

Exploring the relationship between FDI flows and CDM potential

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Abstract

Since it was conceived in 1997, the Clean Development Mechanism (CDM) has become much more concrete, and expectations and reality are beginning to confront one another in the emerging carbon marketplace. This article provides an overview of this innovative policy instrument, which is an element of the United Nations Kyoto Protocol, and questions the simplistic assumption that CDM flows will essentially mimic foreign direct investment (FDI) flows. By shedding light on the nature of the CDM and exploring the relationship between the CDM and FDI, this article clarifies CDM-related determinants of FDI flows, suggests CDM opportunities for transnational corporations (TNCs) and outlines further research needed to determine how developing country entities can attract CDM investment or enhance their ability to export CDM certificates.

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Political overview of the UNFCCC and the Kyoto Protocol

The United Nations Framework Convention on Climate Change (UNFCCC) entered into force on 21 March 1994 and, by February 2005, had been ratified by 188 countries and the European Union. Delegates to the first session of the Conference of the Parties (COP1, Berlin, 1995) agreed that the commitments contained in the Convention for developed countries – to adopt policies and measures aimed at returning their greenhouse gas emissions to 1990 levels by the year 2000 – were inadequate to achieve its ultimate objective.¹ Therefore, they launched negotiations under the “Berlin Mandate” to define additional commitments. These negotiations continued at COP2 (Geneva, 1996) and culminated at COP3 (Kyoto, 1997) with the adoption of the Kyoto Protocol.

The Kyoto Protocol contains legally binding emissions targets for Annex I (industrialized) countries: developed countries are to reduce their collective emissions of six key greenhouse gases by at least 5% on average over the period 2008 – 2012, compared with 1990 levels.² This group target will be achieved through cuts of 8% by the European Union (EU) (the EU will meet its group target by distributing different rates among its members), most Central and Eastern European countries, and Switzerland; 7%

¹ The ultimate objective of the UNFCCC is the “stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner”. The full text of the Convention is available at <http://unfccc.int/essential/background/convention/background/items/2853.php>.

² Cuts in the three most important gases – carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O) – will be measured against a base year of 1990 (with exceptions for some countries with economies in transition). Cuts in three groups of long-lived industrial gases – hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF₆) – can be measured against either a 1990 or 1995 baseline.

by the United States; and 6% by Canada, Hungary, Japan and Poland. Russia, New Zealand and Ukraine are to stabilize their emissions, while Norway may increase emissions by up to 1%, Australia by up to 8% and Iceland 10%. The six gases are to be combined in a "basket", with reductions in individual gases translated into "CO₂ equivalents" that are then added up to produce a single figure.

The Marrakech Accords, adopted by the 7th session of the COP in 2001, paved the way for the ratification of the Protocol, which was opened for signature on 16 March 1998. The Protocol entered into force on 16 February 2005. Through mid-February 2005, 141 governments and regional economic integration organizations had deposited instruments of ratification, with the United States – the largest single emitter of greenhouse gases, accounting for 36.1% of the 1990 carbon dioxide emissions of all Annex I countries combined – being prominent by its absence. The EU launched its own internal emissions trading system on 1 January 2005.

Background on the CDM

One of the novel features of the Kyoto regime is the inclusion of three so-called "Kyoto mechanisms", which give countries some flexibility in where, when and how they achieve the necessary greenhouse gas emission reductions. International emissions trading allows developed countries to buy and sell emission allowances among themselves. The project-based mechanisms – joint implementation and the CDM (figure 1) – make it possible for developed countries to acquire fungible credits for greenhouse gas emission reductions that result from the implementation of climate protection projects

in other Annex I or in non-Annex I countries, respectively, to which they contribute financially.

Figure 1. Schematic diagramme of the CDM



Source: Arquit Niederberger and Albrecht, 1999.

The focus of this article is on the CDM, which has a twofold purpose, namely to assist:

- developing country parties in achieving sustainable development and contributing to the ultimate objective of the Convention; and
- developed country (Annex I) parties in achieving compliance with their emission limitation and reduction commitments under the Protocol.

Under the CDM, projects that result in real, measurable and long-term climate mitigation benefits (either reduced emissions of greenhouse gases or enhanced uptake/removal of carbon dioxide from the atmosphere), and which are additional to any emission reductions that would otherwise occur, can be validated as CDM projects. The range of

sector and source categories that could be addressed via CDM project activities are indicated in table 1.

Table 1. Sectors/source categories for CDM

Greenhouse gases emission reductions			
Energy	Industrial processes	Agriculture	Waste
CO ₂ – CH ₄ – N ₂ O	CO ₂ – N ₂ O – HFC ₅ – PFC ₅ – SF ₆	CH ₄ – N ₂ O	CH ₄
Fuel combustion <ul style="list-style-type: none"> • Energy industries • Manufacturing industries • Construction • Transport • Other sectors Fugitive emissions from fuels <ul style="list-style-type: none"> • Solid fuels • Oil and natural gas 	<ul style="list-style-type: none"> • Mineral products • Chemical industry • Metal production • Production and consumption of halocarbons and sulphur hexafluoride • Solvent use • Others 	<ul style="list-style-type: none"> • Enteric fermentation • Manure management • Rice cultivation • Agricultural soils • Prescribed burning of savannas (cerrado) • Filed burning of agricultural residues • Others 	<ul style="list-style-type: none"> • Solid waste disposal • Wastewater handling • Waste incineration • Others
CO ₂ removals			
Reforestation/afforestation			

Source: Lopez, 2002.

The actual emission reductions achieved by CDM projects are independently verified *ex post* and result in the issuance of certified emission reduction (CER) credits. These credits can be acquired by private and/or public entities and can be used to meet the Protocol obligations of developed countries. Each CER represents a reduction or sink enhancement equal to 1 ton of CO₂-equivalent emissions.

The details of the CDM are contained in the Marrakech Accords, which were adopted by COP7 in November 2001. However, some of these rules are still being refined or developed under the authority of the CDM Executive Board.³ Nonetheless, a prompt start to the CDM was agreed, and the validation process is progressing with the approval by the Executive Board of acceptable baseline and monitoring methodologies. Furthermore, nearly 30 institutions have applied to receive accreditation as Designated Operational Entities to provide the required third-party project validation and emission reduction/sink enhancement certification services.⁴ However, until the Protocol enters into force, only provisional arrangements are in effect, which represents a nagging source of uncertainty for project developers and potential investors/buyers.

Recognizing that estimates for emerging markets are inherently uncertain, the potential market for the Kyoto mechanisms during the first commitment period (2008-2012) has been estimated to be in the range of hundreds of millions to tens of billions of dollars annually, with lower estimates resulting from the United States' rejection of the Kyoto Protocol (Springer, 2002; Springer and Varilek, 2004). The importance of the CDM in the overall carbon market will depend on a number of supply- and demand-side factors, for example, the strategy of the Russian Federation with respect to the management of its surplus emission allowances; the ability of non-Annex I countries to identify, develop and implement CDM projects; the efficacy of the CDM Executive

³ The most up-to-date information can be accessed via the official CDM web site (<http://cdm.unfccc.int>).

⁴ To date, four entities have been accredited and provisionally designated as operational entities by the CDM Executive Board. As of February 2005, the Board had approved 19 baseline and monitoring methodologies and two consolidated methodologies and had formally registered two projects.

