Exploration of the underlying factors affecting the use of CDM: A comparative analysis of CDM in South Africa and China:

John Fay, Farai Kapfudzaruwa and Lin Na

Abstract

Both South Africa and China are emergent economies heavily dependent on fossil-fuel based energy sources, and the potential to leverage the Clean Development Mechanism (CDM) is significant in both countries. However, experience to date with CDM indicates South Africa has significantly lagged behind China in the uptake of the CDM, accounting for only 0.9% of the worldwide registered annual Certified Emission Reductions (CERs) while China has dominated the market, generating over 54% of the annual worldwide CERs. Thus, an opportunity exists to redefine the role of CDM in South Africa to better incentivise a lower carbon development trajectory. This paper provides a comparative analysis of the CDM experience in China and South Africa in order to identify the underlying drivers and obstacles to CDM in both countries. It is the authors' objective to analyse the lessons learnt from market-leading China and laggard South Africa to better understand the structures and policies necessary within host CDM countries to unlock the potential of CDM in a post 2012 regime.

1. Introduction

The Clean Development Mechanism (CDM) is a market-based approach under the Kyoto Protocol, designed to provide financial incentives for developing countries to voluntarily contribute to emission reduction efforts and promote sustainable development (UNFCCC, 2009). China and South Africa both ratified the Kyoto Protocol in 2002, and are eligible to implement CDM projects and to trade the Certified Emission Reduction credits (CERs) through the international compliance carbon market. The fundamental structure of the CDM as a market-based approach causes it to favour low-cost opportunities that generate significant CER volumes, in host countries with political stability, investment security and large 'smokestack' industries (such as heavy engineering, energy production or manufacturing that is heavily dependent on fossil fuels).

Whilst the main emergent economies in developing countries (China, India, Mexico, Brazil and South Africa) inherently meet the favourable CDM country criterion outlined above, in reality the geographical distribution of the projects indicates a significant disparity in CDM uptake between the countries. Of the 4 673 projects in the CDM pipeline as of October 1st 2009, the Asia and Pacific region has dominated the CDM while Africa has under-performed. China has taken the leadership role by supplying 2012 CERs, whereas South Africa, the leading CDM host country in Africa, has played a negligible role thus far (see Table 1).

Table 1: CDM project and CER comparison
Source: UNEP (2009)

Location	*Worldwide*	*China*	*South Africa*
Issued projects	566	144 (25.4%)	4 (0.7%)
Issued kCERs	333 069	153 234 (46%)	1 023 (0.3%)
Registered projects	1 834	626 (34.1%)	16 (0.9%)
Registered 2012 kCERs	1 685 229	912 041 (54.1%)	15 643 (0.9%)
Remaining CDM pipeline projects	2 839	1 205 (42.4%)	12 (0.4%)
Remaining CDM pipeline 2012 kCERs	1 100 520	627 221 (57%)	1 065 (0.1%)
GDP 2008 estimated[1] ($ thousands)	-	4 326 187 000	276 764 000
Total 2012 CERs / GDP ($ thousands)	-	0.39	0.06
Estimated population[2]	-	1 338 613 000	49 052 000
Total 2012 CERs /population	-	1.26	0.36
Total emissions (thousand tons CO_2)[3]		6 017 690	443 580
Total 2012 CERs / Est. total emissions		0.28	0.04

Notes:
1. World Bank 2008 GDP.
2. CIA World Factbook 2009.
3. Energy Information Agency 2006 Estimates

As of October 1st 2009, 1 834 projects have been registered by the CDM Executive Board (EB) at the United Nations Framework Convention on Climate Change (UNFCCC), with expected CERs representing 1 685 million tons of carbon dioxide equivalent (tCO_2e) by the end of 2012. Among the registered projects, China has 626 projects, representing 34.6% while South Africa has 16 projects representing less than 0.9% of the total. Even when normalising the significant size difference between China and South Africa, it is further apparent that South Africa has lagged behind (Table 1). China has significantly higher utilisation of CDM in terms of CER per thousand tons of CO_2 emitted (0.28 to 0.04), CER per thousand dollars of GDP (0.39 to 0.06), and pipeline CER per person (1.26 to 0.36).

This article explores the underlying drivers of the Chinese and South African experiences in order to compare and contrast what has supported or hindered CDM uptake in both countries. The paper discusses how a country's regulatory and policy framework need to be aligned with the emission reduction targets and sustainable development criteria for CDM to ensure that the mechanism enhances the social, economic and environmental demands of the country. It is the authors' intent to analyse the experience gained from market leading China to better understand how

to leverage the CDM market and to facilitate further development in South Africa. At the same time, the lessons learnt from the Chinese and South African CDM market can guide other developing countries to develop a healthy and mature path for the implementation of CDM and other market-based mechanisms.

2. Methodology

This paper utilised methodological and investigator triangulation as the main research approaches (Denzin 1970; Jick 1979; Kimchi 1991). This approach used conferences, interviews, reports, archival documents and field observations as the main data collection methods. The use of multiple data sources to examine CDM experiences in South Africa and China enhanced the validation process by ensuring that weaknesses inherent in one approach were counterbalanced via strengths in another (Denzin 1970; Jick 1979).

The majority of statistical data was obtained from the UNFCCC website and the UNEP Risøe CDM project pipeline for October 1, 2009 (UNEP 2009) which provides an analysis and database for all CDM projects that have been sent for validation. It also contains information pertaining to the Designated Operating Entities (DOEs), project types, number of CERs and several analyses relevant in investigating and comparing the current state and future trends of CDM in China and South Africa. The analysis from UNEP and UNFCCC website also played a significant role in providing background information in designing interview questions. Review of publicly available background documents was also critical in providing contextual information on CDM in South Africa and China. Key documents reviewed included UNFCCC and national CDM regulation; national renewable energy policies and regulation; EB-approved methodologies and project design documents (PDD); reports and criteria provided by the South African and Chinese Designated National Authority (DNA). An extensive literature review on CDM was also conducted as a means of exploring and understanding the current discussions around CDM, both globally and specifically to South Africa and China (e.g. discussion on 'additionality', efficiency of the EB and regulatory aspects of CDM).

To develop a first-hand understanding of the drivers and constraints to CDM uptake in both China and South Africa, structured interviews and unstructured discussions were conducted with relevant CDM stakeholders. A number of observers and stakeholders in the research process also enhanced the reliability of the data by comparing data from different individuals for consistency. The interviews focused on understanding the main drivers and constraints of CDM in China and South Africa in the context of sustainable development, flow of investments, institutional and capacity issues, efficiency of the EB and other CDM management structures and the regulatory framework of the CDM. The interviews largely used open-ended questions to facilitate open discussions with the stakeholder on a wide range of issues related to the CDM (Bryman 1998; Neuman 2006). To identify key informants, a list of key CDM stakeholders in China and South Africa was compiled from CDM association lists, project documents, CDM analysis reports and conference proceedings. Furthermore, asking each contacted interviewee for additional referrals for information rich key informants proved effective (Mason 1996; Welch *et al* 2002).

