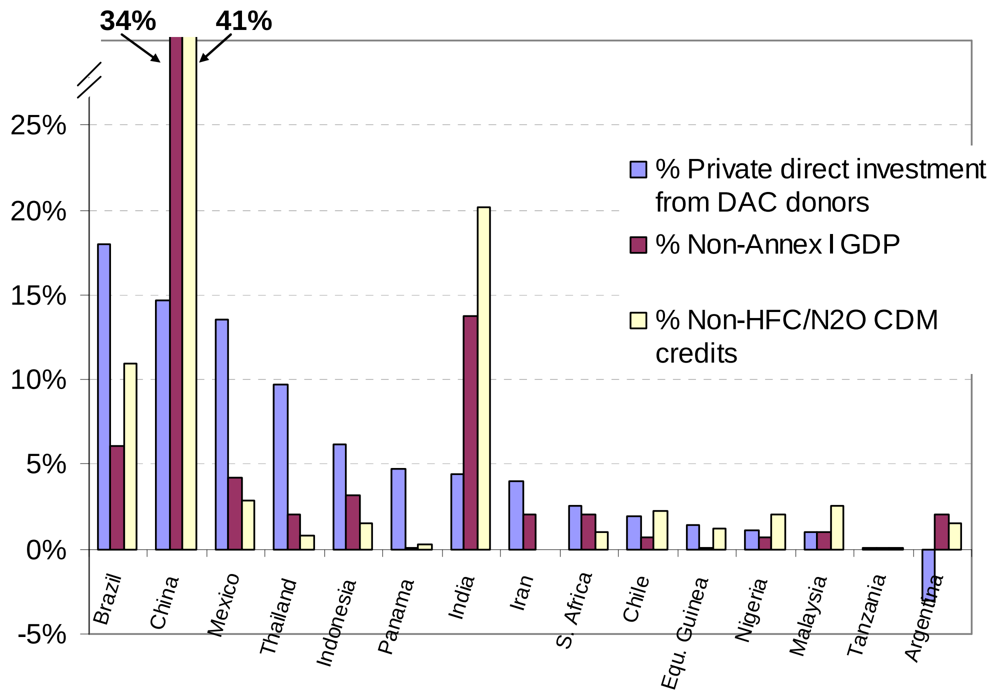
Sources: Project Design Documents, except # PPI database, 2006, * Matsuo 2004. Several other energy efficiency projects (not shown here) had investment costs and CER returns between the three projects illustrated above.

2.3 Private investment flows

Private companies play an important role in the CDM market, both in Annex I and non-Annex I countries. This is because the majority of CDM credits are expected to be generated from projects undertaken by private-sector firms in non-Annex I countries. Private companies in Annex I countries account for a significant proportion of demand for CDM credits.

Information on private investment flows in general (not just for CDM) identifies those countries which are successful in attracting inward investment. In 2004, private investment from 22 developed countries[11] (DAC countries) provided almost $160 billion of flows to developing countries (OECD 2006). This investment is not evenly distributed amongst countries. Indeed, for 2004 private investments where the host country is identified, the top three recipients (Brazil, China and Mexico) accounted for 46% of total private investments to identified countries[12]. Figure 4 below illustrates for selected countries the proportion of private direct investment (PDI) to known countries and proportion of non-Annex I GDP in 2004, and shows clearly that for several countries there is no link between the amount of PDI and the size of that country's GDP.

Figure 4: Comparing % private direct investment from DAC donors, % non-Annex I GDP 2004, and % CDM credits (excluding HFC/N_2O), selected countries



Sources: OECD DAC, IEA statistics, UNFCCC CDM project information

It is not surprising that countries which are successful at attracting private investment in general should also attract investment in CDM projects. However, Figure 4 also shows that levels of private inward investments are not correlated to CER credit generation. Thus, some countries that receive a high proportion of private direct investment are not places where many CDM projects are registered or under development. For example, Thailand, Indonesia, Panama and Iran are in the "top 8" destinations for private investment.

[11] This information is for DAC member countries, i.e. Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States.

[12] The exact destination of approximately 27% of all private direct investment by DAC donors is not identified by country, and is shown as e.g. "Asia unspecified". Thus, Brazil, China and Mexico account for 46% of PDI to known countries by DAC donors, or for 33% of total PDI by DAC donors.

However, even though all these countries have established the national institutions needed to approve CDM projects, i.e. their designated national authority (DNA), there are few registered projects in these countries to date (8 in Indonesia and 5 in Panama)[13]. These countries also account for a significantly higher share of non-Annex I GHG emissions than they do of the CDM market.

Conversely, some countries that attract relatively little private investment are quite popular CDM "destinations". For example, the net flow of private investment between Argentina and DAC countries was negative, i.e. funds were flowing from – not to – Argentina. Yet, Argentina has more (and larger) CDM projects registered than Panama (although the majority of CDM projects and associated credits from Argentina are developed unilaterally). Similarly, China and India – which are popular CDM countries - account for a much larger proportion of Non-Annex I GDP than they do of private direct investment to non-Annex I countries. This partly reflects the general investment environment within China and India. For example, Lamb (2005) indicates that "weak infrastructure …, anti-export biases, complex labor laws, cumbersome administrative procedures …continue to discourage FDI flows on a scale commensurate with the size of the Indian economy". This disparity between ability to attract PDI and CDM projects also reflects variations in the types of CDM projects, and associated investment requirements, in different countries.

The potential variation in funding structures for CDM projects can also explain why some countries account for a larger proportion of the CDM market than they do of private direct investment from DAC member countries. Indeed, many CDM projects are developed entirely (or with a majority stake) by the host country, and thus have no investment component from foreign sources. In fact, majority host-country involvement is mandatory for Chinese CDM projects, and is also the norm for Indian CDM projects. This necessarily reduces outside involvement in CDM project development. Further, there may be no Annex I investments in underlying projects even for CDM projects developed "bilaterally", i.e. with involvement from "Annex I" countries. This is because even though billions of dollars are allocated by Annex I governments and entities for CDM funding, it is mainly to buy CDM credits rather than invest in the underlying project. Countries generating large volumes of CDM credits from unilateral CDM projects are therefore not using the CDM to encourage inward investment in projects. Companies in host countries will nevertheless benefit from developing unilateral CDM projects via the associated CER revenues.

3. Overcoming Policy/Legislative Barriers in Host Countries

There are different types of national-level barriers that can impede the development of CDM projects. Such barriers fall into three categories:

- National barriers not related specifically to the CDM, such as the policy or legislative framework within which a CDM project operates (assessed in this section);
- CDM-related barriers, such as institutional capability, awareness etc. (assessed in section 4);
- Project-related issues, including availability of finance, country risks, project-related risks (finance issues assessed in section 5).

Consideration of the policy and legislative framework within a country is a very important factor for potential investors. Such a framework will therefore also have an impact on CDM activity within a country. However, many CDM project activities are being developed unilaterally, i.e. without the involvement of foreign investment. Even CDM project activities that are developed on a bilateral basis may often involve Annex I parties or entities purchasing credits generated by the project, rather than funding the underlying

[13] There is, however, much interest in developing CDM projects in Thailand, and several projects are under way. Nevertheless, development of the CDM has been hampered in Thailand because of the long delays between projects being proposed and approved by the DNA.

project. The policy and legislative framework within a country may therefore enable domestic and foreign investments to different extents.

The impact that a policy and legislative framework has on foreign investment to a particular country may therefore be significantly different from the effect it has on CDM activity within that country. However, there are several desirable characteristics that can help encourage private investment, and that will also help investment in CDM project activities. Much work has been done by a variety of bodies on this subject, and includes information on government actions that can help to attract investment (e.g. IFC 1998, IPCC 2000, OECD 2002, WB 2003, OECD 2006b).

Key actions for national governments that can help encourage investment, domestic and foreign, include:

- Ensure that laws are stable and enforced. The lifetime and crediting period of CDM project activities can exceed the lifetime of a parliament by several years, or even decades. Investors in CDM projects will need reasonable certainty that key legislative provisions will remain stable, unambiguous and enforced. This will allow investors to continue to generate CERs into the future.

- Provide an appropriate tax/incentive framework for investments, including CDM investments. For example, the economic attractiveness of Annex I investments in potential projects (including CDM projects) will be reduced if the technology used in such projects is subject to import tariffs. Introducing a levy on CERs from a project will also reduce the economic attractiveness of potential CDM projects.

- Reduce participation/ownership restrictions on foreigners. For example, some countries (e.g. the Philippines) do not allow non-citizens to own land. Others may restrict the level of foreign investment in particular sectors (e.g. India does not allow foreign direct investment in plantations, MEA undated). Some countries stipulate local procurement requirements for some project types. Restrictions may also be placed on the level of foreign ownership in potential CDM projects. This places barriers/limits to foreign investment, including for potential CDM projects.

- Develop a clear policy on CDM-relevant issues, such as the impact of national legislation on the eligibility of proposed CDM projects and the ownership of CERs.

There are several other factors that are also important in encouraging investments. These include stable political regimes and macro-economic climates within a country. However, since this section focuses on actions governments can take within the lifetime of a parliament to encourage investment; these issues are not treated further in this paper. Available pools of skilled workers and other counterparts knowledgeable about the CDM may also be important[14]. These issues are discussed in section 4.

Some measures that national governments can undertake to improve the investment climate within a country in a relatively short timeframe are examined below.

3.1 Importance of enabling, stable, enforced and unambiguous legislation

A country’s legislative framework and provisions can help or hinder investment. Investors in projects that have long lifetimes, such as CDM projects, will need to be reasonably certain that the legislative framework

[14] For some project types, availability of a skilled workforce may not be needed. For example, household energy efficiency measures will need to be simple enough to be implemented by householders. However, the presence of CDM-aware consultants, project developers and/or investors will be important in determining whether a particular investment is carried out under the CDM or not.

within a country will enable them to implement their project for the expected lifetime. The stability, as well as provisions, of domestic legal frameworks thus also influences interest in and development of proposed CDM projects.

Investors will also need to make sure that they remain in compliance with relevant laws. This is easier to ensure if legislative provisions are simple and transparent. Complex laws can indeed be a barrier to investment – and have been identified as such in India (Lamb 2005).

How legislation is implemented is also important. OECD (2006) highlights the importance of effective enforcement and implementation in attracting investment. Inconsistent implementation and interpretation of laws is a barrier to investments, as it either increases risk of non-compliance, or increases the time/resources needed to interpret relevant legislation. Inconsistent implementation and interpretation of laws hinders investments e.g. in Armenia (UNESCAP 2003). In contrast, the strong rule of law, transparency and stability are identified as key factors behind Costa Rica’s success in attracting foreign direct investment (OECD 2004).