Board (regarding approval of methodologies, project registration); the progress of Annex I countries in implementing domestic climate mitigation policies; and political decisions on the future evolution of the UNFCCC/Kyoto regime beyond 2012 (Jotzo and Michaelowa, 2002; World Bank, 2004).

Generic CDM transaction types

The financial contribution of developed country entities (e.g. governments, private companies, market intermediaries) to CDM projects (or the international sourcing of CERs by them) can take a number of forms. The basic CDM transaction models from the perspective of Annex I (developed country) entities are:

- Investments in CDM projects: equity investments (i.e. direct via joint venture companies/wholly owned subsidiaries, or indirect (portfolio) investments via the purchase of securities) that provide co-financing to projects that generate CER credits (investors receive the profit/return on investment⁵ and CERs (see box 1 for examples)).
- Purchases of yet-to-be-generated CERs: forward contracts (e.g. in the form of a carbon purchase agreement) or call options to purchase a specified amount of CERs generated by a CDM project upon delivery, perhaps with some up-front payment.

⁵ Return on investment is a measure of a corporation's profitability, equal to a fiscal year's income divided by stock equity plus long-term debt. Return-on-investment measures how effectively a firm uses its capital to generate profit.

- CER trades on secondary markets: spot or options transactions in existing CERs, generated either under the above models or unilaterally by project host country sources.

At present, the most common form of transaction is forward contracts to purchase CERs, which limits the risk to the buyer; Frank Lecocq (2004, p. 25) estimated the share of what he termed "commodity transactions" in 2003-2004 at 95%. Recognizing that data on transaction types are notoriously hard to come by (because many deals are transacted confidentially), we have only been able to confirm two projects with approved baseline methodologies that involve FDI (box 1).

Box 1. FDI in CDM projects

The following CDM projects were among the first five for which baseline methodologies have been approved by the CDM Executive Board (note that this does not guarantee the approval of these projects by the Board as CDM projects). They both involve equity FDI, which, in some cases, is directly linked to CER transfers:

- *AT Biopower Rice Husk Power Project, Thailand.* Instead of the current practice (i.e. open-air burning or decay), this project will use rice husk to generate electricity, based on technology not yet used in Thailand. Rolls Royce Power Ventures (RRPV) holds a minority stake in AT Biopower. RRPV's investment is seen as a small contribution to the promotion of "green" projects and, although any sale of carbon credits would increase the expected return, RRPV believes that the project is robust enough to give a reasonable return without CDM cash flow. According to the baseline methodology and the project design document, CDM additionally is related to both financial (e.g. relatively low return on investment) and non-financial (e.g. perceived risk) investment barriers as well as the risk of introducing a new technology. The CERs are being contracted to Chubu Electric Power Company in Japan, which has its own voluntary target to reduce the carbon intensity of its electricity production (kg CO₂/kWh) by 20% between 1990-2010, and regards FDI linked to CDM as one means of achieving this target (Ito, 2004).
- *Ulsan Chemical HFC 23 Decomposition Project, Republic of Korea:* INEOS Fluor Japan Ltd. has pioneered the application of technology for the decomposition of hydro fluorocarbons (HFCs) and other fluorocarbons produced by

the fluorocarbon manufacturing process in its plants in Japan, the United Kingdom and the United States. Under this project, INEOS Fluor Japan Ltd. will install HFC 23 collection and decomposition process equipment in the currently operating HCFC 22 Ulsan Chemical Company manufacturing plant by transferring the new technology to the Republic of Korea and, in return, will receive a portion of the CER credits generated (potentially 1.4 million tons annually, depending on the performance of the plant, which is estimated to have a market value of more than \$10 million). The income from the sale of CERs is the only source of return on INEOS Fluor Japan Ltd.'s investment (Komai, 2004).

Source: the authors.

The share of CDM deals that each of the three CDM transaction models (i.e. investment in CDM projects, forward purchase of CERs, CER trades on secondary markets) would represent in a mature market has not been analyzed in depth. Some observers have suggested that the volume of pure carbon purchase deals will be limited by underlying project financing challenges and that investment-type CDM deals involving private buyers might increase, now that the Kyoto Protocol has entered into force and companies have more clarity on their home country regulatory frameworks, a key driver of demand. But others have pointed to the potential for unilateral CDM, which would lead to even more pure carbon purchase deals (Jahn *et al.*, 2004).

Another important point to keep in mind when exploring the relationship between FDI and CDM flows is that – contrary to initial expectations – governments and hybrid entities (e.g. public-private partnerships, such as the funds offered by the World Bank's Carbon Finance practice) are significant players in the market. In 2003-2004, although Japanese private investors increased their market share to 41% (a doubling over 2002-

2003), the World Bank Carbon Finance business (24%) and the Government of the Netherlands (23%) together still accounted for the largest share of the project-based emission reduction market in volume terms (Lecocq, 2004, p. 19). One analysis of the future importance of government vs. private sector buyers estimated that buyer governments will account for between about half and three-quarters of direct, international greenhouse gas compliance instrument purchases in 2010 (Natsource, 2003), but the trend over the past several years has been going in the opposite direction. In 2003, the private sector acting alone accounted for 45% of the total volume of emission reductions contracted in the developing world, double the share in 2002 (Lecocq and Capoor, 2003).

On the other hand, an increasing number of OECD country governments are developing and implementing public procurement programmes to purchase Kyoto certificates. Due to the rather generous allocations of emission allowances to the private sector under many of the National Allocation Plans under the EU Emission Trading Scheme (Gilbert, Bode and Phylipsen, 2004), EU governments will have to take up the slack to ensure compliance. How they choose to do this (i.e. policies that result in domestic reductions in non-regulated sectors vs. Kyoto mechanism transactions) will affect the balance of public vs. private sector demand for CERs, as well as the prevalence of FDI transactions. Some EU countries, such as the Netherlands, are actively engaging in CER procurement programmes that generally do not involve FDI.

With these two important observations in mind, the rest of this article considers the relationship between FDI and potential CDM flows. From the perspective of Annex I

country entities, cross-border sourcing of greenhouse gas emission reductions can take two basic forms:

- arms-length trade (CER imports); and
- direct production of CERs through FDI (or other forms of equity investment) in CDM projects.

Under the prevailing CER forward purchase (trade) model, transactions will likely be governed by traditional factors of comparative advantages in production and trade, such as initial endowments (in particular, capital and labour), but low-cost greenhouse gas emission reduction and sink potentials will have to be added to the list of relevant initial endowments. The relationship between international trade flows and potential CDM flows is not the subject of this research note, but would warrant further consideration given the prevalence of CDM transactions in the form of CER trade. This article focuses instead on the direct production of CERs resulting from FDI by Annex I entities.