For the China research component, 17 interviews with European companies operating in China were drawn upon. In addition, structured interviews were held with four local project developers, two investors, two researchers and two officials representing

the DNA (one from the Ministry of Environmental Protection, one from the CDM Project Management Centre). In South Africa, 53 key informants were identified and contacted for structured interviews. Interviews were conducted with one DNA official, eight project developers, two DOEs, four research consultants and three representatives of a financial services firm. Unstructured discussions held with CDM stakeholders during relevant conferences in China and South Africa were also drawn upon.[1] These interactions were important to gather information on key issues affecting CDM (such as new CDM methodologies, policies, and post-2012). Moreover, most of the respondents are influential in the climate change policy realm, so that their input was important in any policy discussions for the post-2012 CDM outlook.

Lastly, previous research on CDM, as well as direct involvement in carbon finance through the implementation of CDM projects in China and Africa by the paper's authors, provided additional insight into understanding the opportunities and challenges in the CDM process. The researchers have been involved in numerous workshops and field observation on CDM in Africa and Asia. These workshops and field observations are an invaluable source of information for policy because they provide interaction and input from individuals who work on CDM on daily basis. The authors have been actively involved with the implementation of the EU-China Facilitation project and the development of the Africa Carbon Credit Exchange.

3. CDM: Current state, opportunities and challenges

As highlighted by the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report, anthropogenic greenhouse gas (GHG) emissions are 'very likely' the cause of climate change which poses enormous threats to economic stability, public health, national security, as well as to the environment (IPCC 2007). In order to promote climate justice, the Kyoto Protocol recognises that human activity driving GHG emissions has been concentrated in developed countries over the past 150 years and therefore has adopted the principle of 'common but differentiated responsibilities', placing a greater burden to address climate change on the developed countries (UNFCCC 2007; Comim 2008). As a result, all developed nations, aside from the United States, have ratified the Kyoto Protocol and committed to legally binding measures that set a ceiling or cap on allowable emissions released in the atmosphere over a given timeframe. Conversely, developing countries that have ratified the Kyoto Protocol do not have binding emission reduction targets for the first period from 2008 – 2012 (IETA 2009). As one of the mechanisms defined by the Kyoto Protocol, the CDM allows the Annex I countries (developed countries with emission caps) to implement the GHG emission reduction projects in the non-Annex I countries (developing countries without emission caps), providing a flexible alternative for Annex I countries to meet their binding obligations. This approach, as supported by market theory advocates, is perceived to create a cost for emissions while simultaneously creating a market incentive to emit less, either through efficiencies or offsets (Yeoh 2008: 190).

For countries in Africa to fully exploit the economic and environmental benefits of emission trading, CDM also needs to provide an effective medium for transfer tech-

[1] Conferences include UNEP Financial Initiative Conference held October 23-24, 2010 (John Fay, Farai Kapfudzaruwa); The Ecocentric Journey Conference September 15-17 2009 (John Fay, Farai Kapfudzaruwa); The EU China CDM Facilitation Project Final Dissemination Conference held November 19, 2009 (Lin Na); Convention of Parties 15 – attending from Dec 09–17, 2009 (John Fay).

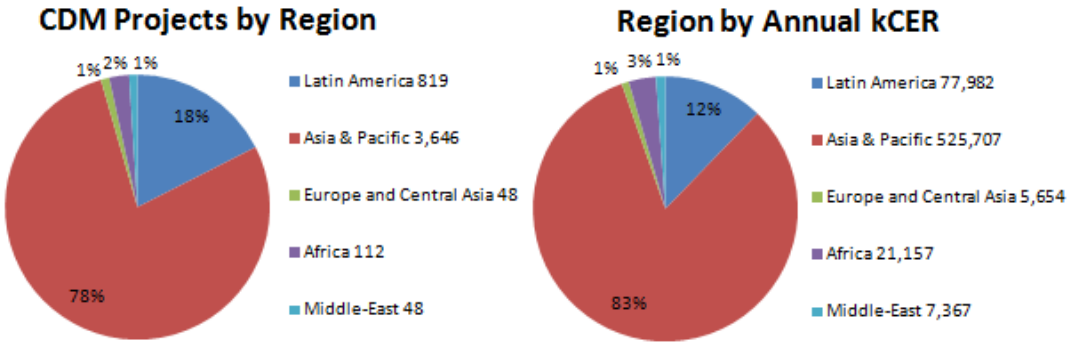
nology to these developing countries (Lütken 2009). Other important issues which have been raised include the risks associated with CDM projects hampering development and how these risks can be quantified (Bohringer *et al* 2007). According to Oleschak and Springer (2007) CDM risks tend to be low for (large) countries with high potentials such as China, India and Brazil. The main reason for countries to be classified as low risks for CDM projects is the fact that the institutions related to the monitoring and implementation of flexible instruments are rated excellent. These countries score high on the following points: DNA in place, participation in capacity-building, memoranda of understanding with potential investors, declaration of policy, and experience with projects (Oleschak & Springer 2007). The regulatory environment which encompasses enforcement of contracts, ease of starting business, and registration of property rights are also an important factor in determining the risks levels of CDM projects (Oleschak & Springer 2007). Youngman *et al* (2007) complement Oleschak and Springer's findings by critically examining past CDM and JI project portfolios for the extent to which the technology transfer promised to host countries really occurred. Youngman *et al* (2007) revealed that more than half of 116 CDM and JI projects analysed do indeed involve the transfer of technology hardware from outside the host country, with a total value of €1.3 billion. However, for low- and non-emitting energy technologies (wind, hydro, biomass, energy-efficient devices) the carbon value offered by CDM may not be enough to cover the high up-front investments. Therefore, stimulating specific technologies can be considered an additional policy goal and may require policy instruments in addition to a simple carbon price (Youngman *et al* 2007). The authors also suggest that options such as programmatic CDM projects need to be supported within the policy realm. These research findings present some important questions that will inform policy decisions, which will be probed in this paper. The comparison of CDM experiences in China and South Africa will provide an opportunity to understand whether additional policies are needed to 'accelerate technology diffusion for long-term climate targets' if technology transfer occurs, but not systematically enough to diffuse new technologies (Bohringer *et al* 2007).

Despite the dual goals of emission reductions and achieving sustainable development, the emerging CDM project portfolio is shaped almost exclusively by financial incentives for the emission reduction component of projects (apart from the small share of investors that wish to pay a premium for particularly Sustainable development friendly CDM projects) (Ellis *et al* 2007). As a result many of the current CDM projects represent relatively low-cost emission mitigation opportunities that do not result in investment in new infrastructure. Therefore, the future climate change regime should redesign the CDM to ensure that it exploits the link between sustainable development benefits and mitigation which could be a key to motivating developing countries to take on future mitigation commitments (Ellis *et al*, 2007). This implies lasting changes in energy infrastructure and demand.