A country’s general legislative framework can also impact CDM development within its borders. In fact, legislation in some countries may actually render the development of particular CDM project types unfeasible. For example, some municipalities in South Africa own electricity generating capacity and generate and distribute electricity (Platts 2003). Municipalities can derive significant levels of revenue – and profit - from these electricity operations (Polity undated). This framework will not encourage local authorities to develop energy efficiency projects (in general, or as CDM projects), as these would reduce the volume of electricity distributed, and therefore revenue, for the relevant authorities.

Several countries also have a regulatory framework that makes it difficult for private-sector independent power producers (IPPs) to feed electricity to the grid. This is an important barrier for CDM projects, particularly for certain types of renewable electricity or energy efficiency activities such as wind energy development or efficient bagasse co-generation, which are often undertaken by the private sector as IPPs. The importance of the private sector is illustrated in India, where private-sector projects accounted for 3.52 GW of the 3.59 GW installed wind capacity by March 2005 (Hindu Business Line, 2005). There is a huge potential for increased use of renewable electricity or co-generation in many non-Annex I countries. However, potential CDM projects that would generally be undertaken by independent power producers will be hindered in the absence of an appropriate domestic, enabling policy framework (see text box for information on cogeneration in Egypt).

Cogeneration Potential and Barriers in Egypt

Egypt's proven natural gas reserves in mid-2005 were 66.3 trillion cubic feet (1.9 trillion m3). The government has embraced a national plan for promotion of use of natural gas in residential and industrial facilities through the construction of a transmission network of 14,350 km to distribute natural gas to end users. At the same time, several sectors within the Egyptian economy have a good potential for natural gas-based cogeneration applications. This is particularly true for textile, food processing, and petro-chemical plants. Within these industries, the total installed cogeneration capacity is 380 MW, mainly using steam or gas turbines. However, the country's potential in cogeneration far exceeds this figure. A large number of hotels, hospitals and commercial buildings could also become natural gas-based cogeneration end-users. A survey conducted by Bechtel International in 1999 estimated the cogeneration potential in Egypt at 1,600 MW (Cogeneration & On-Site Power Production magazine, Sept.-Oct. 2006). Since then, and at an annual economic growth rate of around 5 to 6%, this estimate has grown considerably. Developing this cogeneration potential as CDM projects could be feasible. During the past three years, some private sector CDM project development firms made efforts to develop CDM projects – but with little success. In addition to the CDM-specific barriers outlined in this paper, barriers specific to cogeneration have been cited by the developers:

- Lack of well-qualified energy services companies that are capable of designing and implementing cogeneration projects.
- Lack of a national strategy or policy that promotes and encourages end-users to install cogeneration systems. Additionally, there is no market or financial incentives introduced by the state to attract end-users to the technology.
- Lack of comprehensive regulatory guidance on the terms and conditions for how cogeneration installations can sell its excess energy to the grid, nor there is a guaranteed access to the power grid.
- Local financial intermediaries are unfamiliar with cogeneration technologies and how to appraise cogeneration investments, which leads to lack of project funding opportunities.
- Electricity tariffs have been and are still heavily subsidised by the government which reduces the economic incentive by end-users to invest in cogeneration technologies.

Source: Interview with Ihab El Massry, Sindicatum Carbon Capital, Egypt

Ensuring that legislation is both stable and enforced is also important. For example, the Indian government set guidelines for a minimum electricity price from renewable electricity systems of 2.25 Rs/kWh in 1994/95, to increase at 5% p.a. (MNES2, not dated). This should have led to prices for renewable electricity of approximately 3.66 Rs/kWh by 2005. However, MNES (not dated) and several proposed renewable electricity CDM projects[15] in India indicate that the actual prices for renewable electricity are significantly below this level. Further, tariffs for renewable electricity systems can sometimes drop unexpectedly, as for the RSCL co-generation expansion bagasse project, where the local electricity board decided to reduce the tariff paid[16]. This uncertainty hampers an accurate estimation of future benefits of a particular project and will therefore hinder investments in such projects.

Considerable uncertainty can exist both in the interpretation and the implementation of particular legislation. For example, if tax legislation is unevenly enforced, similar projects could face different costs. Legislative uncertainty adds to the risk that a proposed project will not perform as expected, or could operate at a

[15] See e.g. PDD for RSCL co-generation expansion project in Tamil Nadu, India, http://cdm.unfccc.int/UserManagement/FileStorage/I2V92PWD75TF21HJX1TZ7LKAILDOAI

[16] http://cdm.unfccc.int/UserManagement/FileStorage/I2V92PWD75TF21HJX1TZ7LKAILDOAI

competitive disadvantage. Studies have consistently found that predictability and simplicity of regulations is a priority for investors (e.g. Mackinnon 2003).

3.2 Provide an appropriate tax/incentive framework

Developing and enforcing an appropriate tax framework for businesses and individuals is a large and important task for governments, involving both strategic decisions and significant resource levels. High or discriminatory taxes can be a barrier to investments, as they reduce the effective rate of return. A complex or un-transparent tax system can also be a barrier to investment. Assessing general tax frameworks is beyond the scope of this paper. Further, decisions on whether to develop a CDM project, and if so, in which country, are unlikely to be made solely on tax considerations, but will also involve an assessment of the project's context, framework conditions, and potential market.

However, the incentives (or disincentives) for different potential CDM projects can vary significantly by country. This can influence the type of CDM project being developed. For example, renewable energy systems are eligible for tax relief in several countries, including Malaysia (BCSE 2005) and Mexico (Ovalle Araiza 2005).

Import duties can also affect the type of CDM projects developed, and whether they are done so unilaterally (i.e. involve no foreign investment) or bilaterally. For example, the import duty on wind electricity systems varies enormously: until July 2005 it was 20% in Thailand **(**Steenblick 2005, MFA 2005), 1% in Sri Lanka (GoSL 1979) but 0% in the Philippines (DoA 2004). Interestingly, there are no wind CDM projects are under development in Thailand[17], in contrast to both Sri Lanka and the Philippines. Almost 90 wind electricity CDM projects are under development in India, where import duty on wind energy turbines is 25% (IndiaMart 2007). However, India is also one of the world's leading wind turbine manufacturers, and almost 90% of its wind CDM projects are developed unilaterally, which may reduce the import requirements for such projects.

The availability of subsidies is another important factor that can either encourage or impede CDM project developments. For example, providing direct subsidies for fossil fuels will reduce the economic attractiveness of renewable sources of energy – including from CDM projects. Maintaining electricity tariffs below production costs will reduce incentives for private, small-scale renewable electricity providers. Subsidies can be very significant in some countries, sectors or consumer groups. Indeed, Indonesian subsidies for oil - although declining on a per litre basis - were estimated to be $12bn (or 5% of GDP) in 2005 (IEA 2006b). Indian farmers pay only 10% of the supply cost of electricity (Sanghi 2003). Providing employees with subsidies for heating also reduces demand-side energy efficiency incentives. Reforms to reduce such subsidies started in China in winter 2006 (China Daily 2006). While there may be many reasons why such subsidies are in place, countries wanting to increase CDM interest may wish to examine the level/format of such subsidies.

3.3 General institutional framework and governance

The institutional framework within a country is an important factor that impacts the level of investment, including inward investment to that country. The perceived efficiency of the government in a potential CDM host country influences investors' decisions whether or not to invest in a country (WB 2003, OECD 2005). This efficiency is affected by the general institutional framework within a country, as well as how well, quickly and reliably this framework is adhered to. For example, administrative practices within a country are often seen by investors as "a proxy for the commitment and capability of the government as a whole" (Jacobs 2003). Further, inward (foreign) investment may be impeded in countries where there are complications or

[17] Of the 24 proposed CDM projects currently under development in Thailand, most involve biogas to energy or biomass energy projects.

delays in obtaining the permits or authorisations needed to construct/implement particular projects or project types.

Several authorisations, permits and/or assessments may be required to develop projects within a country[18]. Import procedures may also need to be dealt with for certain project types. Investments will be slowed if the required permits or project equipment are not delivered in a timely manner. Indeed, surveys have shown that customs procedures are sometimes seen as major – or even prohibitive – barriers to investment (OECD 2006c). Such procedures can vary significantly by country. For example, an average of 12 documents and 51.5 days are needed to import goods into Sub-Saharan Africa -compared to e.g. 8 documents and 12 days in Korea (WB 2007).

While import-related delays may not necessarily reduce CDM activity within a country, it may favour the development of unilateral, rather than bilateral, CDM development. For example, importing goods to India can take considerable time - requiring on average 15 documents and 41 days (WB 2007). OECD (2006c) cites an example where it took 3 months for renewable energy equipment to clear Indian customs. However, since many CDM projects that are being developed in India are unilateral (and may thus not need imports), they may not be affected by customs-related delays.

Which level of government has the mandate to deliver the required authorisations may also vary by country. In some countries, more than one level of government may need to approve a proposed project. Such "concurrent" regulations can occur in the forestry sector in Argentina and in the electricity sector in India. This means that investors will need to take province/State law – as well as national law – into account when developing CDM projects. Attitudes of and/or incentives from governments to particular project types may differ within countries. For example, the feed-in tariffs for wind electricity vary across India, as they are decided by individual States (MNES, not dated).

The effectiveness of a country's legal system and protection of intellectual property rights (IPR) are also very important factors influencing inward investments. For example, concerns about not being able to maintain IPR mean that some technology providers may choose to not export to particular countries such as China (OECD 2006c). Lack of an effective appeals process in general, as well as on issues related to developing a project and/or to allocating any associated CERs can also be a barrier to developing projects or participating in the CDM.

The "informal" nature of some business practices in some countries can also inhibit inward investment, including in potential CDM projects. For example, the World Bank's "doing business" database also indicates that there are several countries where the majority of firms expect to pay bribes "to get things done" and that more than 90% of firms expect to pay such bribes in India and Bangladesh (WB 2006). Further, corruption was identified as the second largest impediment to investment in the Philippines during a survey of 700 firms (WB, IFC and ADB 2005).

Many governments in non-Annex I countries have made significant improvements to their institutional frameworks over the last decade. Further improvements are possible, and will help to facilitate investment conditions (which in turn can help encourage CDM-related investments).

[18] For example, different types of projects (not just CDM projects) may need business licenses, building permits, environmental permits and/or land titles. Which authorisation(s) required will vary according to the project type, size and country. For example, an environmental impact assessment (EIA) is needed before large (> 1,000 hectare) plantations are authorised in Brazil (May, not dated). In Belize, the cut-off threshold is 500 hectares[18] or larger - for any land to be leased, and this EIA is to be repeated every five years (GoB 2000).

3.4 Restrictions on foreign ownership

Constitutions or sector-specific policies in several non-Annex I governments restrict foreign ownership of, or participation in, certain types of projects, activities or land. This may be done for strategic reasons (e.g. in the defence sector) or for other reasons, e.g. to encourage the growth of domestic industries, or maximise revenues from domestic resources such as oil and gas.