Analysis of FDI and CDM drivers and interactions

Overview of relevant FDI drivers and flows

For CDM transactions that do involve private equity investment, FDI flows might serve as a useful, albeit incomplete, indicator of potential CDM flows (Fankhauser and Lavric, 2003). UNCTAD defines FDI⁶ as "an investment involving a long-term

⁶ FDI has three components: equity capital, reinvested earnings and intra-company loans or debt transactions (UNCTAD, 2003a, pp. 31-32). The extent to which each of these components might be linked

relationship and reflecting a lasting interest and control by a resident entity in one economy in an enterprise resident in an economy other than that of the foreign direct investor" (UNCTAD, 2003a, p. 31). More simply put, FDI involves direct investment in productive assets by a company established in a foreign country, as opposed to minority investment of less than 10% by foreign entities in local companies. Although a minimally enabling regulatory framework for FDI is a prerequisite for inward FDI, and business facilitation efforts can help to attract foreign direct investors, economic factors are the main determinant of FDI inflows and reflect the primary motivations of TNCs (see first two columns of table 2).

to CDM transactions may have been considered by individual TNCs with anticipated carbon liabilities, but has not been the subject of academic analysis to date.

Table 2. Traditional and potential CDM-related determinants of FDI inflows

TNC motive	Selected economic determinants	Additional CDM determinants	CDM relevance to TNCs
Market-seeking	<ul style="list-style-type: none"> • Per capita income • Market size • Market growth • Access to regional / global markets 	<p>New/expanded markets for:</p> <ul style="list-style-type: none"> • climate friendly technologies and • CDM-related services <p>in developing countries</p>	<ul style="list-style-type: none"> • TNC technology providers • TNC providers of CDM-related services (e.g. consulting, brokerage, certification)
Resource/asset-seeking	<ul style="list-style-type: none"> • Access to labour • Access to raw materials • Adequate infrastructure 	<ul style="list-style-type: none"> • Access to greenhouse gas reduction / sink enhancement opportunities (CERs) • Institutional prerequisites for host country CDM approval 	<ul style="list-style-type: none"> • TNC emitters of greenhouse gases in regulated markets • Market intermediaries
Efficiency-seeking	<ul style="list-style-type: none"> • Differential comparative advantages • Better deployment of global resources 	<ul style="list-style-type: none"> • Low-cost greenhouse gas reductions via CDM projects • Investment in foreign affiliate technology upgrades compensated with CERs 	<ul style="list-style-type: none"> • TNCs emitters of greenhouse gases in regulated markets • TNCs without home country greenhouse gas liabilities
Strategic asset-seeking	<ul style="list-style-type: none"> • Access to new competitive advantages 	<ul style="list-style-type: none"> • Access to complementary CDM assets possessed by foreign-based firms, e.g.: <ul style="list-style-type: none"> • resources • project pipelines • expertise/capabilities • markets • Improved company valuation 	<ul style="list-style-type: none"> • TNC providers of CDM-related services (e.g. consulting, brokerage, certification) • Market intermediaries • Corporations that own excess emission certificates obtained via CDM

Source: the authors, drawing from UNCTAD, 1998, p. 91, and Dunning and McKaig-Berliner, 2002, pp. 8-9.

We suggest that the CDM might expand the traditional economic determinants of FDI, as TNCs perceive new CDM-related business opportunities (such as the production of CERs by foreign affiliates that also give them a competitive advantage (e.g. energy efficiency improvements)) and economic drivers (such as access to new markets for climate-friendly technologies or services). TNCs whose home countries are included in Annex B of the Kyoto Protocol, particularly those in sectors that are responsible for a significant share of greenhouse gas emissions, may be subject to domestic legislation to curb their emissions.

The EU Emission Trading Scheme, for example, was launched at the beginning of 2005. It is a cap-and-trade system that will regulate the carbon dioxide emissions of over 12,000 facilities across the expanded EU (all 25 members) engaging in energy supply activities (even if the energy is for internal use) and/or the production of iron and steel; cement, glass, lime, brick and ceramics; or pulp and paper.⁷ These companies/facilities will be allocated tradable emissions allowances each year. Companies whose emissions exceed their store of allowances will face hefty penalties (€40 per ton of excess carbon dioxide emitted annually during the period 2005-2007 and €100 per ton during the period 2008-2012) and will still be required to deliver the missing allowances. The first trade of EU allowances for compliance under the first commitment period of the Kyoto Protocol was transacted in early November 2004 at a price of 9 per ton of CO₂ equivalent. Thus the EU-Emission Trading Scheme provides an economic incentive for TNCs to consider

⁷ For details, see Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC. The Linking Directive is COM/2003/403.

lower-cost opportunities abroad, such as those under the CDM. Such transactions are regulated by a "Linking Directive".

The Kyoto mechanisms also provide opportunities to technology providers to expand their market for state-of-the-art energy-efficient and climate-friendly technologies to developing countries, which, without CDM financing, may not be commercially viable in a developing country context. Yet a business model that would involve the direct engagement of such companies in Kyoto-motivated FDI transactions (e.g. up-front capital investment, loans or rebates in exchange for CERs generated using company technologies) has not received much attention to date. Finally, TNCs that provide CDM-related services, such as legal services (advice on CDM contractual arrangements), CDM project validation and certification services, strategic consulting services (e.g. assessing potential CDM options/assets) or capacity building services have engaged in strategic asset-seeking FDI (merger and acquisition activity or strategic alliances) to gain new competitive advantages.

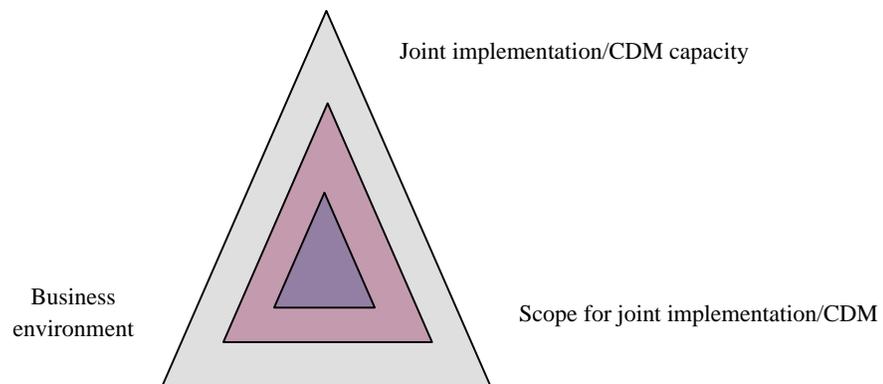
In addition to these direct economic determinants, CDM-related motivations for FDI transactions might also include maintaining a positive public image and foreign affiliates' licenses to operate in host countries by contributing to local sustainable development; gaining a better understanding of company carbon liabilities, in-house mitigation potential/costs and CDM benefits; gaining experience to be in a position to influence policy; and management of corporate social responsibility obligations and related risks.

The following section explores the extent to which these additional CDM drivers might lead TNCs to increase FDI and whether FDI flows can be expected to be a proxy for CDM flows. Despite decreasing global FDI flows since 2000, developing countries actually saw a rebound in inward FDI in 2003 (a 9% increase compared with 2002), a recovery further strengthened in 2004 (UNCTAD, 2004). Nonetheless, for 2002 and 2003, only a handful of CDM-eligible developing economies attracted FDI inflows of more than \$2 billion annually, namely Bermuda, Brazil, Cayman Islands, China, Hong Kong (China), India, Republic of Korea, Malaysia, Mexico and Singapore (UNCTAD, 2004). Five of these are also the developing economies with the largest absolute greenhouse gas emissions: Brazil, China, India, Republic of Korea and Mexico (details are presented in table 3 and discussed below).