The operation of CDM requires significant institutional arrangement at different levels. At the international level, the EB oversees the CDM activities and policy making, under the authority and guidance of the Conference of the Parties (COP). At the domestic level, the DNA reviews submitted CDM projects and approves or rejects them based on specific international and domestic procedures and regulations. The institutional capacity is important as research has shown host country CDM procedures, specifically evaluation criteria and approvals, are a determinant to CDM investment (Nhamo, 2007: 553). Since its inception in 2005, the CDM has grown rap-

idly, with 4 673 projects in the CDM pipeline, which will amount to over 7 416 430 kCERs by 2020 (UNEP 2009). Even though the Asia and Pacific region currently accounts for approximately 80% of the CDM project pipeline and the volume of CERs (Figure 1), countries from Latin America and sub-Saharan Africa have slowly increased their uptake of CDM projects. Within Africa the uptake has remained small, but a group of CDM leaders have emerged, mostly within the wealthiest economies including South Africa, Egypt and Morocco. Each of these three countries has a handful of large scale CDM projects in the pipeline (UNEP 2009).

Figure 1: CDM Projects and KCERs by region
Source: UNEP (2009)



As a mechanism that gives monetary value to emission reductions, the market searches for the highest volumes at the lowest cost. As such, the CDM has been more effective in achieving one of its main goals of reducing mitigation costs while being less effective in contributing to sustainable development (Figueres & Streck, 2009; Holm Olsen 2007; McGown 2008; Sutter & Parreno 2007; Fenhaan 2008). CDM has been effective in quickly eliminating substantial portions of HFC-23 and N_2O industrial gases which experienced early uptake in the market although they contribute little to sustainable development. The exclusion of deforestation leaves the largest emission source of many tropical countries untapped by CDM and misses an opportunity to enhance sustainable land use practices (Figueres & Streck 2009). Since the developing countries are highly vulnerable to the effects of climate change, it is worrying that the CDM has not moved developing countries towards low carbon development paths based on more sustainable energy production and consumption patterns and sustainable forest management (Figueres & Streck 2009; Figueres *et al* 2005; Wara 2007; Wara & Victor 2008). The complex relationship between social and economic development and climate change, particularly in developing countries, may require CDM to be restructured into a genuinely integrated mechanism which reduces emissions at low costs while improving the livelihoods of vulnerable communities. However, the two objectives imply tradeoffs, since setting a high development objective for CDM projects can slow investment transfers and hamper the flexibility of the mechanism to lower implementation costs (Figueres & Streck 2009). However, increased levels of entrepreneurship combined with innovative financing that leverages CDM can help to simultaneously promote sustainable development through reduced emissions (Gantsho & Karani 2007).

There are certain aspects of the CDM related to its efficiency, sustainability, institutions and structure which need to be restructured to strengthen the effectiveness and transparency of the mechanism (Capoor & Ambrosi 2009). As the EB has worked to

maintain CDM credibility through a strict verification process, delays have been problematic and contribute to a recent upsurge of project rejections. Also, the EB's efforts do not sufficiently address the issues 'of re-casting the additionality debate, which is core to the *raison d'être* of the CDM and also the main reason why projects get reviewed for registration' (Capoor & Ambrosi 2009). There has also been mounting criticism about the lack of transparency in the EB's decision-making and lack of predictability (IETA, 2005). Addressing additionality concerns will not only reduce the short-term delays, but also help preserve and expand the credibility of the CDM, so that streamlining the process of registration and issuance is an important immediate objective of CDM reform (Capoor & Ambrosi, 2009). The governance structure of the CDM would have to be reviewed taking into account the need to supervise a rapidly growing market and to include private sector participants that are not represented in the COP ensuring the conditions for fair and predictable decisions (Figueres & Streck, 2009).

4. CDM in China

4.1 Overview

Since commencement in 2006, the number of CDM projects in the global carbon market has experienced tremendous growth. The significant growth of the CDM market in China has made it the largest CDM host country and, consequently, the biggest CER supplier in the international carbon market. As at 1 October 2009, 1 975 Chinese projects have been developed or are currently in the CDM development pipeline, including 626 projects registered at the EB. The expected average annual CERs from the Chinese CDM projects is over 190 million tCO_2e, representing nearly 57% of the worldwide total annual expected CERs (UNEP 2009). China continues to develop CDM projects at a rapid rate; by 10 November 2009 the number of DNA-approved CDM projects jumped to 2 232 (NDRC 2009), with nearly 250 new projects approved in less than six weeks. To put this rapid growth into perspective, at the end of 2006 there were only 138 CDM projects in the pipeline (Eua 2009).

Project scope

As illustrated in Figure 2, current CDM projects in China cover a wide range of industrial type. Renewable energy projects, including small hydro power, wind power and biomass, represent a dominant share of existing CDM projects, in terms of both project number and the quantity of expected annual CERs. Energy efficiency is the second largest area for CDM project development, coming from various industrial sectors including steel, iron and power industries. Furthermore, a majority of the developed and registered energy efficiency CDM projects are for their own power generation, using waste heat recovery or waste gas recovery for power generation. Several new project types have emerged recently, including the solar energy utilisation, perfluorocarbons, SF_6 and transport, which are a result of new methodology development.

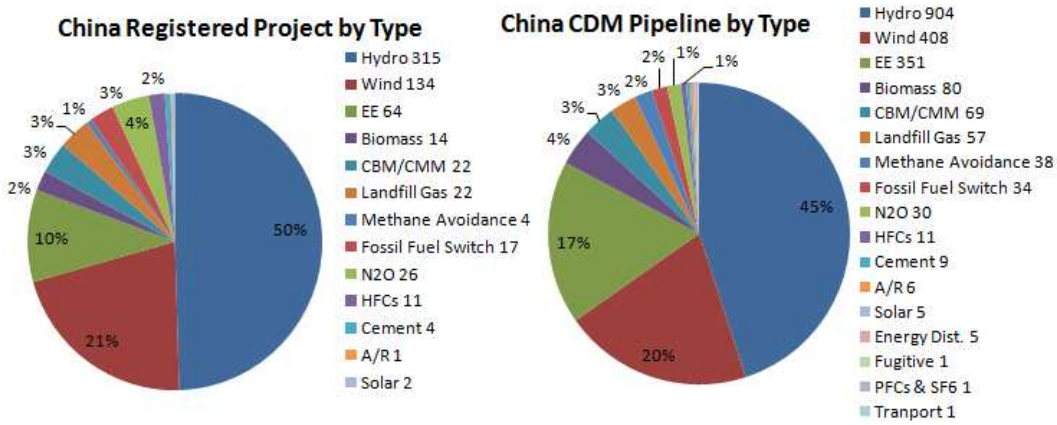


Figure 2: Registered and pipeline projects
Source: UNEP Risø Centre 01-10-09

Early on in the Chinese CDM experience, hydrofluorocarbon (HFC) and N_2O projects were considered as 'low-hanging fruits', due to the large amount of CERs from a single project and the relatively low per unit investment. However, from the beginning of 2009, there are no new HFC projects being developed, with the last HFC project registered in April 2009. This is partly because the HFC destruction potential in the Chinese market has largely been exhausted and through an exorbitant 65% taxation charge for HFC projects under the income-sharing CDM management policy (EUb 2009). The growth of N_2O projects is also slow, with only two new projects developed in the pipeline in the first nine months of 2009.