Government provisions on foreign ownership of natural resources, land or companies can affect CDM project development in different sectors. These include the capture/flare of coal-mine methane, capture/flare of associated natural gas; and forestry projects. For example, since 2006, all hydrocarbon resources in Bolivia belong to the government (Euromoney 2007). This will reduce foreign interest in investing in e.g. associated gas recovery projects.

Sectors other than those involved with resource extraction can also be affected by restrictions on foreign ownership. For example, private power generators in Costa Rica have to have at least 35% ownership by Costa Rica citizens (GoCR 1995). In Malaysia, entities are generally required to be at least 70% Malaysian (International Tax Review 2006). New wind power projects in China need to have a minimum of 70% domestic content, unless there is a written agreement to the contrary (IEA 2006).

3.5 Sector example 1: barriers to renewable electricity development

Renewable electricity systems account for only 22% of expected credits from the current CDM portfolio, despite a huge potential and rapidly growing electricity demand in many Non-Annex I countries.

One of the biggest barriers to renewable electricity developments is the high capital cost requirements of such systems (see e.g. Table 2) and their high cost of CO_2 abatement. However, the legislative/policy framework in a country can also impede renewable electricity development, particularly by smaller electricity producers who are more vulnerable to uncertainties. Such barriers can include:

- Limiting the role of independent power producers (e.g. by not allowing them to feed electricity to the grid). This is because new renewable electricity generation systems are often implemented by the private sector – by companies whose main business is electricity generation (e.g. as for wind power in India) as well as by companies whose main business is another activity (e.g. sugar production, where the by-product bagasse can also be used to generate electricity).
- Artificially low electricity prices and/or subsidies to fossil fuel inputs, as could reduce the economic attractiveness of electricity production from independent power producers (including from renewables).
- Levying import tariffs for any non-domestic components of renewable energy systems.
- Tolerating poor payment discipline, e.g. not enforcing payment, or having inadequate revenue collection mechanisms.
- Uncertainty regarding the development/approval of power purchase agreements (PPAs), e.g. if PPAs have previously been delayed, or needed to be renegotiated.

The importance of some of these barriers is illustrated in the textbox below on developing renewable electricity projects in Malaysia (and in section 4.1 for China).

Palm Oil Sector in Malaysia

Malaysia has a large potential for small renewable energy projects that could be implemented under CDM within the palm oil sector. Around 400 palm oil mills could develop power production using agricultural waste from the production of palm oil (instead of letting this waste decay thus producing methane). By end of 2005, only two projects were implemented in Malaysia with a total installed capacity of 12 MW. According to SV Carbon, a project developer in Malaysia, the key barrier facing the development of numerous CDM projects within the palm oil sector is the complex rules and regulations pertaining to power purchase agreements (PPAs) that need to be used by project developers to sell electricity to the grid. In fact, the format and level of detail for a 10 MW project is the same as that for a 2400 MW coal fired Independent Power Producer (IPP). A recent barrier that added to the complexity of the situation was that the power utility is now interested in taking part, or all, of the revenue coming from the sale of the CERs in CDM projects that are selling electricity to the grid through a PPA. Such an approach to PPAs and CDM hinders new projects.

An additional barrier to CDM project development in this sector is the regulation by the Malaysian DNA that CDM projects must be bilateral, not unilateral. Thus CDM projects in Malaysia need to have an Annex I project participant and involve technology transfer into Malaysia. However, many of the potential projects in the sector can be easily implemented using local technologies. In addition, these potential projects are all small-scale projects and would not necessarily require a foreign source of funding. This combination of complex PPA regulations and DNA requirements has stifled the growth in the number of CDM projects in the palm oil sector and has driven the attention of potential project developers away from this sector.

Source: interview with Soeren Varming, SV Carbon, Malaysia.

3.6 Sector example 2: Land Tenure and Ownership of Natural Resources

At present, forestry projects account for 0.2% of total expected credits for proposed CDM projects under validation or registered. There are several reasons for this small share, including international-level rules (see section 4); low carbon prices; and long lead-times for significant levels of CER delivery (due to slow initial growth of trees).

National-level factors, including land tenure and CER ownership rights, can also affect the attractiveness of undertaking re/afforestation projects under the CDM. Some countries prohibit ownership of land by foreigners. For example, the Philippine constitution includes the provision that “All lands of the public domain, waters, minerals, coal, petroleum, and other mineral oils, … all forests or timber … and other natural resources are owned by the State. The State may directly undertake such activities, or it may enter into co-production, joint venture, or production-sharing agreements with Filipino citizens or corporations or associations at least sixty percent of whose capital is owned by such citizens. … The President may enter into agreements with foreign-owned corporations involving either technical or financial assistance for large-scale exploration, development and utilization of minerals, petroleum and other mineral oils according to the general terms and conditions provided by law.”

Owning a forest is not necessarily a pre-requisite to owning any associated CDM-related credits. However, because forestry CDM projects are long-term projects with crediting lifetimes of up to 60 years it is important to seek clarity and stability of ownership issues up-front.

Nevertheless, determining who has ownership of what is not necessarily a straightforward matter. For example, the ownership of the land may be separated from the ownership of the trees (FAO 2001). This is the case in China, where use and management of some land has been devolved to households while the state has retained ownership of the land (FAO 2005). Several different layers of government may either own forests (e.g. Uganda, FAO 2001) or be involved in delivering permits for forestry activity (IUCN 2005).

Further, national legislation may not be clear as to whether or not foreign ownership of forests is possible - as is the case in China (Wang 2006). Alternatively, land rights issues may be complicated, e.g. if land ownership is governed both by legislation and by "customary law". This is the case in some African countries such as Ghana (IUCN 2005), where land may belong to – and be shared by – communities. Community ownership of, or rights to, forests is common in many non-Annex I countries, such as Tanzania, Thailand, Philippines, Bolivia, Brazil and Mexico (Ellsworth 2001).

Thus, prohibiting foreigners from owning land will create barriers to their involvement in re/afforestation CDM projects unless a long-term lease and/or clear ownership criteria for CERs can be established. Establishing barriers to foreign involvement in A/R CDM projects can significantly reduce the CDM potential in some countries.

4. Overcoming CDM-related Barriers in Host Countries

The CDM-specific framework within host countries is an important factor that can help or hinder development of projects under the CDM. Some of these barriers are sectoral- or project-related, while others are more national level barriers. For example, if a host country has no designated national CDM authority it will not be able to participate in the CDM even if it has an enabling general policy framework and a good investment climate.

There are three key CDM-related barriers in host countries. These relate to:

- The CDM-specific framework within a country, and the importance of ensuring consistent messages between CDM policy and policy in other areas;
- CDM-related institutions and capacity, which are key to allow CDM projects to go forward in a timely manner; and
- Awareness of climate change and the CDM amongst relevant stakeholders.

These issues are outlined below.

4.1 Importance of clear and enabling CDM-specific policy framework

Potential CDM project activities can cut across many different sectors and involve several different types of stakeholders. In order to send a consistent message to potential project developers and investors, it is important that within a particular country there is a clear and consistent policy towards CDM projects of a given type.

Developing a consistent policy will require good communication between the different actors and the various levels of government. It will also require good communication within host country governments – as different government departments, agencies or entities can be involved in developing, implementing, promoting and/or approving CDM projects[19], as well as in developing the policy framework that sets the context within which projects operate. Achieving such consistency can have a large impact on CDM development within a country, as is outlined in the box below for the example of wind electricity in China.

[19] Some CDM projects are implemented by public-sector companies. For example, the "main partner" of the Al-Shaheen oil recovery project in Qatar is the national oil and gas company (Qatar Petroleum).

Promoting wind energy development in China

Electricity demand in China is growing rapidly, with production increasing more than 60% between 2000 and 2004 (IEA 2006), This growth in electricity demand is expected to continue at over 5% p.a. to 2015 (IEA 2006d).

There have been dramatic increases in wind energy use in China over the last few years. Capacity more than doubled from 344 MW in 2000 (NREL 2004) to 769 MW in 2004 (GWEC 2005). It has more than trebled again since then, with capacity reaching 2.6 GW by the end of 2006 (GWEC 2007). Indeed, 1.3 GW of wind capacity was installed in 2006 (GWEC 2007). 20 plants commissioned in 2006 with a combined capacity of more than 0.9 GW1 (69% of 2006 installed capacity) are seeking CDM status. A further 2.9 GW1 of wind capacity from 53 plants with an expected commissioning date in 2007 are also seeking CDM status. This exceeds even recent estimates of “more than 1.5 GW” wind energy expansion in China in 2007 (ENS 2007).

The Chinese New Renewable Energy Law (CNREL), which entered into force on 1st January 2006, has provided a significant impetus to renewable energy development. This law provides several incentives for renewable energy producers – including a guaranteed market for electricity produced* at a premium price - and also requires grid enterprises to “provide the grid-connection service” to renewable electricity producers (GoC 2005). The CNREL indicates that it has been established for several reasons, including to “protect the environment and realize the sustainable development of the economy and society” (GoC 2005). This law is a success in helping to encourage Chinese wind energy development. Further, use of the CDM is now extremely widespread for new wind farms. This indicates that consistent project-by-project uptake can lead to a sector-wide use of the CDM, without necessarily requiring structural changes to the CDM.

Given expectations for continued rapid growth in electricity demand in China, systematic uptake of the CDM by Chinese renewable electricity generators could lead to large volumes of credit generation. Expected annual credits in 2008-12 from renewable electricity CDM projects in China has more than quadrupled between May 2006- end April 2007 to stand at 16.6 Mt CO2-eq/year. If two-thirds of the targeted wind capacity expansion of 2.4 GW by 2010 and a third of the 66 GW capacity expansion target for hydro by 2010 is developed and approved as CDM projects, total annual expected credits from renewable electricity generation systems in China would stand at 84.2 Mt CO2-eq/year (i.e. larger than the volume of credits from Chinese HFC-23 CDM projects)**.

1 Calculated from information in individual CDM project design documents as submitted to the UNFCCC.

* Article 14 states that “Grid enterprises shall ... buy the grid-connected power produced...”.

** Assuming that 1MW of wind and hydro capacity would lead to credits of 1 and 3 Mt CO2-eq/year respectively.

Government-led promotional activities may help to encourage investors and project developers to develop CDM projects in particular host countries. Some countries devote significant resources to promoting CDM activities in their countries. For example, Ecuador has a CDM promotion office that is separate from its DNA (Castro 2004).

A clear policy on the legal status and ownership of CERs is also desirable. However, several CDM host countries have not yet established this. For example, Argentinean law does not currently define rights to CERs (Walsh 2005).