Mapping CDM potential against FDI flows

Sam Fankhauser and Lucia Lavric (2003) suggest that data on FDI flows per capita can serve as an indicator of relative investor satisfaction with the investment climate in different countries, and that the "business environment" is one of the three factors in determining the relative attractiveness of the joint implementation mechanism⁸ for host countries that they investigated (the other two being the potential volume of low-cost greenhouse gas emission reductions or sink enhancement – which puts an upper bound on the scope for joint implementation/CDM – and the institutional capacity for Kyoto transactions (figure 2). Although our discussion of the situation in the top three emitting countries – China, India, Brazil – addresses each of these important dimensions, this section focuses on the business environment.

Figure 2. Key host country factors in joint implementation/CDM transaction decisions



Source: the authors

⁸ "Joint implementation" is another of the Kyoto mechanisms, similar to the CDM, but it is based on emission reduction projects in industrialized countries.

The response of investors to a poor business environment varies. Research has confirmed that foreign investors for the most part do not simply avoid countries without rule-based governance systems (Li, 2004) and with a high pervasiveness and arbitrariness of corruption (Doh *et al.*, 2003). Instead, they invest with different strategies: in poor governance environments, they tend to engage in FDI (rather than portfolio investment) or in the form of joint ventures with local partners, which provide them with greater management control and thus better protection. Yet there seems to be a threshold of corruption beyond which FDI becomes relatively unattractive. This applies to countries that exhibit both a high pervasiveness and arbitrariness of corruption. In such settings, entry modes that allow investors to transfer ownership (e.g. build-own-transfer or non-equity forms of FDI such as management contracts) are more attractive and prevalent than equity FDI (Doh *et al.*, 2003). This is consistent with the low ranking of such countries with respect to the UNCTAD Inward FDI Performance Index (UNCTAD, 2004, p. 14)). Given the large scope for low-cost greenhouse gas reductions and the prevalence of non-FDI entry modalities in these countries, FDI flows might not be a reliable indicator of potential Kyoto mechanism investment flows.⁹

Another challenge in considering the relationship between FDI flows and potential CDM flows is that FDI is defined at the level of enterprises, whereas the CDM is currently defined as a project-based activity. More research would be needed to determine under what conditions equity investment in foreign affiliates might be

⁹ In an analysis of 13 economies in transition, an inverse relationship between the scope for joint implementation and the general business environment was found (Fankhauser and Lavric, 2003). Similar issues are being encountered by developing countries. As a result, host countries characterized by relatively low FDI attractiveness are turning to the unilateral CDM model to capitalize on their CDM potential (Jahn *et al.*, 2004).

channeled into eligible CDM projects or why such FDI is, or is not, a good proxy for CDM project investment. In other words, investment in a company does not necessarily equate to an investment in eligible CDM project activities to mitigate climate change. This is particularly true for FDI that flows to the service sector, which tends to have a relatively low greenhouse gas intensity. In fact, an increasing share of FDI flows to the tertiary sector (which represented 55%-60% of FDI flows to developing countries from 1999-2001 (UNCTAD, 2003a, p. 192)), and may not correspond to the industries with the highest potential for CDM investment. Future research might compare the greenhouse gas reduction potentials of developing countries by industry– taking into account project size and transaction costs – with their overall FDI performance and the distribution of inward FDI by sector.

The "big 3" developing countries from a greenhouse gas emissions perspective are China, India and Brazil (table 3), followed by the Republic of Korea and Mexico, all of which are significant FDI recipients. The FDI and CDM characteristics of China, India and Brazil are discussed below. According to a recent analysis of project-based pre-Kyoto compliance transactions (planned CDM and joint implementation projects), 36 host countries entered into such contracts in 2003, with nearly two-thirds of transacted volumes hosted by Latin American countries, approximately 30% by Asian countries (including 10 projects in India) and less than 5% by countries in sub-Saharan Africa (Lecocq and Capoor, 2003). The trend appears to be towards deals with large economies (e.g. India) or middle income countries (e.g. Brazil); the role of China is therefore expected to increase from its current low level.

Table 3. Emissions and FDI data for potential CDM host countries

(Per cent, billion dollars, number)

Economy	Population 2000 (Millions / % of world total)	Net GHG emissions 2000 (Mt CO ₂)	Net emissions per capita ranking 2000	Inward FDI 2003 (Dollar billion)	Inward FDI as a fraction of gross fixed capital formation, 2003 (%)	FDI performance index ranking 2001- 2003 ^a
China	1272 / 20.8	4899*	119	53.5	12.4	37
<i>Hong Kong</i> <i>(China)</i>	<i>incl. above</i>	<i>incl. above</i>	<i>incl. above</i>	13.6	38.4	9
India	1032 / 16.9	1797*	159	4.3	4.0 ^b	114
Brazil	172 / 2.8	2215*	34	10.1	11.4	46
Mexico	99 / 1.6	609*	91	10.8	8.9	61
South Korea	47 / 0.8	528*	45	3.8	2.1	120

Sources: population, net greenhouse gas (GHG) emissions, emissions per capita: CAIT, 2005, available at: <http://cait.wri.org>; inward FDI 2003: UNCTAD, 2004, pp. 367-371; inward FDI as fraction of gross fixed capital formation: UNCTAD, 2004, pp. 387-398; FDI performance index: UNCTAD, 2004, p. 14).

^a The index is an ordinal ranking of 140 economies, with the rank of 1 representing the economy with the best performance.

* These estimates do not necessarily correspond to official inventories that may have been prepared by the respective governments.

^b Data for 2001.

FDI front-runner: China

Since 1991, China has been the largest non-OECD recipient of FDI inflows; in 2002, China garnered 10% of the world total (\$52.7 billion), up from 3% in 1991 (UNCTAD, 2003a). China's success in attracting FDI can largely be attributed to traditional determinants of FDI, such as its large domestic market size, cost advantages and openness to the rest of the world (Dées, 1999). Interestingly – and of relevance to

assessing whether FDI flows are a good predictor of future CDM investment flows – a large share of FDI in China during the 1990s was by non-resident Chinese based in Hong Kong, China, Taiwan Province of China and Singapore (Kumar, 1996, p. 9). These Chinese investors were mainly small and medium-sized enterprises which concentrated their investment in smaller, labour-intensive companies in eastern China. Consistent with this FDI focus, the sectoral emphasis of FDI was on manufacturing and services, with only 5% flowing to the energy sector¹⁰ (IEA, 2003), even though at least half of China's CDM potential is anticipated in this sector (World Bank, 2004).

Central and western China lacked appeal to foreign investors because their industrial structures are predicated on resource-related industries, heavy and chemical industries as well as large enterprises, many of which were State owned (Jiang, 2001). But the geographical concentration of outdated, large-scale, State-owned industrial production in western, central and north-eastern China, coupled with increasing government regional development investments, social plans for laid off workers and incentives for these regions might signal CDM opportunities for TNCs, particularly in light of China's WTO membership. The liberalization of foreign investment policies and ongoing reforms in the energy industry are expected to help China to attract more foreign investment, particularly to help develop its western gas resources and in new electricity projects (IEA, 2003, p. 89).