CDM management in China

Currently, there are a large number of Chinese governmental authorities directly involved in the management of CDM projects including the National Leading Group on Climate Change (NLGCC), the National CDM Board (NCB), National Development and Reform Commission (NDRC) and the CDM Project Management Centre (CDM-PMC), among which NDRC serves as the DNA for CDM implementation in China (CDM-PMC, 2009). The institutional structure for CDM management is a vertical management system. The NLGCC, consisting of 20 ministries, oversees the national CDM policies, regulation, standards and supervises the National CDM Board. The NCB is responsible for reviewing CDM projects, reporting to the NLGCC on the overall progress of CDM project activities, and making recommendations on amendments to the CDM operation regulations and procedures based on emerging issues (CDM-PMC, 2009). China's DNA is part of the NDRC, which is under the supervision of the NCB and responsible for receiving CDM project application documents, implementing the CDM administrative procedure and issuing the Letter of Approval (LoA) for the qualified CDM projects, and implementing specific CDM activities.

In addition, the recently established CDM Fund Management Centre (CDMFMC) is a key institution within the Chinese CDM management structure. It is sponsored by the Ministry of Finance and manages the funds collected from the CER revenue fees charged by the government which will be used as grants to support climate change activities and provided as a seed fund for clean technology investment.

CDM regulation in China

The regulatory framework for CDM implementation is outlined in the Chinese government's *Measures for the Operation and Management of Clean Development Mechanism Projects* (CDM-PMC, 2009). This serves as the main legal basis for the CDM implementation in China, including guidance on the eligibility of the projects, the application guidelines, the approval procedure of the DNA, the priority areas of sustainable development, and the CER revenue-sharing policies.

Only Chinese enterprises are eligible to apply for CDM projects because only locally owned (at least 51% ownership) companies are allowed to own CDM projects in China. The Chinese government included this regulation to protect local enterprises' ability to participate in the CDM activities. However, according to a recent survey of European enterprises operating in China's CDM market (CDM-PMC 2009), this eligibility requirement is considered as a major barrier for foreign investment and technology innovation in China.

The CDM project owner is required to submit to the DNA the following documents: the PDD, certification of enterprise status (enterprises licence), general description of projects, the Engineering Feasibility Approval from NDRC, and the Environmental Impact Assessment (EIA) approval from the Environmental Protection Administration (CDM-PMC 2009). The project owner is also required to present the Emissions Reduction Purchase Agreement (ERPA) or purchase intent, and the consultant service contract for review. The CER price agreed to in the ERPA is one of the elements to be reviewed and a minimum price, or pricing floor, is given as a 'guideline'. One argument for the price floor is that the GHG emission reduction resources are considered state-owned in China and in the early stages of CDM the local project owners may not have the capacity to negotiate the appropriate purchase price. Also, it is also argued that clear guidance on CDM pricing in China can have a positive impact stabilising the international carbon market and give project owners clarity on potential CDM revenue streams (personal communications 2009).

Although there is no clear framework to define which type of project will contribute the most to sustainable development in China, priority areas for CDM development include energy efficiency, renewable energy and methane recovery and utilisation, which is consistent with the country's overall climate change and energy policies[2].

Prioritisation of the CDM development is implemented and enforced through the CER revenue-sharing policy. According to the Chinese government, GHG emission reduction resources are owned by the Chinese government and the CER revenues generated from the specific CDM projects shall be jointly owned by the project owner and it (NDRC 2005). This statement allows the government to charge certain percentages of the CER revenue from the different types of CDM projects. According to the different priorities, the government therefore collects fees at different levels from the CER revenues, based on the principles below:

- 65% for projects involving HFC and PFC emission reductions;
- 30% for projects involving N_2O emission reductionl
- 2% for projects in priority areas and forestation projects.

---

2 One of the current research projects under the EU-China CDM Facilitation Project, *The Impact Assessment of CDM Projects in China on Sustainable Development* (August 2009), is trying to develop a suitable methodology to evaluate the contribution to sustainable development from different type of CDM projects.

Chinese sustainable development priorities and the CER revenue-sharing scheme appear to have an influence on the current CDM project development trend, in which both the number and the expected annual CERs of renewable energy projects and energy efficiency projects take the biggest share of the pipeline.

4.2 CDM experience in China: Key drivers and obstacles[3]

4.2.1.1 Key drivers

The worldwide CDM pipeline shows China has been a successful player in the CDM market. While there are many factors which have affected CDM development in China, we have found the following points to be particularly salient drivers of CDM development in China:

Firstly, the relatively well-established regulatory framework and procedure from the DNA has facilitated the CDM development. The efficiency of the Chinese DNA has also been improved in recent years, which allows for fast development of a large number of CDM projects.

Secondly, capacity building at the early stage for different stakeholders is commonly viewed as a key driver that has enhanced the local project participants' knowledge and skills, which has significantly facilitated development of the CDM. The engagement and development of local CDM project developers and consultants is also a positive result of different capacity building programmes. There has been numerous capacity building projects and schemes in China targeting the DNA and the local authorities. The EU-China CDM Facilitation Project, for example, is a large capacity building project funded by the European Commission and jointly implemented by Chinese and European partners. Other European member states have also funded similar projects, such as government of Denmark, the UK government, and the Italian government. The regional CDM centers have actively been involved with capacity building projects and the Chinese government has attached great emphasis to CDM awareness raising and knowledge dissemination. Frequent CDM events organised by the Chinese government and other agencies in China have proven to be an effective platform for information exchange and knowledge sharing for the local CDM stakeholders.

Based on the successful capacity building programmes, local expertise and human capacity have been tapped into and mobilised. There is sufficient human capacity and knowledge base in China to implement CDM projects. The opportunity of a growing market has continuously attracted high quality expertise to the field, creating a virtuous cycle that has propelled forward the CDM market.

Thirdly, the overall socio-economic and policy context in China provides an excellent environment for CDM development. In the socio-economic aspects, China has experienced on average over 10% growth from 2005 to 2008; even with the global economic downturn starting from late 2008, GDP growth in 2009 in China is still expected to exceed 8% (Whelan 2009). The robust economic development in recent years has created huge potential for GHG emission reductions and therefore for CDM projects. The rapidly increasing power generation capacity and the large-scale production of cement, steel and iron have provided opportunities for renewable energy and energy-efficiency CDM projects from the power sector and the energy-intensive industries.

---

3 The analysis in this section draws significantly draws upon the experience of authors Lin Na and John Fay in implementing the EU-China CDM Facilitation project.