4.2 CDM Institutional Capacity and Framework

The CDM-related institutional framework within a country can also affect how much inward and/or domestic investment is directed towards (or labelled as) CDM. For the CDM project cycle to be completed efficiently at the host country level, two key ingredients should exist. First, institutions relevant to the CDM should possess adequate information on CDM modalities and procedures. Second, these institutions should have the mandate and ability to take actions that would facilitate the completion of CDM transactions in a timely and transparent manner.

In order to participate in the CDM, potential host countries need to establish a "designated national authority" (DNA)[20]. The initial functions of DNAs can vary across countries, but at a minimum a DNA needs to be able to approve a proposed CDM project, confirm that participation in the project activity is voluntary and that the proposed project activity helps contribute to sustainable development[21].

For the DNA to be operational, various ingredients should be in place. For example, the DNA should be equipped with appropriate office equipment that would enable it to function and communicate with the outside world. Some DNAs in Africa are so poorly equipped that they do not have the means to print out a Letter of Approval. More importantly, there needs to be clear internal guidelines on what steps should take place when a PDD or PIN is submitted for review. Again, many host country DNAs do not have a regulatory framework through which they can function. In other words, some DNAs have been established only on paper.

Adequate staffing of the DNA is a critical issue. The institutional setup of a DNA should be optimised to ensure neither over-staffing nor shortages of staff. Therefore, the DNA setup and staffing should be flexible enough to be responsive to market changes. If a DNA is overwhelmed with proposed CDM projects requesting Letters of Approval (or Letters of No Objection), the DNA should be able to react swiftly to sudden increases in work loads. For example, the Peruvian DNA is set-up in such as way that if the DNA is overloaded, it can hire local short-term consultants to assist with project reviewing. Of course not all DNAs have the resources to adopt such flexible approach to project reviewing. However, it would be ideal for a DNA to have some type of scenario prepared if it faces either too many projects or too little. Ultimately, a host country's DNA should avoid building a reputation for inefficiency, lack of responsiveness or delays in approving projects.

The CDM-related institutional framework within a country can also affect the efficiency (or otherwise) of the national-level approval process for proposed CDM projects. Indeed, experience has shown that CDM-related institutions within different countries operate with varying degrees of efficiency. This can also effect the number (and type) of CDM projects proposed and accepted within a country.

The structure and functions of different countries' CDM approval processes varies significantly. This can affect both the time and resources needed to assess and approve proposed CDM projects. For example:

- Stakeholder/public consultation is required as a part of the DNA approval process in several countries, including Indonesia and Cambodia **(**IGES, 2005a; CCCO, 2004). This can add to both the time and cost of assessing a proposed CDM project.
- High-level participation and/or participation from many government departments is needed in different countries. This can also add to the time required to approve proposed projects. For example, cabinet-level participation is required in Thailand to acknowledge the decision of the DNA **(**IGES, 2005b). Several departments are involved in reviewing proposed projects in India and South Africa **(**DME, not dated; MoEF, 2005).
- National-level fees may be required for DNA assessment of a proposed CDM project. This is the case in the Philippines (IGES 2005) and Thailand (ONEP 2006).
- Project-site visits may need to be scheduled by the DNA, e.g. in Peru (UNEP, 2004).

[20] DNAs can – and frequently do - also have other functions, such as establishing national sustainable development criteria, promoting the country as a CDM host etc.

[21] Once credits have been issued from a CDM project activity, the host country DNA will also need to forward CERs to the project participants.

Delays in the national approval process can be significant. For example, the first Letters of Approval for proposed CDM projects in the Philippines were issued in June 2006 (DENR 2006). Three of these projects had been submitted for validation a year previously, i.e. June 2005. Thailand's DNA was established in 2003, but first approved CDM projects in January 2007 (Carbonium 2007).

In some cases (e.g. Brazil, Malaysia), national approval for a proposed CDM project may only be sought after it has been validated. Such a structure means that different steps in the CDM registration process have to be undertaken sequentially, rather than concurrently. This extends the time-period between developing and registering a proposed CDM project, which can reduce the number of CERs generated pre-2012[22]. For example, the Bumibiopower project in Malaysia was submitted for validation in March 2006 and received no comments. However, this project has not yet been submitted for registration, implying that there could be delays in the national approval process.

In other cases, as in some Sub-Saharan Africa and Latin American countries, the head of the DNA is in charge of other climate change-related issues. This is usually an efficient approach given the limited number of new CDM projects expected to be submitted to the DNA per year which does not justify the creation of the new post for a full-time head of DNA. However, this has proven to be problematic for project developers and potential emissions reductions buyers who are in need of interacting with the DNA frequently, especially during the early stages of a CDM project preparation. In fact, in several Sub-Saharan African countries, project developers and ER buyers often find it difficult to hold a meeting or secure the presence of the head of the DNA when needed.[23]

Many DNAs in host countries do not have designated web sites that would present practical information on regulatory procedures related to CDM project approval in the country. Morocco, Egypt, Philippines, and Brazil are examples for countries where the DNAs have established web sites that are designated for the CDM sector in the country. In least developing countries (i.e. Sub-Saharan Africa) it is unlikely a DNA will be able to set up a web site unless it has received funding from an external source or a development agency. The availability of a web-based information platform has so far proven to be effective in promoting a host country as a CDM project destination.

In general, the DNA in many countries has been structured to act as a "one-stop-shop" for emission-reduction buyers. The DNA web site gives an overall view of the services offered by this one-stop-shop. Some host countries have also used their DNA web site as an investment promotion tool for the country where projects at various stages of implementation that are looking for developers are posted. Additionally, these sites have lists of local CDM consultants and institutions relevant to the CDM process in the country.

In summary, a "successful" DNA should ideally have the following operational characteristics:

a. ***Responsiveness:*** The ability to provide timely responses to inquiries by emissions reduction buyers and other foreign stakeholders interested in CDM in the host country. Also, the ability to made decisions regarding submitted PINs and/or PDDS in a timely manner, while also providing clear justifications to the project proponent in cases of rejection.

b. ***Flexibility:*** Adopting operational regulations that allow the DNA to swiftly modify the way it functions in response to new developments in the CDM market in the host country. For example, the ability to outsource or subcontract project reviewing process during periods with high work load on the DNA in order to prevent delays in issuing letters of approval.

[22] For most CDM projects currently under development, crediting can only start upon a project's registration. A delay between the project's start and registration will therefore reduce the total number of credits it can generate pre-2012.

[23] Interview with Seth Baruch, Quality Tonnes.

c. ***Sustainability:*** A secure operational budget from a long-term source of funding. For example, the DNA's budget might become part of the overall annual budget of the institution or ministry hosting the DNA.

d. ***Efficiency:*** The budget and staffing allocated for the day-to-day operations of the DNA should reflect the potential for CDM in the host country and the expected number of projects to be reviewed and/or approved per year. Overstaffing or understaffing should be avoided.

e. ***Transparency:*** Operations and procedures of the DNA, especially those pertaining to project reviewing and issuance of letters of approval should be formalised, publicly announced, and adhered to for all projects submitted for review/approval. The DNA's web site is a good platform for announcing these procedures.

Various DNAs today have more or less achieved some or all of these operational characteristics. The DNAs of Morocco and Chile are only examples of such DNAs. However, a comprehensive survey of existing DNAs and assessments of what could be identified as a "successful" DNA is beyond the scope of this study.

4.3 Awareness of CDM issues

Among the key barriers facing wider scale application and adoption of CDM is the lack of information and knowledge on the CDM. Within a CDM host country, different levels or needs for CDM information exist. These differentiated needs are directly related to the CDM stakeholders' role within the project cycle, a role mainly defined by the stakeholders' job descriptions and institutional mandates. In general, within a CDM host country, the key stakeholder groups that need to possess adequate and correct knowledge on CDM are as follows:

a. *Group A:* Policymakers responsible for the enacting laws and decisions that could directly affect CDM activities in the countries; these include ministers, undersecretaries, and heads of departments and divisions in government and public sector agencies, such as the national renewable energy agency rural electrification authority, and city municipalities.

b. *Group B:* Individuals working in technical fields and economic activities through which CDM projects could be identified (project origination level). These include rural electrification practitioners, private sector consultants and academics working in sectors like energy efficiency, industrial pollution, solid waste management, and renewable energy.

c. *Group C:* Bankers, loan officers and individuals working in local financial intermediaries active in the area of project financing.

Within Group A, lack of adequate CDM knowledge in some host countries has resulted into the introduction of law and regulations that may stifle growth in the CDM sector in the country. For example, some host country DNAs have imposed a minimum price for CERs rather than leaving it for the market forces to decide the appropriate price. In other cases, the lack of CDM knowledge among Group A stakeholders results in lack of appropriate intervention to remove already existing barriers facing CDM in the country. For example, policymakers may be unaware that an existing high import tariff on renewable energy technologies is negatively affecting the economic viability of renewables projects in the country.

For Group B, lack of CDM knowledge is among the reasons why in some regions, such as Sub-Saharan Africa, there are a limited number of CDM projects identified and implemented. Since developing a CDM project requires up-front resources, it is important to have CDM "champions" that help CDM project development. Lack of information/awareness on the CDM can also impede project implementation. For example, Det Norske Veritas (DNV), a designated operational entity, identified 20 common pitfalls during CDM project validation (Table 3). DNV noted that these pitfalls, mainly caused by lack of adequate information about CDM modalities and procedure could cause delays of one or more months in the project validation/registration process.

Table 3 Examples of common pitfalls in CDM project development

1. Lack of logic and consistency in PDD.	8. Insufficient description of the technology.
2. Deviations from selected calculation methodology not justified sufficiently or incorrect formulas applied.	9. Insufficient explanation of baseline scenarios.
3. Compliance with local legal requirements not covered sufficiently.	10. Insufficient explanation of project Additionality.
4. Insufficient information on the stakeholder consultation process.	11. Baseline information not sufficiently supported by evidence and/or not referenced sufficiently.
5. Evidence of EIA and/or required construction/operating permits/approvals not provided.	12. Major risks to the baseline not identified/described.
6. Letter of Approval insufficient or delayed.	13. The project boundaries not defined clearly.
7. Project participants not identified clearly.	14. Project and/or crediting start date unclear.
	15. Deviations from monitoring methodology not justified sufficiently.

Source: UNEP Risoe-DNV 2005

In addition, lack of awareness of CDM issues amongst expert and government decision-makers could also cause potential CDM projects to be hindered from materialising. For example, Quality Tonnes, a CDM project development company, made efforts during 2006 to engage various city municipalities in African countries to implement landfill CDM projects. According to Quality Tonnes, initial response from the municipalities is usually positive. However, lack of awareness of the characteristics of landfill CDM projects and lack of ability to secure underlying project financing, make it difficult for many of these projects to move forward.[24]

Finally, in Group C, there is lack of adequate information about CDM among financial intermediaries is also a cause for low number of projects being implemented in regions like Sub-Saharan Africa. Many of these countries already suffer from poor credit ratings and high sovereignty risk, which limit the possibility for securing overseas financing for potential CDM projects. This creates an even more important potential role for local financial intermediaries as they become the second-best option as a source of underlying project financing.