China's CDM potential is uncertain, but expected to represent roughly half of total CDM supply during the first commitment period (World Bank, 2004). China is the second largest emitter of greenhouse gases worldwide. If unchecked, greenhouse gas

¹⁰ See Michaelowa *et al.*, 2003 for a succinct overview of FDI trends in the Chinese power industry.

emissions will grow rapidly in response to exploding energy demand in coming years, and China's economy is still one of the most carbon-intensive worldwide, despite a remarkable decrease in its carbon intensity of nearly 50% between 1990 and 2000 (CAIT, 2005). So there is substantial potential for emission reductions (table 4 shows the source of emissions by sector).

Table 4. Greenhouse gas emissions, by sector, 2000, CO₂-equivalent basis

Country/sector	Million tons of carbon	Per cent
China		
Energy	891.3	69.2
Electricity & heat	390.2	30.3
Manufacturing & construction	251.4	19.5
Transportation	59.8	4.6
Other fuel combustion	142.0	11.0
Fugitive emissions ^a	47.9	3.7
Industrial processes ^b	101.9	7.9
Agriculture	275.3	21.4
Land-use change & forestry	-12.9	-1.0
Waste	31.6	2.5
Total	1,287.0	
India		
Energy	296.6	59.1
Electricity & heat	142.1	28.3
Manufacturing & construction	61.3	12.2
Transportation	34.3	6.8
Other fuel combustion	47.8	9.5
Fugitive emissions ^a	11.0	2.2
Industrial processes ^b	17.8	3.6
Agriculture	174.5	34.8
Land-use change & forestry	-11.0	-2.2

Waste	23.9	4.8	
Total	501.8		
Brazil			
Energy	87.6	14.5	
Electricity & heat		10.4	1.7
Manufacturing & construction		25.7	4.3
Transportation		34.3	5.7
Other fuel combustion		14.9	2.5
Fugitive emissions ^a		2.3	0.4
Industrial processes ^b	9.3		1.5
Agriculture	121.7		20.2
Land-use change & forestry	374.5		62.0
Waste	10.9		1.8
Total	604.1		

Source: CAIT, 2005.

^a N₂O data not available.

^b CH₄ data not available.

Note: 1 ton C = 3.6667 tons CO₂.

Given market price expectations for the first commitment period of the Kyoto Protocol of less than \$10 per ton on a CO₂ equivalent basis, however, some of China's reduction potential will not be economical. The great bulk of inward FDI to China has flown into greenfield projects and, although the technology employed may not represent the best available, it is often better than the economy-wide *status quo*. This means that marginal abatement costs in sectors with the greatest emission reduction potentials might be higher than anticipated.

In a recent study, China's CDM potential was judged to be distributed across the economy as follows: electricity generation, 50%; steel and cement production, 10% each; non-CO₂ projects (in particular, HFC-23 decomposition and methane capture), 10%; chemical industry, 5%; and other industries, 15%. China's potential for carbon dioxide emission reductions related to energy supply and end-use during the first Kyoto Protocol commitment period (2008-2012) is estimated at between 25 and 117 million tons CO₂ annually¹¹ (World Bank, 2004).

Despite its documented CDM potential, China was slow to ensure the necessary institutional prerequisites and build a critical mass of CDM capacity. As a result, few potential CDM projects are currently in an advanced stage of development. The World Bank Prototype Carbon Fund recently announced that it will purchase 4.5 million CERs from a Chinese coalmine methane project over 20 years. Since 2001, the Government has commissioned a number of CDM studies and launched capacity building efforts, and a more proactive government policy was recently adopted (World Bank, 2004). A Designated National Authority was appointed and interim rules and procedures for domestic CDM approval went into effect on 30 June 2004, paving the way for Chinese involvement in emerging carbon markets. Although the proactive position adopted by the Government is an encouraging sign, several provisions in the interim CDM regulation – such as the requirement for majority Chinese ownership of the local project participant and benefits sharing provisions – may discourage investors (Arquit Niederberger, 2004). The requirement that the local project partner be under Chinese control may also be

¹¹ This estimate of China's market share is broadly consistent with another recent independent analysis, which estimated China's technical potential for CDM activities related to energy supply and demand at about 350 million tons of CO₂ equivalent annually (Michaelowa *et al.*, 2003).

problematic. In the power industry, for example, where FDI commonly takes the form of joint ventures with a local governmental organization, the foreign direct investor in three quarters of the joint ventures has a controlling interest (Michaelowa *et al.*, 2003), which would prohibit such entities from engaging in CDM project activities.

With China's substantial and growing market- and resource-seeking outward FDI, mainly driven by growing domestic competition and a need to access energy and metal resources, Chinese TNCs could also profit from additional CER sales to Annex I entities associated with its own outward FDI projects in Asia or Africa. Similarly, non-Annex I economy TNCs investing in China, such as those from Hong Kong, China, could leverage additional CDM income streams from Annex I entities. Such CDM-related business opportunities for TNCs from developing economies investing in non-Annex I countries have scarcely been considered.

Overall, China has a significant CDM potential (energy efficiency, fuel switching, nitrous oxide, HFC-23 decomposition) and a recently improved institutional framework. It is rapidly gaining experience with real CDM projects. Experts regard China as an increasingly favourable country for CDM transactions, as evidenced by improved host country rankings (table 5).

Table 5. Point carbon CDM host country ratings, December 2004

Country	Rating	Interpretation	Rank
India	BBB	("somewhat attractive")	1
Chile	BBB	"	2
Brasil	BB	("not totally unattractive")	3
South Korea	BB	"	4
Peru	B	("slightly better than 50:50 chance that	5
China	B	CDM investments will succeed")	6
Morocco	B	"	7
Mexico	B	"	8

Source: Point Carbon, 2004.

Note: the rating of CDM host countries is based on Point Carbon's methodology, which includes an assessment of 14 indicators to evaluate host countries' institutional conditions for CDM, investment climate, as well as project status and potential. See <http://www.pointcarbon.com/category.php?categoryID=323&collapse=323> for further details.

FDI under-performer: India

Compared to China, India's inward FDI and FDI stock as a percentage of GDP are much lower. But expectations are that continued policy reforms will lead to greater inward FDI, even though other forms of partnerships (e.g. licensing, outsourcing) have proven to be efficient in areas of Indian specialization such as information technology services, call centers, business back-office operations, and research and development. According to the Confederation of Indian Industry, foreign investment has mainly been in the power, transport, chemicals, and paper industries, and investment has come primarily from countries that are now obligated under the Kyoto Protocol and domestic legislation

to abate greenhouse gas emissions.¹² Since marginal abatement costs are generally lower in developing countries, additional foreign investment and partnership is expected from these countries for climate change mitigation (e.g. technology cooperation, partial or full financing).