Lastly, and possibly most salient, the perspective of overall Chinese governmental policy has been instrumental in enabling CDM. The development of renewable energy and energy conservation is a top priority in China's overall national planning and strategies. In 2006, the Renewable Energy Law was formulated to promote the development of renewable energy. Further, 2007's Medium- and Long-term Development Plan for Renewable Energy has set up specific renewable targets by 2020. Besides the renewable energy policies, the domestic energy conservation and emission reduction programme has intensified, with various energy efficiency projects being launched. As a result, the domestic policy trends have been perfectly matched with a more mature status of CDM to create a booming market and project pipeline in China. This has resulted in significant uptake of CDM by large-scale state-owned enterprises (SOEs) and investment groups which are actively involved in project development, and has profound implications for the enhancement of the CDM (EU 2009a). SOEs are involved in sectors such as power generation, energy-intensive manufacturing industries including cement, steel and iron. In the power generation sector, the big SOEs are highly involved in the development of CDM projects. The five largest power-generating SOEs, China Datang Corporation, China Huaneng Corporation, China Huadian Corporation, China Power Investment Corporation, and China Guodian Corporation, have developed a large number of CDM projects in the pipeline, taking a significant share of the wind and hydro CDM projects (UNEP 2009).

Key obstacles

Although CDM development in China is generally viewed as a success, there are various issues which could be improved upon there and in other developing countries. Firstly, an appropriate guideline to direct CDM towards sustainable development is currently missing in China. As a market-based mechanism, CDM orientation can be focused on the market players' interests to the detriment of sustainable development. The DNA has the responsibility to guide the CDM towards sustainable development of the host countries and should develop comprehensive criteria for sustainable development at the early stage of CDM development. Since the CDM is continuously evolving and is a learn-by-doing process, the CDM guidance should remain flexible in order to address the emerging issues. The Chinese CDM measures which serve as the legal basis for CDM implementation were officially formulated in 2005 and now may require modifications to further enhance the sustainability criteria of CDM in China.

Secondly, due to fast-growing CDM projects in China, the demand for DOE[4] services is increasing but capacity is limited, creating a significant bottleneck in the CDM process. The validation and registration of an individual project is taking longer than in previously years, increasing risks and costs for all other project stakeholders. Capacity building for domestic DOEs in China started much later than for the DNA and project developers, resulting in validating and verification bottlenecks in the CDM process. Until March 2009, the DOEs were only international organisations with no domestic firm accredited by the EB. However, on 25 March 2009 at the EB 46 meeting, two Chinese Applicant Entities (AEs), the China Environmental United Certification Center and China Quality Certification Centre were accredited

4 A DOE is a domestic or international legal entity accredited and designated by the EB, which validates the proposed CDM projects and subsequently requests the registration of the project at the EB, and verifies the emission reductions, certifies the CERs and requests the EB to issue the CERs.

as DOEs for both verification and verification/certification functions (UNFCCC 2007). Since the domestic DOEs are now accredited, project developers have begun using their services; this has been considered by some to be a faster option due to fewer projects in their working schedule and easier follow-up communication (interview with K Lieberg, 6 November 2009).

Thirdly, apart from the domestic barriers, uncertainty raised from the international climate change negotiations has challenged the healthy operation of the market and is viewed as a significant obstacle to further CDM development in China. Any market-based mechanism like CDM resulting from the policies and politics is generally viewed as highly risky for the market, and lack of clarity in the market serves to exacerbate the risks (interview with S Kwan, 6 November 2009). There needs to be greater certainty in the markets from a regulatory perspective in order to facilitate a healthy and stable market. This is seen as a general limitation of the CDM, applying to all the host countries and CDM stakeholders.

5. CDM in South Africa

5.1 Overview

Project scope

South Africa affirmed accession to the Kyoto Protocol on July 31 2002, entering the Protocol into force on 16 February 2005 (REEEP 2009). While other emergent economies have successfully harnessed the potential of CDM to varying extends, South Africa has consistently been a laggard since CDM inception. As at October 21, 2009, only 131 CDM projects have been submitted to the South African DNA, consisting of 102 Project Idea Notes (PINs) and 29 PDDs. Of the projects submitted to the DNA, only 33 projects have advanced to validation, representing 17 registered, four issuing CERs and another 12 at various stages in the CDM EB pipeline (DNA 2009). In addition, the trend of project submission to the DNA has not seen a noticeable increase in 2009, considering only 35 projects have been submitted to the DNA as at October 2009, compared to 41 in the whole of 2008.

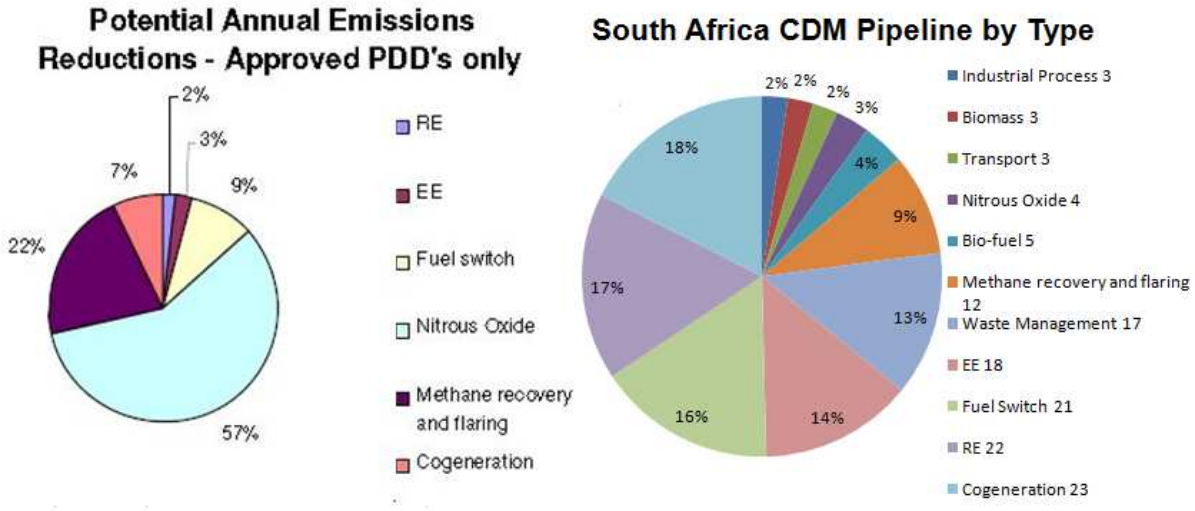


Figure 3: South African annual CERs by approved PDD and CDM pipeline by project type

Source: DNA (2009)

The project types of all CDM projects submitted to the DNA are illustrated in Figure 3, indicating a high percentage of cogeneration, renewable energy, fuel switch, energy efficiency, waste management and methane recovery and flaring. However, when comparing that to the number of projects that have been moved through the process and corresponding CER potential, the nitrous oxide projects account for a majority of credits, while renewable energy, energy efficiency and waste management have had little success in generating CERs; representing a significantly smaller percentage of total CERs than their percentage of total projects in DNA pipeline.