5. Overcoming Financing Barriers

Lack of financing is among the most common barriers inhibiting CDM project development. Financing constraints are also cited by many CDM project developers, particularly when it comes to projects that have high initial investment costs such as renewable energy projects. High capital cost requirements is an age-old challenge that has been facing renewable energy projects. Large numbers of potential small-scale CDM projects in poor host countries are unable to move forward due to this financing barrier. Other characteristics that add to the challenge of securing financing for renewables projects are that they typically reduce CO_2 (rather than a high GWP GHG), the projects involve a long project lead time, and the fact that they are perceived by financing sources as high risk projects compared to conventional power generation projects. Additionally, project appraisal is usually made on the basis of the installation cost (cost per kW installed) rather than the life-cycle cost of production of electricity (cost per kWh). Such approaches favour conventional technologies with low capital cost requirement.[25]

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[24] Interview with Seth Baruch, Quality Tonnes.

[25] Wuppertal Institute, Promoting Renewable Energy Technologies Through CDM, 2006.

Other financing challenges facing project developers (particularly smaller developers) in poor host countries are the high transaction costs associated with CDM project preparation and implementation. The following section outlines in more detail the issues of project risk and transaction cost in a CDM project.

5.1 CDM-specific project risks

CDM project financing barriers are primarily related to the various types of risks associated with a CDM project. In addition to the conventional types of project risks such as political and exchange rate, time over-run, and capital cost over-run risks, there are risks that are specific to CDM projects. Table 4 outlines these risks that could typically influence project financing institutions' decisions whether to participate in the financing of a CDM project.

Table 4: CDM-specific project risks

DNA/Letter of Approval Risk	The risk of having either a delay in the issuance of LoA by DNA, or project failing to obtain a LoA. Risk of LoA being revoked after it has been issued.
Validation & EB Registration Risk	Risk of DOE unable to complete validation of project due to inconsistencies or lack of data. Risk of having the project reviewed by EB prior to registration. Both delays impact the flow of accumulated CERs.
Monitoring & Verification Risk	Risk of errors during project monitoring that result into ex-post miscalculation of emissions reductions.
EU ETS Risk	Risk of EU ETS (biggest source for demand for CERs) having an over-supply of EU Allowances (EUA) which would dampen the demand for CERs.
Methodology Risk	Risk of having an approved methodology being put on hold for a period of time, such as the case of AM0006, and AM0016.
Review of Issuance Risk	Risk of EB reviewing the project prior to issuance of CERs.

Source: Guidebook to CDM Project Financing, UNEP RISOE Centre-Ecosecurities, (forthcoming 2007).

Some investment guarantee agencies have recently started to offer products and services to mitigate CDM-specific risks in developing countries. For example, the World Bank's Multilateral Investment Guarantee Agency (MIGA), has recently provided insurance to a Canadian company investing $2 million in the Nejapa landfill gas-to-energy CDM project in El Salvador. While MIGA's insurance package includes coverage against standard political risks typically offered to foreign firms investing in a developing country, it also includes coverage against the risk of El Salvador DNA revoking the Letter of Approval or failing to deliver the agreed upon amounts of CERs upon their issuance.[26] Similarly, Swiss Re, a reinsurance company, has recently introduced an insurance policy that covers risks associated with CDM project registration and issuance of CERs by the EB. The policy covers the 15 sectoral scopes of CDM projects, yet is not offered for CDM projects all developing countries, especially regions or countries with high sovereignty risk. It does not also cover risks of a project failing to deliver the expected CERs due to technology failure or miscalculations by the DOE.[27] Rabobank in India has also introduced an investment guarantee product aimed at CDM projects. The product covers the risks of non-delivery of CERs from the project as well as other types of

[26] Carbon Finance magazine, 31 July 2006.

[27] ibid, 03 July 2006.

conventional, non-CDM risks like political risk. However, the product is only offered for CDM projects in India and targets mainly European emissions reductions buyers.[28]

While such investment guarantee approaches for CDM could help to even out the regional distribution of CDM projects by mitigating the high sovereignty risk of some host countries, none of these have yet been mainstreamed into the standard CDM project financing.

Another financing barrier identified by CDM project developers is the fact that local banks in many developing countries are only willing to provide loans in local currency when the CDM project may often involve the procurement of project equipment in hard currency. Additionally, the majority of potential CDM projects in many host countries are within the small-scale range. This is especially the case in Sub-Saharan African countries. The small size of these projects contributes to the limited amounts of additional stream of revenue to be generated from CERs hence the projects end up being too costly e.g. per installed MW to be financially attractive for local banks to consider.

Project developers, on the other hand, state that when a CDM project is incorporated within a wider donor-funded technical assistance or loan programme in the country, the project is more likely to move forward. For example, Quality Tonnes has been able to push forward a landfill project in a sub-Saharan African country through linking the project to an existing World Bank urban sanitation project being implemented in the country[29]. The World Bank's *Clean Energy Investment Framework: Action Plan*[30] represents an example of multilateral development agencies starting to incorporate carbon finance into overall clean energy promotion frameworks. The action plan examines various means for promotion of clean energy technologies and takes into consideration the potential for using CDM and carbon finance as a means to increase access to financing for clean energy projects in developing countries. Similar approaches to mainstreaming carbon finance into the operations of other development banks would have a positive overall impact on facilitating CDM project development in host countries.

5.2 Transaction costs

Transaction costs associated with completing the CDM project cycle represent a common hurdle facing many project developers, especially for small-scale projects and in poor developing countries. This is because transaction costs are incurred up-front, while CDM revenue is only generated once the project's methodology has been approved, the project registered and credits issued. Table 5 shows a breakdown of representative transaction costs for large and small-scale CDM projects.

Some emission reductions buyers, especially large institutional or national carbon funds, have been offering different types of in-advance payments to project developers in order to assist project developers to overcome the burden of the project's transaction cost. One model involves offering this advance payment as a grant, separate from the funds used by the buyer to purchase emissions reductions. Another model is to pay part of the price for the purchased CERs in advance before the project's inception.

[28] ibid, 25 August 2006.

[29] Interview with Seth Baruch, Quality Tonnes.

[30] World Bank, *Clean Energy Investment Framework: Action Plan*, January 2007.

Table 5: CDM project transaction costs

Activity	Cost (large-scale, USD)	Cost (small-scale, USD)	Type of cost
Initial feasibility study, i.e. Project Idea Note (PIN)	5,000-30,000	2,000-7,500	Consultancy fee or internal
Project Design Document (PDD)	15,000-100,000	10,000-25,000	Consultancy fee or internal
New methodology (if required)	20,000-100,000 (incl. US$1,000 UN registration fee)	20,000-50,000	Consultancy fee or internal
Validation	8,000-30,000	6,500-10,000	DOE fee
Project Registration Fee	10,500-350,000[31]	0-24,500[32]	EB fee
UN Adaptation Fund Fee	2% of CERs	2% of CERs	EB fee
Initial verification (incl. system check)	5,000-30,000	5,000-15,000	DOE fee
Ongoing verification (periodically)	5,000-25,000	5,000-10,000	DOE fee
Share of Proceeds to cover administration expenses (SOP-Admin)	The fee paid at registration is effectively an advance that will be 'trued up' against actual CERs issued over the crediting period (if different to emission reductions projected at registration). SOP-Admin is not capped.		EB fee

Source: Guidebook to Financing a CDM Project, UNEP Publications, March 2007

For example, the Austrian JI/CDM Programme offers cover as a grant up to 50% of project related documents (baseline preparation, validation fees, etc.) with a maximum of Euro 40,000. Another example is the CAF – Netherlands CDM Facility, which offers to cover up to 100% of costs for project related documents. The World Bank's Community Development Carbon Fund (CDCF) also offers to initially cover all costs for project related documents (PDD preparation, monitoring plan, validation, etc.) but these are reimbursed through adjusting of CER following their issuance[33]. In general, high transaction cost is cited by many CDM project developers as one of the key barriers facing CDM project development, especially in Sub-Saharan African countries and in particular in the case of small-scale projects.

In addition to these transaction costs, some governments apply levies specifically to the credits generated by CDM projects. For example, the Chinese government takes 65% of the CER revenue from HFC23-reduction CDM projects. At current levels of these projects, this would result in revenue of more than 1.5 billion Euros for the Chinese government to 2012[34]. The Egyptian government has/is also introduced a levy on CERs,

[31] US$ 0.10/CER for the first 15,000 CERs per year and US$ 0.20/CER for any CERs above 15,000 CERs per year (max US$350,000). The minimum shown here has been calculated as 15,000 CERs/year over a single 7-year crediting period.

[32] As for large scale, unless total annual average emission reductions over the crediting period are below 15,000 tCO_2-e, in which case no fee is payable. Maximum calculated as 25,000 CERs/year over 7-year crediting period.

[33] Guidebook to Financing a CDM Project, UNEP publications, March 2007 (forthcoming).

[34] Assuming a CER price of 8 Euros.

Table 6. Several governments also charge a fee for reviewing proposed CDM projects (as outlined in section 4). Whether or not such charges will change potential investors' CDM activities will depend on the level of the tax or charge.

Table 6: CER taxation levels in Egypt's DNA

Category	Project Type	CERs Taxation (%) Large-scale	CERs Taxation (%) Small-scale
A	Renewable Energy	1%	0.5%
B	Energy Efficiency Fuel Switching Industrial Processes	3%	1.5%
C	Waste Management Afforestation	6%	3%
D	N_2O Abatement CFCs & HFCs	8%	4%

Source: Communication with Egyptian DNA, Feb. 2007.

CDM capacity building investments and increased cooperation with host countries could help reduce transaction costs related to CDM project development. For example, project developers in host countries that have invested in building the capacity of local CDM stakeholders, especially practitioners and consultants, have been typically able to keep project transaction costs within the lower range of the figures in Table 5. This has been particularly true in the case of fees for preparation of PINs, PDDs, and new methodologies, where needed.[35] Therefore, host country governments, in cooperation with carbon funds and development agencies, could contribute to the reduction in transaction cost through further investing in building local capacities for CDM project development.

Building the capacities of potential project participants in host countries can also help reduce transaction costs by reducing a project developer's reliance on international technical services needed to complete the project cycle. Building awareness of the CDM within the lending and project financing communities can also help reduce the funding barrier to CDM projects.