India has the second largest absolute greenhouse gas emissions of any potential CDM host country (table 3). Of the top three developing country emitters, it has by far the lowest emissions per capita (less than one ton of CO₂e per capita (GOI, 2004)). Given India's low level of income (less than \$500 per capita) and access to energy services, coupled with its heavy reliance on coal, the country's emissions are expected to multiply rapidly without technological leapfrogging and policy measures. India's power demand alone is expected to increase by 3.5 times from 2000 to 2020 (Indian Planning Commission, 2002). The prevalence of inefficient technology and the need to provide energy services to a growing population means that opportunities for CDM investment could be substantial in the power generation (clean coal, renewables) and industrial (e.g. iron/steel, cement) sectors¹³ (World Bank, forthcoming). India's CDM potential during the first commitment period of the Kyoto Protocol has been estimated at about 10% of the total CDM market (World Bank, forthcoming). The Confederation of Indian Industry estimates the mitigation opportunities in various industries as follows:¹⁴

¹² See <http://www.ciionline.org/services/78/default.asp?Page=CDM%20Projects.htm>.

¹³ It should be noted that, in addition to energy supply and end-use (which accounted for 61% of Indian greenhouse gas emissions in 1994), fully 29% of India's emissions were from agriculture, mainly enteric fermentation and rice paddy cultivation (GOI, 2004, p. 32). These official government figures are roughly consistent with the data provided in figure 3.

¹⁴ The Confederation also provides data on the total investment cost and the amount of electricity generation that the various options could encompass. For full information and data references, see <http://www.ciionline.org/services/78/default.asp?Page=Mitigation%20Opportunities.htm>

- coal washing (reduce ash content from 40% to 30%): 11 million tons CO₂ equivalent annually;
- fuel switching (imported liquified natural gas in current coastal coal plants): four million tons annually;
- conventional efficiency (improve thermal efficiency 1.5%): four million tons CO₂ equivalent annually;
- integrated gas combined cycle power (install relevant technologies): five million tons CO₂ equivalent annually;
- renewables (wind, solar, bagasse, mini hydro): 60 million tons CO₂ equivalent annually.

In fact, India is emerging as a leader in CDM transactions in the nascent Kyoto pre-compliance market, with more CDM projects under development than any other host country (CDM Watch, 2004). About a quarter of all baseline and monitoring methodologies submitted for CDM Executive Board approval have come from Indian project developers. An important factor is the active role that Indian industry has taken. With support from USAID, for example, the Confederation of Indian Industry established a Climate Change Center to build awareness of climate change issues within Indian industry, promote consensus on the CDM, build local capacity to develop climate change mitigation projects, and to develop a pipeline of projects. Potential buyers have also funded project design document development (World Bank, forthcoming). Complementing the efforts of the private sector is the Indian National CDM Authority, which has already approved 25 projects. In a recent rating by Point Carbon (table 4), India was the top-ranked CDM host country.

FDI success in Brazil

Brazil has also been very successful in attracting FDI and – despite a 26% drop in FDI from the previous year to \$16.6 billion in 2002 – it remains the largest recipient in Latin America. While the significance of FDI in the economy as measured by inflows as a percentage of gross fixed capital formation declined from 23% in 2001 to 20% in 2002, measured by FDI stock as a percentage of GDP it increased from 43% to 52% between 2001 and 2002.

TNCs from developed countries remain the largest investors in the Brazilian market, with the United States responsible for a quarter of FDI inflows over the 1990s. Since the current United States administration has said that it will not ratify the Kyoto Protocol, inward FDI from the United States may not be linked to significant interest in CDM investment. In 2002, however, the majority of the largest three foreign affiliates in all three sectors originated in Europe, in particular, the Netherlands, Spain and the United Kingdom (UNCTAD, 2003b):

- industrial sector: Japan (metals), Germany (motor vehicles), Netherlands/United Kingdom (petroleum);
- tertiary sector: Spain (telecom), France (trade), Netherlands (trade);
- finance: Netherlands, Spain, United Kingdom.

FDI stock in the primary sector declined sharply in 2002, while FDI in the secondary sector increased slightly, led by manufacturing in the food, automobile and chemicals industries (UNCTAD, 2003a, p. 54). FDI in the services sector declined from

\$1.6 billion in 2001 to \$1.0 billion in 2002. In 1998, the three most important industries in terms of FDI stock were business activities (31%), finance (12%) and electricity, gas and water (8%), a major shift of emphasis since 1990.

In contrast to China and to a lesser extent India, Brazil's energy-related emissions are dwarfed by emissions from deforestation (over 60% of total emissions) and agriculture (figure 3). Nonetheless, there is potential for CDM projects in energy (fuel substitution, energy efficiency) and industrial activities (process change, energy efficiency, fuel substitution), in particular, in basic materials industries such as aluminium, cement, chemicals, ferroalloys, iron and steel, pulp and paper (UNIDO, 2003), many of which currently attract FDI.¹⁵

Brazil was the first country to sign the United Nations Framework Convention on Climate Change and its proposal for a Clean Development Fund was the catalyst for international negotiations that culminated in the definition of the CDM contained in the Kyoto Protocol. The country was among the first to establish the required Designated National Authority to approve CDM projects, i.e. the Interministerial Committee for Global Climate Change (by Presidential Decree in July 1999). It is also engaged in a large number of CDM project identification and development activities by different promoters. Various institutions, such as UNCTAD and the World Business Council for Sustainable Development have supported CDM capacity building efforts as well.¹⁶ The

¹⁵ For further CDM/FDI information on the South American region see Morera, Cabeza and Black-Arbeldaez, 2004.

¹⁶ These activities were both part of the United Nations Foundation supported project "Engaging the Private Sector in the Clean Development Mechanism". (See http://r0.unctad.org/ghg/sitecurrent/projects/engaging_psic.html for further information on the UNCTAD programme and WBCSD, 2004, for information on lessons learned from its Brazilian rural solar energy case study, undertaken in partnership with British Petroleum, UNDP and UNIDO.

Brasilian Designated National Authority has already given provisional approval to two CDM projects (final approval will not be granted until the Kyoto Protocol enters into force), with about 10 in the pipeline (Miguez, 2004). One of these – the Brazil NovaGerar Landfill Gas to Energy Project – is the first (and, to date, one of only two) CDM projects to have been officially registered by the CDM Executive Board on 18 November 2004 (for further details on this project, see <http://cdm.unfccc.int/Projects/DNV-CUK1095236970.6/view.html>).

In general, Brazil is regarded by the international business community as one of the most attractive countries to host CDM projects (UNIDO, 2003). A number of TNCs are already involved in various types of CDM transactions there, although none involve FDI (box 2). Point Carbon ranked Brasil as the third most attractive host country for CDM projects (table 4).

Box 2. Involvement of TNCs in Brazilian CDM project development

BP/PRODEEM Solar Project. BP Amoco (in association with PRODEEM, a programme of the Brazilian Ministry of Mines and Energy aimed at providing sustainable energy to schools and community buildings in rural areas of the country) won a contract from the Government of Brazil to supply 1,852 rural schools in 12 states in North-Eastern Brazil with solar electricity. The total cost of solar panels and their installation was financed by the Federal Government; BP ensures maintenance and upkeep for three years. This project was undertaken in cooperation with the World Business Council for Sustainable Development to provide a working business example of a CDM project and to contribute to CDM rule-making and capacity building (see WBCSD, 2004, for further details). The project has been completed outside of the CDM (prior to the entry into force of the Kyoto Protocol).