CDM management in South Africa

The DNA, within the Department of Energy, has the legal mandate to oversee the CDM in South Africa under Section 25 of the National Environmental Management Act. Since its inception in 2004, the main task of the DNA has been to assess potential CDM projects, to determine whether they 'assist South Africa in achieving its sustainable development goals and to issue formal host country approval where this is the case' (DNA 2009). However, as a result of the weak institutional and policy framework and lack of capacity the DNA has been playing an important role in providing support to project developers and promoting CDM in South Africa to potential investors. Unfortunately, the private sector and investors in South Africa have been too conservative and not forthcoming to promote CDM (interview with L Chauke, 28 October 2009). To overcome these challenges the South Africa Clean Development Mechanism Industry Association (SACDMIA) was launched in 2007. to provide a platform for CDM industry stakeholders to promote their common interests, that is, 'CDM investment promotion, capacity building, and research or facilitation dialogue with the relevant institutions, civil society and government'; it strives to formulate a common perspective on how to stimulate growth within the energy sector, and streamlining the existing operational environment so that the CDM can act as a vehicle for reducing GHG emissions and driving foreign direct investment (van den Berg 2007). As the lead contributor in the African CDM project pipeline and among the few well-functioning DNAs in Africa, the South African DNA also participates in the DNA Africa Forum to discuss challenges within the CDM process with stakeholders such as DOEs.

The DNA is also mandated to promote the establishment of CDM projects in South Africa 'in cooperation with other government agencies with the same or similar responsibilities' such as the Department of Environment (NEMA section 25 (3) (1)(e)). However, other relevant government agencies have not been active in promoting CDM in South Africa (e.g. the Department of Trade and Industry and the National Treasury which are part of the DNA steering committee), a scenario which has slowed the uptake of CDM projects in the country. A senior Department of Energy official involved with the DNA noted that other government agencies needed to be more proactive in participation of CDM workshops and promoting CDM in the country (interview with L Chauke, 28 October 2009). This is seriously undermining South Africa's performance in the CDM market as there is no coherent structure within government departments to attract investment and manage CDM in South Africa. The DNA requires support from other departments which can leverage investment for CDM more effectively than the Department of Energy.

CDM regulation in South Africa

The regulatory framework for CDM implementation is outlined in a government gazette (section 25(7-8) of the National Environmental Management Act (NEMA). This serves as the main legal basis for the CDM implementation in South Africa,

including guidance on the eligibility of the projects, the application guideline, the approval procedure of the DNA and the sustainable development criterion.

Project developers or owners enter the CDM project approval process through voluntary screening or mandatory submissions. The voluntary screening provides the DNA with an opportunity to carry out an initial screening of the project and provide feedback to the developer on the likely performance of the project against approval criteria. This is done via submission of a brief PIN and an application form to the DNA. The mandatory submissions require all projects to submit a detailed description of the project via a PDD and an application form to receive a letter of approval from the DNA. The PDD should already have been validated by the DOE at this stage. The PDD is posted on the DNA website for public consultation for a period of 30 days. The DNA will then provide a recommendation based on the consultation and its evaluation process and then sends them to the DNA steering committee for consideration. Based on the comments from the committee, the DNA makes its final decision on the approval of the project.

Unlike in China, the South African DNA has a set of defined sustainable development criteria which guides the evaluation of the projects. These criteria are guided by the definition of sustainable development in NEMA Section 1 (xxix): 'the integration of social, economic and environmental factors into planning, implementation and decision making so as to ensure that development serves present and future generations'.[5] Despite having this definition and guidelines, a DNA senior official noted that it is difficult to 'measure the social development impact within CDM' (interview with L Chauke, 28 October 2009). Therefore, the DNA encourages the N_2O projects in South Africa which have minimal positive impact to social and economic development to invest in other social community projects (ibid). However, the DNA official explained that if the number of N_2O projects increases, the DNA will consider imposing a tax on these CDM projects as is the case in China.

5.2 CDM experience in South Africa: Key drivers and obstacles

Key drivers

While CDM in South Africa has not generated a large number of projects to date, there are positive aspects within the structure which could serve as the foundation to increase South African CDM uptake. The following points are encouraging elements the research has identified within the South African CDM experience.

Firstly, while the absence of an efficient DNA is often regarded as a hindrance to increasing CDM in Africa, this does not seem to be the case in South Africa (NEPAD, 2009). The South African DNA is well organised and highly regarded both domestically and internationally. Our research has indicated the South African DNA is doing an effective job administering the CDM limited pipeline to date. Stakeholders interviewed consistently regarded the DNA highly, comments including: 'responsive and helpful with a transparent and clear process' (A van Roffet, interviewed 28 October 2009); 'really tried to push CDM and has done a fairly good job' (M Parramon, interviewed 30 October 2009); and 'one of the best functioning DNAs in the world – clear process and committed to timelines … will engage for a solution to work for all on any problems' (H Sa, interviewed, 28 October 2009).

5 Further information regarding the NEMA sustainable development definition can be found at: http://www.dme.gov.za/dna/dna_susdev.stm.

Secondly, the South African economy is based on a high emission structure, providing ample possibilities for CDM projects. The high dependency on coal-based power, and a growing demand for electricity provides an ideal baseline scenario for energy efficiency and renewable energy projects, creating significant potential for CDM projects (du Toit, 2009: 49). While there has been slow uptake to date in these sectors, increasing electricity tariffs and improved technologies are increasingly making renewable energy projects more cost-competitive, thus increasing the likelihood of implementation. In addition, there is great potential for the CDM to support important sustainable development priorities of the South African government, e.g. the Integrated National Electrification Programme, and the White Paper for Renewable Energy target of 10 000 GWh by 2013 (REEEP 2009).

Thirdly, there is a strong base of local project developers with the technical expertise to develop projects in South Africa. While most other countries in the Southern Africa region have few if any local groups with the expertise to successfully develop a CDM project, South Africa has many capable CDM stakeholders and a CDM industry association.

Key obstacles

There is a great deal of hesitancy and uncertainty regarding the perceived risks of CDM in South Africa. Throughout the research, the following issues emerged as recurrent obstacles to greater CDM uptake in South Africa.

First, potential South African projects owners in the public and private sector have a perceived lacked of the vision required to fully harness CDM opportunities. This is compounded by a lack of governmental capacity, public awareness and overall education regarding climate change and CDM (du Toit, 2009:54). The public sector has been hesitant to take on additional responsibilities of developing CDM and the private sector is unwilling to take on the risks associated with investing in CDM (personal communication 2009). The conservative nature of South African business combined with limited regulatory pressure to reduce emissions has resulted in an unwillingness to make sustentative investment into CDM (NEPAD 2009). While local expertise is available in South Africa to navigate the intricacies of the CDM process, organisations that would own the CERs have not possessed the ability to identify quality opportunities and corresponding benefits, resulting in little uptake of potential CDM projects. In addition, the carbon markets are complicated and continually evolving, thus requiring a champion at each stage of the project development cycle in order to implement. Due to the conservative business environment in South Africa, few project champions have emerged to date. As a result, the critical mass required to propel the CDM market forward has not been generated.