6. International Barriers

International, as well as national, barriers to CDM development can also be important, and can influence the geographical spread of CDM project activities. These barriers can be caused by several factors, including buyer/investor criteria on project location, type or size; explicit exclusion of certain project types from the CDM pre-2012; and process-related issues of the CDM framework. These issues are outlined below. Uncertainty about the post-2012 framework (and demand for CDM credits) is also an important factor.

6.1 Buyer/investor criteria on project location, type or size

There is a huge potential variety of CDM project locations, types and sizes open to potential CDM project investors and/or to potential buyers of CDM credits. Decisions on what type of projects to develop, where, when, and whether they should be developed as CDM projects are influenced by a myriad of factors – including a country's investment climate and national-level factors as discussed above. CER buyers and/or CDM investors may also have their own criteria to decide if, how, when, where and on what to spend CDM-related funds. These are outlined below.

[35] This conclusion is based on findings from UNEP RISOE Centre's multi-country, CDM capacity building activities.

The role of the buyer/investor in a CDM project can influence the geographical (and sectoral) spread of the CDM market. For example, a technology provider who will be paid partly through CER revenues may have a large choice of potential project locations, but a smaller choice of what project type to be involved in. A project financer might have constraints on available finance and required rate of return/payback periods. CER buyers have a large choice of project type, sector, location and size – but are dependent on the project being developed with other underlying finance.

Governments and companies have earmarked almost $12bn for CDM funding to 2012 (EDCM 2007). A large proportion of this is allocated to carbon funds, with approximately $1.9bn housed at the World Bank (WB 2006b). Some of these funds have decided to focus on projects in particular project types or geographical areas. For example, the largest fund (Umbrella Carbon Facility) focuses on large projects only, and its project portfolio is made up of two HFC23-reduction projects (CFU not dated). The Spanish Carbon Fund (US$ 275m) CDM component focuses on projects in Latin America, North Africa, East and South Asia (CFU not dated2) and to date has signed emission reduction purchase agreements with projects in China, Mexico, Uruguay and Egypt (CFU not dated3). The Italian Carbon Fund (US$155m) focuses on projects in China, Central and Latin America, the Mediterranean, as well as the Balkans and Middle Eastern countries (ICF not dated). These criteria can influence the geographical distribution of CDM projects. Indeed, the only CDM projects in Tunisia that have reached the validation stage are the two projects whose credits are being bought by the ICF.

Some funds also stipulate minimum project sizes. Minimum project size requirements can also influence the geographical location of projects. Such requirements can also affect the type (sector) of projects, favouring larger projects or those that reduce emissions of gases with a higher global warming potential. For example, the KfW Carbon Fund stipulates that a project should generate more than 50 thousand credits a year (KfW 2005). This precludes many of the currently-proposed CDM energy efficiency projects, as well as wind electricity projects below approximately 20 MW and hydro projects with capacities lower than approximately 10 MW[36].

Investors in the underlying CDM project may also have criteria or preferences used to guide decisions on CDM investments. These too can affect both the locations and sectors of CDM investments. For example, Ecosecurities (a project developer involved in more than 300 CDM/JI projects) will only invest in CDM project activities if expected credits in the first year of project operation exceed the transaction costs for the first year (Medina 2006). More than half of Ecosecurities' total portfolio is in China and Brazil (Ecosecurities 2007). Econergy, which is involved in 41 CDM projects, focuses predominantly on renewable energy projects in Latin America (36 of 41) (Freire, 2006).

Detailed design rules of different national or international emissions trading systems can also affect demand for different types of CDM credits, and hence affect the geographical distribution of CDM projects. For example, although most emissions trading systems (ETS) currently operating or under development will accept CDM credits (Ellis and Tirpak 2006), the EU ETS – by far the largest - will not accept credits from forestry CDM projects.

6.2 Barriers caused by the international CDM framework

The framework negotiated for the CDM to 2012 can impede the development of certain types of CDM projects. These barriers are sometimes explicit, e.g. limiting the amount and eligibility of LULUCF activities in the CDM. Barriers can also be implicit, e.g. caused by delays in agreeing such a framework – such as for proposed re/afforestation projects, which have a relatively long gestation period. Delays and/or uncertainties

[36] Site-specific variations in expected credits from a renewable electricity project can be significant, and will depend on the GHG-intensity of the grid, as well as for how many hours the renewable electricity system is expected to operate per year.

relating to the process of CDM methodology and project approval can also be important barriers for certain projects or project types.

6.2.1 Barriers to LULUCF CDM projects

To 2012, re/afforestation (A/R) projects are the only eligible land-use change CDM projects. Reaching this decision and developing the appropriate framework took several years. Thus, although the Kyoto Protocol was agreed in 1997, the framework for LULUCF CDM projects was only fleshed out in COP9 (2003) and COP10 (2004). Further, the Marrakech Accords also placed a limit on the number of credits from A/R CDM projects that could be used for compliance by Annex I Parties.

There are several international-level and national-level factors that impede LULUCF project development in the CDM. International-level factors include:

- the temporary nature of credits for re./afforestation CDM projects;
- a cap on the potential use of LULUCF credits (to 1 % of a Party's base year emissions for each of the years of the commitment period);
- limited eligibility for potential LULUCF project types and the need for a single definition of forest for a country.

Temporary credits for re/afforestation CDM activities were established to take into account concerns about "permanence", i.e. that carbon sequestered in forests could be re-emitted. Credits from re/afforestation CDM activities – in contrast to credits from emission-reduction CDM activities – have a limited lifetime (i.e. their validity expires after a number of years). Obviously, a temporary credit is less attractive than a credit which is permanent. Prices for forestry-related CERs will therefore be lower than those for emission-reduction CDM projects.

The currently-expected importance of CDM A/R projects is less than half the internationally-agreed threshold. By April 2007, A/R projects are expected to account for 0.3% (836 thousand CERs/year) of expected credits from CDM projects currently in the pipeline. This corresponds to 0.7% of aggregate Annex I Party base year emissions. Given that the CDM pipeline is growing rapidly, but that trees generally grow slowly, the proportion of forestry projects in the CDM is likely to remain very small – and well below the agreed pre-2012 cap.

Although reforestation is eligible as a proposed CDM activity, other activities that result in a human-induced increase in carbon stocks on land are not. Avoiding deforestation is also not eligible as a CDM project activity. These include soil carbon management as well as revegetation. Indeed, which replanting activities are eligible for CDM will vary by country, depending on the definition chosen for minimum forest size, tree cover, and tree height. Thus, reforesting small areas of land (<0.05-1 hectare) are not eligible for the CDM. Increasing the tree crown cover on land may also not be eligible for the CDM, depending on the definition of forest chosen[37]. The impact of these provisions on a country's CDM potential will vary by country, and can be significant (see Box for information on Indonesia).

[37] For example, if a country has chosen a definition of forest with a minimum tree crown cover of 20%, increasing the tree crown cover from 0 to 15% will not be considered as reforestation (irrespective of how long the land in question had no tree crown cover). Similarly, if a country has chosen a minimum tree height of 3 m, even dense planting of small trees (or other vegetation) will not be considered as reforestation.

LULUCF CDM Development in Indonesia

By the year 2000, Indonesia had 105 million hectares (m ha) of forest compared to 115 m ha in 1990 (FAO 2005). Emissions from LULUCF activities accounted for 2.5 billion tons of CO2 in 2000 (CAIT accessed 22.01.07). The potential for LULUCF CDM in Indonesia is therefore significant.

Indonesia is active in the CDM field. However, it accounts for a much smaller share of the CDM market than of Non-Annex I GHG emissions. Currently, it is hosting 20 proposed/registered CDM projects (mainly renewable energy projects, but also in the cement and landfill gas sectors). Indonesia's DNA was established in July 2005.

Several activities related to forestry and the CDM have been undertaken in Indonesia to try and "prepare the ground" for A/R projects. These activities include establishing detailed, district-specific datasets on the area of eligible land and their fire risks (Murdiyarso et al 2006), and laying out a clear procedure to follow when proposing an A/R project activity (Masripatin 2005).

However, no A/R projects have yet been submitted for validation in Indonesia. One of the international-level barriers cited (Masripatin 2005) is that of requiring a single definition for forestry throughout the country. In Indonesia, there are seven different types of forest: these all have different forms of vegetation, including minimum crown cover and tree height. Choosing a single value for these parameters reduces the eligible land are for potential A/R CDM activities.

Nevertheless, national-level issues may pose a greater barrier to potential A/R CDM activities. For example, despite several national and international-level initiatives, illegal logging continues to be a problem in Indonesia. This is exacerbated by "weak controls and an ineffective legal system" (CIFOR 2006). Policy, financial and governance barriers are also important (NEDO 2006).

6.3 International process-related issues

Both international-level institutions and guidance is continuing to evolve. Although the CDM was established in 1997, the framework needed to implement different CDM project types only started to be agreed in 2001 (for large-scale emission-reduction CDM projects). This framework, and detailed substantive guidance on particular issues, continues to develop for large-scale and small-scale CDM, and for emission-reduction as well as re/afforestation projects, via decisions from the COP, COP/MOP, and CDM Executive Board (EB).

The international governance structure agreed for the CDM was intentionally set up to involve several steps, actors and checks. These checks are on proposed CDM projects as well as on the methodologies used to calculate emission reductions. The broad framework of this structure was established in the Marrakech Accords, and includes overall supervision by the CDM EB as well as project-based validation and verification by an accredited designated operational entity (DOE) and "bottom up" methodological guidance. Within this framework, both institutions (e.g. EB expert panels, registration and issuance team) and guidelines (e.g. on specific methodologies, or on cross-cutting issues such as additionality assessments) are also still evolving.

There are both advantages and disadvantages to a system where both institutions and guidance is dynamic. However, the working of the international part of the CDM approval process has been heavily criticised for being too slow, too expensive and too unpredictable (e.g. IETA 2006). This section will outline international process issues (not limited to the EB) that can affect the geographical spread of CDM project activities. These include agreements on the eligibility (or otherwise) of proposed CDM project types, as well as DOE capacity and methodology availability. The effect of uncertainties on the post-2012 framework and carbon prices is also outlined.

6.3.1 Agreeing on the eligibility of proposed CDM project types

Although the CDM is already operational for several project types, there are sometimes delays in obtaining international agreement as to which project types are eligible under the CDM and/or how such project types could be assessed. For example, no decision on the eligibility of carbon capture and storage (CCS) in geological formations as a CDM project activity will be taken before COP/MOP4 (to take place in 2008) (UNFCCC 2006b) and no agreement has yet been reached on the CDM eligibility of HFC23 reduction from new HCFC22 facilities. Further, clarification on how to implement the COP/MOP1 decision on the eligibility of CDM programmes was only agreed after COP/MOP2.