Prototype Carbon Fund Plantar Project. The World Bank Prototype Carbon Fund will purchase certified emission reductions generated by this project, which involves the establishment of 23,100 hectares of high

yielding Eucalyptus varieties to produce wood for charcoal production to displace coke produced from coal in pig iron production; the reduction of methane emissions during charcoal production; and the regeneration of native vegetation on 478.3 hectares of pasture land. Investors in the Prototype Carbon Fund include six governments and 17 private enterprises (See <http://carbonfinance.org/pcf/router.cfm?Page=Partic> for a full listing of PCF participants).

V&M do Brasil Avoided Fuel Switch Project. The International Finance Corporation "Netherlands Carbon Facility" will provide a conditional commitment to the Brazilian steel producer V&M do Brasil to purchase five million tonnes of greenhouse gas emission reductions resulting from the continued use of plantation-derived charcoal in the production of steel instead of switching to coke made from imported coal. The total contract value is expected to be €15 million. Toyota Tsusho Corporation will sign a contract with V&M to purchase an additional volume of emission reductions that the project will generate.

Source: based on WBCSD, 2004, <http://carbonfinance.org/pcf/router.cfm?Page=ProjectsID=3109> and other materials.

TNCs, climate risks/opportunities and CDM

In order to assess whether it is reasonable to expect a link between FDI at the level of companies and project-level CDM flows, it is necessary to understand the potential motivation of TNCs that emit greenhouse gases and have a need for CDM offsets or see value in acquiring such offsets for resale.

The 20 largest TNCs in UNFCCC Annex II countries in terms of foreign assets are concentrated in the telecoms (e.g. Vodafone, Deutsche Telekom AG, Telefonica SA), petroleum (BP, Exxonmobil, Royal Dutch/Shell, TotalFinaElf, ChevronTexaco Corp) and automotive (Ford Motor Company, General Motors, Toyota, Fiat, Volkswagen, Honda) industries. The electrical and electronic equipment producer General Electric ranks

second (UNCTAD, 2003a, p. 187). Companies in the petroleum industry have the largest potential carbon liabilities with respect to domestic climate policies in their home countries, as they are major sources of greenhouse gas emissions, and British Petroleum and Royal Dutch/Shell have been leaders in the development of carbon markets. It is likely that such companies will continue to seek out low-cost mitigation opportunities in their foreign affiliates that can contribute to compliance of the parent enterprise or foreign affiliates in regulated markets and to diversify their worldwide operations to less carbon-intensive energy sources. But it is difficult to predict what role the CDM will play in overall company strategies and to what extent any CDM engagement will be in the form of FDI. In addition to in-house reductions, BP Australia is marketing its carbon neutral BP Ultimate and autogas fuels under the greenhouse friendly label. But, according to the terms of the Australian programme, the carbon offsets must be obtained through mitigation projects in Australia.¹⁷ A similar model that would involve investment in CDM projects is conceivable.

The transport industry is responsible for as much as one third of greenhouse gas emissions of Annex II countries, and is therefore a logical target for direct (e.g. new car fuel efficiency standards) or indirect (e.g. carbon taxes on transport fuels) emission controls. Car makers exporting to regulated markets must therefore develop their product lines to respond to demand for lower emission vehicles. Climate change policy can thus offer business opportunities for low-emission vehicles; but, so far, only the introduction of fuel cell buses has been considered as a potential CDM project. On the other hand,

¹⁷ For further information, see www.greenhouse.gov.au/greenhousefriendly/consumers/products.html.

some Japanese and European car makers are exploring CDM opportunities as a pure compliance instrument, because the production of cars causes direct greenhouse gas emissions that may be subject to regulation or taxation. The United States auto makers have the greatest carbon intensity of production (due, in part, to the fact that they are more vertically integrated). But since greenhouse gas emissions are not regulated in the United States and because United States car makers rely to a large extent on the domestic market, their direct and indirect exposure is somewhat buffered in the short-term (Innovest, 2001).

Since five of the world's largest TNCs are from the United States – which currently does not plan to ratify the Kyoto Protocol – so it is unclear whether they will be able to profit from investment in CDM-type transactions. Certainly, their foreign affiliates operating in regulated markets or in CDM host countries could have a business interest.

Preliminary insights

Relationship between FDI flows and CDM potential

From a global perspective, current trends in FDI flows give some indication of the preferences of foreign investors. One element in common with the CDM is the quality of the general business environment. However, for a number of reasons, FDI flows do not necessarily reflect CDM market potential:

- CDM demand comes from both governments and the private sector, which might have different motivations and preferences. And private sector demand for emission reductions is not all associated with TNCs that operate in developing markets.
- Conversely, not all TNCs have an interest in Kyoto compliance instruments such as CERs from CDM projects, and some might not have a compelling incentive to make the required additional investment in climate mitigation.
- CDM transactions are predominantly in the form of CER trade, rather than equity investment in CDM projects, and not all equity investment in CDM projects will be in the form of direct investment.
- FDI might flow to industries/economies that do not represent large CDM potential and *vice versa*. (India, for example, is expected to be a major supplier of CERs, but its inward FDI is low and non-equity FDI mainly flows to telecoms, information technology and business services, which do not have substantial CDM potential.)
- FDI flows to companies do not guarantee investments in climate change mitigation efforts that meet CDM criteria, although technologies that are transferred to developing countries in connection with FDI generally tend to be more modern and environmentally "cleaner" than what is locally available (OECD, 2002). Greenfield FDI may even increase absolute greenhouse gas emissions in a host country.
- The necessary institutional prerequisites, specialized capacity and incentives to facilitate CDM investments and keep transaction costs low might be lacking in potential CDM host countries.

These observations are reflected by the fact that the largest CDM-eligible emitters of greenhouse gases (with greenhouse gas emissions over 100 million tons of carbon annually¹⁸) – which are also believed to have significant CDM potential – are distributed across three of the four cells of the UNCTAD FDI matrix (table 6). In fact, with the exception of Brazil, China and Mexico, the developing countries with the largest emissions exhibit low FDI performance. And India – classified as an FDI underperformer with low FDI potential (UNCTAD, 2004) – hosts more potential CDM projects currently under development than any of the other 26 host countries (CDM Watch, 2004).

¹⁸ On a CO₂ equivalent basis. See, Climate Analysis Indicators Tool (CAIT) Version 2.0 (Washington, DC: World Resources Institute, 2005), available at: <http://cait.wri.org>.

Table 6. Relationship of largest developing country greenhouse gas emitters (absolute basis) to UNCTAD FDI matrix, 2000-2002

	High FDI performance	Low FDI performance
High FDI potential	FDI front- runners Brazil (3), China (1), Mexico (5)	Below potential Iran (7), South Africa (8), Republic of Korea (4)
Low FDI potential	Above potential	FDI under-performers India (2), Indonesia (6)

Source: UNCTAD, 2004, p. 17.

Note: Numbers in brackets represent the ordinal rank of the country with respect to absolute emissions, with 1 being the greatest emissions.

Overall investment climate and CDM considerations

It is not obvious that the overall investment climate is a good proxy for the more specific CDM investment climate. Among FDI front-runners, a number of Latin American countries, such as Chile, Costa Rica and Mexico, have taken the initiative to promote CDM activities and have attracted a greater share of fledgling CDM transfers than the FDI giant China, which only recently established the necessary institutional prerequisites. The reason for this is that these Latin American countries have invested in the necessary domestic CDM capacity¹⁹ (e.g. CDM awareness and training programmes,

¹⁹ For an example of CDM capacity building in Latin America, see Sane, Jáuregui and Yiu, 2001.

analysis of CDM potential, facilitation of project identification) and are committed to efficient institutional arrangements to promote and process CDM projects, which keeps transaction costs low.