Second, the overall complexities of the CDM market have been a disincentive to both public and private entities in South Africa. The uncertainty surrounding the CDM market, including fluctuating market prices and little post-2012 clarity, has created a situation whereby the upfront investment to access the CDM is a major deterrent to moving projects forward. The long approval process and concerns regarding if a project will be registered also contributes to hesitancy of potential project owners to engage in the process. There is also a need for increased flexibility of existing approved methodologies from the EB. If an existing methodology cannot be leveraged, the cost of developing a new methodology was cited during our stakeholder interviews as a prohibitive factor to CDM, and while 'BRIC countries have

developed numerous CDM projects, this does not mean that the opportunity automatically extends to South Africa' (DME 2009: 13).

In addition, the high cost of validation and lack of South African DOEs is a major bottleneck to CDM projects. All project developers contacted during our research indicated issues with DOEs as a major problem in South Africa due to cost and availability. Validation costs, varying by project type from an estimated €10 000 to as high as €58 000 for a programmatic CDM validation, represent a significant investment by project developers or owners (interviews, 2009). Additionally, as many DOEs are European organisations, costs are often denominated in euros, adding further uncertainty due to exchange rate risks. The timelines and subsequent overall expense of validation has increased in the past two years, in one project developer's experience from approximately 3-6 months to 8-12, resulting in further expenses for the CDM projects (interveiw with R Spalding, 30 October 2009). This problem was further exacerbated in September, 2009 when DOE SGS United Kingdom Ltd, which has been active in South Africa, was suspended by the EB.[6]

The third main obstacle identified is the underlying financing of CDM projects. Even though an implicit intent of the Kyoto Protocol is to increase FDI for emission reduction projects, CDM experience has shown that the onus 'rests almost entirely on investors in developing countries being willing to put up the financing for the projects, that through the generation of CERs help developed country emitters avoid having to make such investments' (Lütken 2009). Depending on project type, the income from the CERs is usually not sufficient to cover the overall project costs. As a result, there is a need to find debt or equity financing which can be difficult to secure in a reasonable timeframe. This can be extremely difficult as financial return is not guaranteed until the CERs are delivered unless sold ex-ante, often at a significant discount. As a result, CDM financing can easily become an afterthought which can only be leveraged after underlying project finance is organised, which is then further complicated as this can bring into question financial 'additionallity' of the CDM project. Compounding this problem has been the financial crisis; the perceived higher risk of African-based project finance has made funding even more scarce due to the current risk adverse investment climate (Interview with K Reuss, 30 October 2009).

The fourth major obstacle our research has identified is the lack of meaningful governmental or regulatory support for renewable energy and a dependence on high-emission coal based power. The South African *White Paper on Renewable Energy* (2003), has set a target to produce 10 000GWh from renewable energy sources (mainly from biomass, wind, solar and small-scale hydro) by 2013; the report also deemed this target to be economically viable through subsidies and carbon financing. To date, only two renewable energy CDM projects have been registered and no subsidies on the scale required to meet the target have been disbursed, leaving South Africa's modest renewable energy target significantly off-track to meet its 2013 goal. This is a significant point of departure for South Africa in comparison to the global CDM experience, where renewable energy projects represent 59% of the overall CDM pipeline (UNEP 2009).

However, in order to reverse this dearth of renewable energy project and support the 2013 renewable energy target, the National Energy Regulator of South Africa

6 The UNFCCC list of DOEs indicates SGS as suspended: http://cdm.unfccc.int/DOE/list/index.html, viewed November 10, 2009.

(NERSA) released in March 2009 the Renewable Energy Feed-In Tariff (REFIT) regulatory guide (NERSA, 2009). The REFIT guidance document appointed Eskom, the centralised, single energy buyer in South Africa, as the Renewable Energy Purchasing Agency (REPA) and set 2009 tariffs by renewable energy technology (see Table 3).

Table 3: REFIT 2009
Source: Renewable Energy Feed-In Tariff (REFIT)(2009)

Technology	*REFIT (R/kWh)*
Wind	1.25
Small hydro	0.94
Landfill gas	0.90
Concentrated solar	2.10

While the REFIT has the potential to help incentivise CDM development, no power purchase agreements have been signed as of the end of October 2009 because Eskom does not have funds to pay the REFIT, as stated by Eskom's Director of Sustainability (UNEP FI Roundtable, 23 October 2009). Funding for REFIT is to be requested through the 2010 tariff request.

As South Africa's primary energy producer and buyer, Eskom is the key player to lead both renewable energy and energy efficiency projects but has done little to galvanise the renewable or CDM industries. Eskom's Director of Sustainability indicated that initially there was great excitement in 2004 when CDM became available; however, reality around downstream funding and the difficult registration process tempered enthusiasm for CDM. This is confirmed by looking at Eskom's direct CDM experience: the parastatal submitted three PINs to the South African DNA in 2006 and one in 2007, comprising two renewable energy and two energy efficiency projects, of which none have submitted PDDs to the DNA due to lack of underlying funding for the projects (Interview with M Rambakos, interview, 28 October 2009).

With low electricity prices from coal-based generation in South Africa, independent power producers (IPPs) need a stable planning horizon, strong off-taker agreements and a tariff and regulatory framework in place that provides an adequate return to make renewable projects feasible. Without these assurances on the project's financial metrics, renewable energy projects cannot get off the ground, resulting in a missed opportunity for a robust renewable energy CDM pipeline in South Africa. To date, Eskom has not provided off-taker agreements that make projects feasible, slowing the renewable and subsequently the CDM markets. Eskom's lack of willingness to engage directly with CDM or provide a conducive environment for IPPs demonstrates a need for greater coordination between the policy and development framework and key entities such as Eskom

6. Analysis and conclusions

While the uncertainty surrounding the post-2012 climate change regime has adverse implications for all countries developing CDM projects, it also provides an opportunity to address the obstacles to CDM worldwide and within CDM host countries. Ideally the international negotiations will streamline the cumbersome CDM process

and deal with difficulties regarding DOEs, permissibility and establishment of applicable methodologies and underlying financing. This is also an ideal time for South Africa to reflect on its overall CDM experience in order to better promote emission reductions and sustainable development. By 'looking East' to understand the drivers of China's effective implementation of CDM, South Africa can explore its own CDM experience to better understand why it has not been fully leveraged.

By comparing the CDM experience of China to South Africa's, it becomes evident that, while there are many influencing factors, the main CDM element which has allowed China to thrive and South Africa to lag behind is the implementation of a robust policy framework and engagement by key governmental and private sector stakeholders. Such a robust policy framework will engage key government, private and public sector stakeholders and provide the underlying incentives required to unlock the potential of CDM. Collaboration and engagement among different stakeholders also paves the way for robust leadership within government and the private sector with a clear understanding of the CDM potential.

The Chinese government and industry decision-makers quickly recognised the opportunity of CDM and developed a policy structure to nurture the nascent industry. Similar to South Africa, China has an increasing demand for power and has prioritised the development of renewable energy and energy efficiency, creating incentives that have enabled these project types to move forward. As a result, renewable energy and energy efficiency projects represent nearly three quarters of the CDM project pipeline in China. In contrast, South Africa has suffered from a lack of leadership around the implementation of emission reductions an integrated part of development strategy. Policy to enable renewable energy in South Africa has been wholly ineffective and stifled by Eskom's unwillingness to leverage CDM as a financial incentive. To better leverage CDM, policy and its implementation needs to prioritise low carbon development approaches and integrate it throughout all development initiatives. Finally, while it is unlikely South Africa will agree to stringent emission caps at international climate change negotiations, considering policies similar to China's efforts to reduce emission intensities has the potential to promote CDM participation.