International decisions on the CDM eligibility of different project types could have a significant impact on the geographical distribution of CDM projects/credits. This is particularly true for pending decisions on the eligibility of project types that could generate large volumes of credits but from a limited number of sites in non-Annex I countries. For example, the IPCC identifies abandoned or depleted oil and gas fields as being "prime candidates" for geological carbon capture and storage (IPCC 2005). Any agreement to allow CCS projects to generate credits under the CDM will therefore increase the potential CDM activity in non-Annex I regions that produce oil and gas[38]. This would greatly increase CDM potential in the Middle East but not in other regions, e.g. Sub-Saharan Africa. Similarly, agreement that HFC23-reduction from new HCFC22 facilities is eligible under the CDM would increase the potential emission reductions from this source – but mainly in China, where most expansion in future production is expected (McCulloch 2005).

6.3.2 DOE capacity and availability

Designated operational entities (DOEs) are accredited companies whose input form a crucial part of the CDM process. Firstly, proposed CDM projects need to be validated by a DOE before they can be registered. Secondly, emission reductions from a registered CDM project need to be verified by another DOE before any CDM credits can be issued. Unlike validation, verification is thus an activity carried out periodically. Any delays or bottlenecks in DOE activities will therefore also delay the process of CDM project registration or credit issuance.

The number of DOEs is small, although growing. There were 17 accredited DOEs by April 2007, up from 13 a year previously[39]. Between them, these DOEs need to periodically verify emission reductions from the more than 640 registered projects, as well as to assess another 1200 projects that have been submitted for validation. This is a relatively new line of work, since the first CDM projects were submitted for validation in December 2003.

It would not be surprising if DOEs faced capacity constraints, given the rapid growth in the CDM portfolio and consequent demand for DOE services. Such constraints may be the reason for delays in submitting proposed CDM projects for registration. For example, the Huaibei Haizi coalmine methane project in China was submitted for validation in July 2006, and received one set of minor comments (about poor editing and inconsistent start dates). This proposed project was approved by the Chinese DNA before August 2006. However, by February 2007 this project had still not been submitted for registration. There can even be delays in registering projects that have received no public comments. For example, the VGL waste heat 4

[38] However, because of the costs required to separate and transport CO_2, CCS CDM project sites are likely to be limited to sites relatively close to a large point source of CO_2 emissions.

[39] See http://cdm.unfccc.int/DOE/list/index.html for an up-to-date list of DOEs.

MW captive power project in India was submitted for validation in November 2006. The DNA approved this unilateral project in December 2005. However, it was 6 months before this project was registered[40].

6.3.3 International-level guidance, including methodologies

A proposed CDM project can only be registered once its baseline methodology has been approved by the CDM EB. By the end of April 2007, 79 baseline/monitoring methodologies have been approved[41] for a wide variety of project types and sizes (including emission reduction and re/afforestation projects).

While there is a broad array of approved methodologies suitable for application to a similarly broad array of potential CDM projects, many more potential project types and methodologies could be developed. However, developing a baseline methodology can require a considerable amount of time and money. Furthermore, success is far from guaranteed, with several proposed methodologies not being approved (sometimes even after 2-3 official iterations with the methodology developer). The developer of a CDM project that uses a new proposed methodology therefore takes on more risk than a project developer who develops a project that can use an already-approved methodology[42].

The non-availability of a suitable baseline methodology (and time, cost and risk of developing an approved one) may therefore be a barrier to CDM project development in some situations. This is likely to be particularly pronounced for projects that are relatively small (i.e. that do not qualify for the simpler "small-scale" methodologies, but that are expected to generate less than e.g. 30,000 credits per year) or that are not replicable for the project/methodology developer[43]. Indeed, the underlying project for most new methodologies currently proposed are expected to generate at least 100,000 (and sometimes more than a million) credits per year.

There are some new methodologies under development, which if approved could lead to a significant change in the sectoral and geographical distribution of the CDM market. For example, methodologies for efficient coal-fired plants are currently under discussion (one for supercritical coal plants[44], and another for ultra-

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[40] However, PDDs may need to be modified during the validation process even if no public comments have been received. For example, the Rosa dos Ventos wind electricity project in Brazil received no public comments. However, the DOE identified several items that needed to be corrected. Revisions to the PDD to take these corrective actions into account took from April to December 2006. Delays in revising the CDM-PDD could have been caused either by the DOE (in identifying corrections needed), or by the project participants (in implementing these corrections).

[41] For an up-to-date list, see http://cdm.unfccc.int/methodologies/PAmethodologies/approved.html (for large-scale emission reduction projects), http://cdm.unfccc.int/methodologies/SSCmethodologies/approved.html (for small-scale emission reduction projects), http://cdm.unfccc.int/methodologies/ARmethodologies/approved_ar.html (for large-scale re/afforestation projects), http://cdm.unfccc.int/methodologies/SSCmethodologies/SSCAR/approved.html (for small-scale re/afforestation projects).

[42] However, EB rejection of a proposed methodology does not always constitute an insurmountable barrier for planned CDM projects. For example, the methodology proposed for the El Canadá hydro project in Guatemala was one of the first to be submitted to (and rejected by) the CDM EB. Nevertheless, this project is now registered. The underlying projects for other proposed, but rejected, methodologies are now also registered. These include renewable electricity projects, such as La Vuelta And La Herradura (hydro) and Darajat III (geothermal) projects. It is also true for projects in other sectors, such as the Transmilenio bus rapid transport project in Colombia (where the proposed methodology was substantially revised and resubmitted), or the energy efficiency Ramla cement project in Israel (which was registered using an already-approved methodology instead of the new methodology initially proposed).

[43] If a project developer could apply a proposed new baseline methodology to several different projects, they might be more willing to give a stronger weight to the potential benefits of developing a proposed new baseline methodology.

[44] NM0217. The underlying project is a new supercritical coal plant in India.

supercritical plants[45]). The first Chinese ultra-supercritical coal plant was commissioned in late 2006 – and the proposed new CDM methodology was developed using this plant as an example. Ultra-supercritical technology is expected to become routine for new coal capacity by 2010 (Wang 2007), and coal capacity is expected to increase sharply over the next few years (IEA 2006d). Unless the proposed CDM methodology is modified to include a time/capacity threshold beyond which ultra-supercritical plants will no longer be considered additional, this project type could become an extremely large component of the CDM market by 2012.

Additionality has consistently been a contentious issue in the CDM. Ensuring that only projects that are "additional" generate CDM credits is key to the environmental integrity of the CDM. It is also extremely difficult to establish objectively for many project types – particularly for projects that provide non-CDM benefits such as reduced fuel costs or greater productivity. This is because establishing a project's additionality involves assessing what would have happened if the proposed project was not developed under the CDM (i.e. a counterfactual baseline). Developing an appropriate methodology to determine additionality was a common difficulty in many proposed methodologies to calculate emission reductions from CDM projects. This difficulty has been eased through the development of EB-approved "additionality tools". Nevertheless, additionality is still a sticking point for some proposed CDM projects, and was the reason for EB-rejection of 9 projects[46].

Other international-level guidance can facilitate, or impede, development of particular CDM project types. For example, there have been long delays in agreeing guidance needed to implement the COP/MOP1 decision (December 2005) that rendered a "programme of activities"[47] eligible for the CDM. The wording of this provision was unclear and initial EB guidance on how to implement it was provided in December 2006 (UNFCCC 2006c). However, by April 2007, no agreement had been reached on subsequent guidance, or on the forms that would need to be completed before submitting a CDM programme of activities for validation (UNFCCC 2007). Developing methodology-related tools, such as the combined tool to determine a project's baseline scenario and assess additionality can also take considerable time.

Delays in providing specific guidance or tools can also delay methodology development and approvals, and therefore project developments. This can have an indirect effect on the geographical distribution of CDM projects if the greatest potential for some countries' participation can only start to be developed once such guidance has been agreed. For example, the two largest CDM projects currently under development in Ghana are awaiting methodology approval.

6.4 Uncertainty about the post-2012 framework and carbon prices

There is considerable uncertainty surrounding the potential demand for CDM credits post-2012 as the climate regime – and consequent demand/supply for GHG credits - for this period has not yet been established. Thus, although CDM projects currently under development can generate credits for many years post-2012[48], the "bankability" of credits produced pre-2012 is much higher than those generated post-2012.

There is also considerable uncertainty – both pre and post-2012 - about the economic value of a CDM credit. CER prices can vary considerably from one project to another, depending on several factors including the project's size (i.e. expected credit volumes), location, and risk. Further, since the CER price is often indexed

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[45] NM0215. The underlying project is an ultra-supercritical coal plant in China, whose first two units were commissioned in November 2006 (People's Daily Online 2006). These units, with a total capacity of 2GW, expect to generate almost 1 million credits per year.

[46] To end April 2007, a total of 14 proposed CDM projects have been rejected by the CDM EB.

[47] This is sometimes referred to as "programmatic CDM".

[48] Crediting periods can extend up to 21 years for emission-reduction projects and 60 years for re/afforestation projects.

to the price of an allowance under the EU ETS, price fluctuations in this market can have significant repercussions on CER prices.

These uncertainties also influence what type of CDM projects are undertaken – which in turn can affect the geographical distribution of CDM projects. This is because post-2012 demand uncertainty will render less attractive those CDM projects with a long lead time (e.g. hydro electricity systems), or with low level of credit generation in early years (e.g. forestry projects). CER price uncertainty also increases risks/reduces the CDM incentive" for capital-intensive projects. However, this may not be a large barrier to project development if CDM revenues are only a small proportion of the project's income.

7. Conclusions

There are different ways of measuring a country's CDM "success". In part, this is because the distribution of the CDM portfolio varies significantly depending on how it is defined. For example, China dominates the portfolio in terms of expected CER generation, accounting for more than half of all expected CDM credits to 2012. India accounts for the largest number of proposed projects: a third of the total. Equatorial Guinea, Guatemala and Chile all expect to account for a much larger share of the CDM market than of non-Annex I greenhouse gas emissions. Which countries are identified as "successful" in CDM terms could be different still if CDM success was measured in terms of attracting project investment, in terms of attracting ***inward*** investment, or in terms of CER transactions. Since the CDM aims to reduce greenhouse gas emissions, contribute to sustainable development and lead to technology transfer, more than one way of measuring successful CDM activity may be appropriate.