Furthermore, contractual arrangements can help minimize country risk associated with CDM deals, assuming that these are in the form of carbon purchase agreements. India, for example, which is an "FDI underachiever", has been the most active country in terms of submissions of projects for validation under the CDM. The projects have mostly been small-scale renewable projects, with the exception of some large, non-CO₂ projects. As mentioned earlier, unilateral CDM, implemented without the involvement of entities from a third party, is one way that countries with a poor investment climate are hoping to take advantage of the Kyoto mechanisms, although it remains unclear whether the CDM Executive Board will endorse this approach. Indian project developers recently submitted the first Project Design Document and proposed a new baseline methodology for a unilateral CDM project, which should lead to clarification on the issue by the Executive Board.

Implications of FDI flows for CDM additionality

If a large amount of FDI is going into a certain sector of a country, this implies that the risk-return relationship in that sector is likely to appear favourable to foreign investors under prevailing global market and domestic regulatory conditions in the country. As mentioned above, evidence suggests that technologies that are transferred to developing countries in connection with FDI generally tend to be more modern and

environmentally friendly than what is locally available, perhaps lowering the business-as-usual emissions baseline. It has been shown that a significant fraction of TNCs self-regulate environmental aspects of their activities (e.g. OECD Guidelines for Multinational Enterprises, International Finance Corporation (IFC) Equator Principles, company policies), which is perceived to have a strong positive influence on the environmental performance of foreign affiliates. In fact, 30% of Asian foreign affiliates of TNCs involved in a recent study claim that foreign affiliates operate according to home country standards (Hansen, 2003). Even the IFC – the private sector lending arm of the World Bank – has detected a "huge interest in sustainability issues, coupled with the demand for innovative solutions" (Woicke, 2004). The typically better environmental performance of foreign affiliates might make it more difficult to demonstrate the additionality of climate protection projects in sectors/enterprises that attract much FDI, although investment barriers are not the only ones conceivable, and it may be more expensive for TNCs to make additional CDM investments in their own plants. On the other hand, many companies have been surprised at the amount of no regret mitigation potential they have uncovered, resulting in substantial net savings to their bottom lines.

Ignored by FDI, courted by CDM?

In reviewing the literature on determinants of inward FDI at the national level, Nagesh Kumar (1996, pp. 8-9) concluded that low income, agrarian economies with relatively poor infrastructure have limited scope for attracting FDI inflows, regardless of whether their policies are trade-friendly (e.g. liberalization of trade policy regimes, investment incentives, protection of intellectual property rights). This conclusion is consistent with declining shares of low income countries in South Asia and sub-Saharan

Africa in global FDI inflows, despite the liberalization of trade and investment regimes. FDI flows have remained very modest, compared with other regions, such as Asia and Latin America, and TNCs have not made as significant a contribution as elsewhere. According to the OECD (2003), FDI in these sub-regions has been largely limited to investments in petroleum and other natural resources, and the TNCs have focused their activities on areas where returns are high enough to offset perceived risks of investing. In such cases, it might be difficult to argue convincingly that modest additional CDM financing is required to make a project commercially viable, but it is still conceivable that the CDM could help to overcome non-financial barriers to implementing some climate mitigation projects.

The backbone of the African private sector at present, however, is micro, small and medium-scale enterprises that often operate in the informal economy, yet most trade and investment promotion institutions do not reach them and channels for financial intermediation are ill-adapted to their needs (OECD, 2003). Efforts to attract more diverse FDI projects must go hand in hand with developing clusters of enterprises and subcontracting or vendor programmes to link better these enterprises to those operating in the modern economy. Similar efforts are needed to promote the development of carbon sequestration and small-scale rural energy supply or efficiency projects that are expected to be particularly important for CDM in many African countries. The World Bank's new Community Development Carbon Fund specifically targets small-scale projects in least developed countries and the poorer regions of other developing countries. To date, large

hydropower and waste-to-energy projects that involve methane emission reductions have attracted the greatest CDM investor interest (CDM Watch, 2004).

Implications and need for further research

This article suggests that the simplistic assumption that CDM financial flows will be correlated closely with FDI flows may not hold and warrants further analysis. More importantly, however, further research is needed to determine how developing country entities can attract CDM investment or enhance their ability to export CERs. This will require a more detailed analysis of:

- the sources of demand (countries, government vs. private sector investors and investors' CDM preferences);
- the dynamics of evolving carbon markets;
- the different CDM transaction models (equity investment in CDM projects vs. *ex ante* CER purchase agreements vs. secondary market CER trades); and
- the national determinants of CDM financial flows.

The UNCTAD / Earth Council Institute Carbon Market Programme is one initiative to investigate these trade- and investment-related CDM issues.

Furthermore, the results reported in this article have important policy implications for the full spectrum of actors in the CDM and carbon markets. For example:

- Countries that have not been successful at attracting classic equity FDI, such as India or Latin American countries, can still be successful CDM host countries, particularly under carbon purchase arrangements. However, the underlying project finance remains a challenge, and countries must act fast to ensure that the necessary institutional prerequisites are met, as the window of opportunity for the first commitment period under the Kyoto Protocol (2008-2012) is rapidly closing.
- Conversely, even FDI front-runners like China will have to adopt a proactive and supportive institutional, regulatory and policy framework to capture CDM potentials.
- TNCs can benefit in a variety of ways from the CDM. To date, some companies that anticipate greenhouse gas regulation in their home country have considered the CDM as a compliance tool, which may or may not be linked to FDI. The CDM may also open new strategic opportunities to technology providers, financial intermediaries or CDM host country TNCs operating in other CDM host countries, but these emerging opportunities have scarcely been explored. Host country companies that succeed in leveraging CDM finance for their investment projects might gain a competitive advantage.
- Information on the drivers, financial structure and transaction type of emerging private sector CDM deals is generally confidential, but would help CDM host country policymakers and project developers to respond better to CDM demand (via targeted incentives, awareness-raising, capacity building and project identification).

- The future price for CERs is highly uncertain. Low prices will limit the scope for the potential value added of CDM to influence investment choices, particularly with respect to large projects for which the additional CDM finance is a small fraction of the total and has little influence on the project's return on investment. Under these circumstances, public-private partnerships that combine CDM funding with other incentives, such as host government support for priority demonstration projects, could be essential. Care must be taken, however, that the incentives offered do not run counter to WTO provisions (Assunção and Zhang, 2002).

TNCs should investigate their potential carbon liabilities and CDM opportunities to consider if and how they can take advantage of emerging carbon markets to enhance their bottom line, while contributing to the protection of the global climate system and the sustainable development of CDM host countries. The CDM will not offer the same incentives to all companies, but could be particularly attractive to companies operating in regulated markets, such as the EU, or which produce climate-friendly advanced technologies or have significant low-cost greenhouse gas reduction potential in their foreign affiliates. CDM host countries, in turn, should assess the linkages between trade, investment and environmental issues (OECD, 2001) and consider how they can leverage CDM financial flows in support of their development priorities.

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