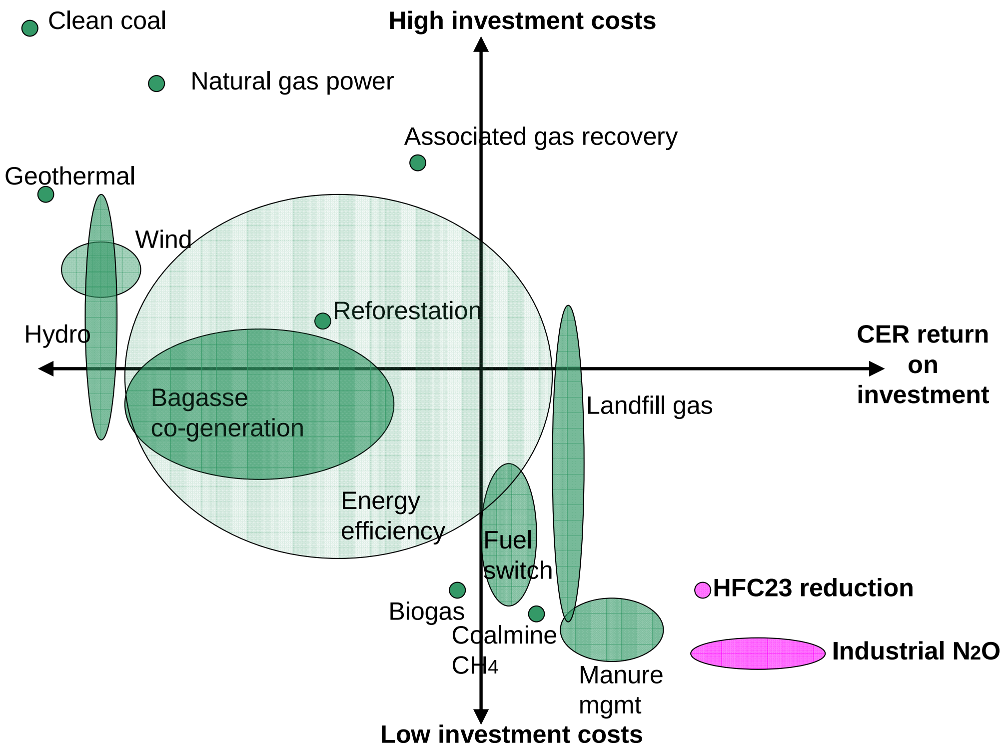
Irrespective of how CDM "success" is measured, an even distribution of the CDM portfolio between countries would not be expected. This is because:

- The cost and volume of potential greenhouse gas mitigation measures varies widely from country to country;
- Internationally-agreed CDM eligibility requirements limit which of these mitigation measures can be developed as CDM projects;
- The policy, legislative and institutional framework within which a CDM project operates also varies widely between countries and sectors, so making some countries more attractive than others as CDM hosts;
- CDM-specific enabling environments also differ between countries;
- Ability to raise project finance and overcome CDM-related transaction costs also varies by country (as well as sector).

In terms of credit generation from CDM projects, China has by far the largest share of the CDM market, with 53% of expected credits. Indeed, the five largest CDM countries: China, India, Brazil, Korea and Mexico have dominated the CDM market since 2005 and currently account for 84 % of expected credit generation to 2012. The location of HCFC-22 production facilities (and hence HFC23 reduction projects) is one of the reasons for this, as options for these low-cost, low risk, high-volume and low lead-time projects are concentrated in China – although also occur in India, Korea, Mexico (and Argentina). However, China still dominates CDM supply (although less so) even if HFC23 and end-of-pipe industrial N_2O reduction projects are excluded from the analysis. This is partly due to the rapid rise in renewable energy CDM projects in China: Chinese renewable energy projects appear to be systematically applying for CDM status, and more than 250 such projects have been brought forward since May 2006.

There is a huge disparity in the investment requirements needed for different types of CDM projects. This can also affect the geographical distribution of the CDM portfolio as it may be more difficult to raise large volumes of project finance in some countries than others. These different capital requirements are partly because the investment requirements for some CDM projects correspond to the entire project cost, whereas costs for other CDM projects reflect the cost of a CDM "add-on". Figure 5 below illustrates the variation in investment costs and expected CER returns on investment to 2012 for selected CDM projects currently under development. The current CDM portfolio is – perhaps unsurprisingly- dominated by projects with low investment requirements, low mitigation costs and large credit volumes. The potential for some of these project types is concentrated in a handful of countries.

Figure 5 Investment costs and expected CER returns on investment for selected CDM projects



N.B.: Graph not to scale. Ellipses represent ranges of costs/returns on investment for which the authors have information.

Sources: as for Table 2 and own calculations

National and international actions can both help countries' to tap a larger proportion of their CDM potential. This work can be done by national governments and the international UNFCCC negotiating process, as well as by organisations such as development agencies, financial institutions and carbon funds. For example, for countries where many CDM projects are likely to be relatively small-scale (such as Sub-Saharan Africa), national governments and development agencies should strengthen the institutional capabilities of entities that could play the role of an Enacting Agent to bundle small-scale projects in order to reach the minimum annual CER levels required by large institutional buyers.

National actions

There are a wide range of actions that governments could take to help increase interest in CDM project development. These encompass actions that facilitate investment (and inward investment) in general, as well as on improving the CDM-specific framework and institutions, and could include:

- Ensuring that laws are stable and enforced as investors in CDM projects will need reasonable certainty that key legislative provisions in place that allow/enable CDM activities will remain stable, unambiguous and enforced.

- Providing an appropriate tax/incentive framework for investments, i.e. one that is simple, transparent (and enforced).

- Developing (or maintaining) an efficient institutional framework, as perceived efficiency is an important factor influencing inward investment.

- Mainstreaming investment guarantee products. Insurance, reinsurance and investment guarantee agencies should work more closely with CDM project developers and large institutional ER buyers towards mainstreaming the various CDM investment guarantee products introduced during 2006. CDM regional distribution should benefit considerably from the widespread of these products.

- Reducing participation/ownership restrictions on foreigners, as these constitute barriers to “bilateral” CDM project development.

- Establishing a simple, timely and transparent CDM project approval process within the DNA. This would require the formulation of a well-structured DNA project approval committee representing relevant entities.

- Developing a clear policy on CDM-relevant issues, such as the impact of national legislation on the eligibility of proposed CDM projects and the ownership of CERs.

- Building CDM capacity in relevant CDM stakeholders, financial and lending institutions through structured, hands-on technical training on CDM project identification and development.

Sector-specific reforms can also impact potential CDM project development. For example, in the electricity sector, providing subsidised fossil fuel or electricity will make renewable energy projects less attractive. Conversely, enabling independent power producers to feed electricity to the grid or providing a guaranteed market or prices for renewable energy will help encourage renewable energy projects. This could be facilitated if carbon finance or CDM were mainstreamed within existing power sector reform and other types of technical assistance programmes targeting the energy sector being implemented by development agencies. Additionally, development banks active in infrastructure and urban planning projects in host countries should take into consideration CDM and possibility for linking their activities with CDM project developers.

Actions to remove country-specific barriers will help to increase a country’s attractiveness as a location for a CDM host country. Yet, removal of one or more barriers may not be sufficient to encourage and/or increase investment in CDM projects if other, more significant, barriers remain. To take an extreme example, increasing CDM awareness within a war-torn country may not be enough to encourage CDM-related investment in that country. However, if changing legislation to allow independent power producers to sell electricity to the grid was the “weakest link” in a country’s CDM attractiveness, making such a change could be a significant help.

Governments may wish to maintain some policies even if they act as barriers to CDM project development. This is because these policies may have an important domestic benefit, and/or may be developed for strategic purposes such as energy or food security. However, they should be aware of the impact of these policies on CDM, and assess the trade-offs with other policy objectives.

International actions

Measures undertaken or agreed by the international community can also influence the expansion and geographical spread of the CDM. These include measures undertaken in the international UNFCCC negotiating process, as well as CER-buyers:

- Modify buyer/investor criteria on project location, type or size. The importance of "centralised" purchase of CERs, e.g. via carbon funds (approx $1.9bn at the WB alone), increases the influence of a fund's criteria in shaping the geographical distribution of the CDM market as a whole. Large buyers with development agendas (such as some carbon funds) have the ability to absorb risk and should increase their CDM activity in sectors where projects are highly replicable, e.g. renewable energy and energy efficiency.

- Clarify the post-2012 climate regime, as this establishes the demand for CDM projects as well as influencing the potential supply (e.g. from the forestry sector) and value of associated credits. An unknown post-2012 regime will skew CDM activity towards low lead-time/large volume projects, which are sometimes concentrated in certain sectors and countries.

- Clarify pre-2012 project eligibility criteria. Pending decisions, e.g. on the CDM eligibility of HFC23 reduction from new HCFC-22 production facilities could rapidly increase China's already-dominant share of the CDM market. Rendering geological carbon capture and storage options eligible under the CDM could also impact the geographical spread of CDM activity.

- Continue pre-2012 efficiency improvements in CDM governance, as delays and uncertainty impede project development.

Some of these national and international changes in policy frameworks and enabling conditions could have a relatively rapid impact on CDM potentials and interest in different countries. For example, pending international-level decisions on the CDM eligibility of particular project types could significantly alter the geographical and sectoral distribution of CDM project activities. Thus, allowing carbon capture and storage could potentially increase Africa's share of the CDM; while rendering new HCFC-22 plants CDM-eligible is likely to further increase China's share of the CDM market. If pending methodologies for coal-fired electricity CDM projects are approved by the EB, this is also likely to boost the share of coal-intensive countries such as China and India in the CDM market.

Other potential actions highlighted above could have a longer-term effect on CDM potential and activity in particular countries or sectors. The cost of these actions can also vary widely. For example, enforcing laws is often more difficult and takes more time than creating new or changing existing laws. It can also take considerable time and resources to establish an efficient host country DNA structure and adequately trained and staffed DNA personnel.

Actions by national governments, the international community, multi-lateral and financial organisations can all help countries tap their CDM potential more efficiently by strengthening weak links in the CDM development chain. However, undertaking these actions will not necessarily lead to an even geographical distribution of CDM projects or credits, as the potential for cost-effective emission reductions varies widely by country. Further, removing CDM-specific barriers to project investment will not always be enough to encourage increased CDM activity: many CDM projects are capital-intensive, so an enabling general investment framework is also crucial.

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Glossary

A/R	Re/afforestation projects
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
COP	Conference of the Parties
DNA	Designated National Authority (for the CDM)
DOE	Designated Operational Entity
EB	The CDM's Executive Board.
ER	Emission Reduction
ETS	Emissions Trading Scheme
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GHG	Greenhouse Gas
HFC23	A by-product of HCFC-22 (R-22) manufacture.
IPP	Independent Power Producer
LoA	Letter of Approval
LULUCF	Land use, land-use change and forestry
MIGA	Multilateral Investment Guarantee Agency
MW	Megawatt
N_2O	Nitrous oxide
PDD	Project design document (for a CDM project)
PDI	Private direct investment
PIN	Project Idea Note (developed at an early stage of CDM project development)
PPA	Power purchase agreement
UNFCCC	United Nations Framework Convention on Climate Change
WB	World Bank