The South African government also needs to ensure that policies can be realistically implemented in order to avoid cases whereby Eskom is unwilling to sign power purchase agreements for renewable energy due to a lack of funding for the incremental expense mandated in the REFIT. This will only be possible through better communication and collaboration across all relevant governmental departments. Policy-makers need to be continually engaged to be made aware of the evolving CDM opportunities in order to continually align regulation to fully exploit the potential incentives of CDM.

Further, while alignment of overarching polices is important to drive CDM, a greater awareness and understanding of opportunities and benefits of CDM by key public and private sector decision makers at the 'Board' level is needed to better exploit opportunities that have so far been left unharnessed. As exemplified by the Chinese management structure of CDM, significant involvement by many decision-making entities in government and business is required. This is a relevant lesson for South Africa as increased awareness by decision-makers is important to maximise CDM utilisation. While the South African DNA has been running CDM promotion workshops since 2006, the DNA acknowledges low participation from the key decision-makers that own the assets eligible for CDM projects, resulting in a communication gap that can only be bridged through combined efforts with 'other government min-

istries, trade groups and industry associations' (Interview with L Chauke, 28 October 2009). Through creating greater awareness of the CDM process and aligning with governmental development priorities, potential project owners will have the incentive to move CDM projects forward, and be better informed about the market based incentives available to generate emission reductions by following sound advice, adhering to CDM rules and planning for extended timelines.

To conclude, the Chinese and South African CDM experiences highlight the need for a systematic approach to create a vibrant environment for CDM to thrive in host countries. CDM project potential and technical capacity to work through the intricacies of CDM is not sufficient to harness its full potential. The alignment and implementation of governmental development policy with emission reductions and sustainable development, as defined by each country, is also required to make possible CDM participation and provide the underlying incentive for governmental and private sector asset owners required to unlock the potential of CDM.

References

Bohringer, C., Klaassen, G., Moslener, U., 2007. Technology Transfer and Investment Risk in International Emissions Trading. *Climate Policy* 7 (6): 467-469.

Bryman, A. 1988. *Quantity and Quality in Social Research.* Hymna: London.

Capoor, K. and Ambrosi, P., 2009. State and Trends of the Carbon Market 2009. World Bank: Washington DC.

Comim, F., 2008. Climate Injustice and the Capability Perspective. *Development* 51(3), 344-349.

Denzin, N K., 1970. *The Research Act: A Theoretical Introduction to Sociological Methods*. Aldine" Chicago.

Du Toit, L., 2009, Promoting Clean Development Mechanism in South Africa: Law and Policy. *SA Public Law* 24(1): 33-55.

Ellis, J., Winkler H., Corfee-Morlot J., Gagnon-Lebrun F., *2007*. CDM: Taking Stock and Looking Forward. *Energy Policy* 35 (1): 15-28.

EU [European Union], 2009a. EU-China Facilitation Project: The Pre-2012 CDM Market in China-Policy Context and current Developments. Available online at www.euchina-cdm.org/media/ ocs/CDM_Project_The_Pre_2012_CDM_Market_in_China_2009_07_20_EN. pdf (Accessed 4 November 2009.)

EU [European Union], 2009b. EU-China Facilitation Project: The CDM Policy Improvement in China.

Figueres, C., Haites, E. and Hoyt, E., 2005. Programmatic CDM Project Activities: Eligibility, Methodological Requirements and Implementation. Study for the Carbon Finance Business Unit of the World Bank. World Bank: Washington DC.

Figueres, C., and Streck, C., 2009. Enhanced Financial Mechanisms for Post 2012 Mitigation. Background Paper to the 2010 World Development Report. Policy Research Working Paper 5008. World Bank: Washington DC.

Gantsho, M., and Karani, P., 2007. Entrepreneurship and innovation in Development Finance Institutions for Promoting the Clean Development Mechanism in Africa. *Development Southern Africa* 24(2): 56-71.

Holm Olsen, K., 2007. The Clean Development's Contribution to Sustainable Development: A Review of the Literature. *Climate Change* 84 (1): 59-73.

IETA, 2005. Strengthening the CDM: Position Paper for COP 11 and COP.MoP 1: Position Paper to COP12 COP/MOP 2. IETA.

Intergovernmental Panel on Climate Change (IPCC), 2007. *Climate Change 2007: Synthesis Report-Summary for Policymakers.* Geneva: IPCC.

Jick, T D., 1979, Mixing Quantitative and Qualitative methods: Triangulation in Action. *Administrative Science Quarterly* 24 (4): 601-611.

Lütken, S., 2008. Developing Country Financing for Developed Country Commitments? A Reformed CDM, Copenhagen Denmark: UNEP Risø Centre.

Mason, J., 1996, *Qualitative Researching*. Sage: London.

McGown, A., CDM: A Mechanism for Eliminating Poverty? *Environment,* 50(3): C2.

Ministry of Environment Protection (China), 2008. Emission Standard of Coal Bed Methane/Coal Mine Gas. Available online at http://english.mep.gov.cn/standards_reports/ standards/Air_Environment/Emission_standard1/200810/t20081031_130728.htm (Accessed 20 October 2009).

NERSA [National Energy Regulator of South Africa], 2009. Renewable Energy Feed In Tariff. Online at http://www.nersa.org.za/UploadedFiles/ElectricityDocuments/ REFIT%20Guidelines.pdf. (Accessed 20 October 2009).

NEPAD-OECD., 2009. Boosting Africa's Energy Sector through Carbon Finance. Background Paper for the Ministerial Meeting and Expert Roundtable of the NEPAD-OECD Africa Investment Initiative, 11-12 November.

Neuman, W.L., 2006. *Social Research Methods: Qualitative and Quantitative Approaches,* 6th Edition. Pearson: Boston.

Nhamo, G., 2007. CDM project approval and evaluation criteria: Comparative study of Morocco and South Africa. In Aravossis, K., Brebbia, C.A., Kakaras, E., & Kungolos, A.G. (Eds), *Air Pollution 2007*, WIT Press: Southampton, 553-562.

Nhamo, G., 2006. Institutional and legal provisions for the Clean Development Mechanism in South Africa. In Aravossis, K., Brebbia, C.A., Kakaras, E., & Kungolos, A.G. (Ed). *Environmental Economics and Investment,* WIT Press: Southampton, 167-176.

Oleschak, R and Springer, R., 2007. Measuring host Country Risk in CDM and JI projects: A Composite Indicator. *Climate Policy* 7(6) 470-487.

REEEP [Renewable Energy and Energy Efficiency Partnership], 2009. South Africa Policy and Regulatory Review. Available online at http://reeep-sa.org/projects/ doc_download/56-south-africa-2009. (Accessed 3 November 2009.)

Republic of South Africa, 1998. National Environmental Management Act (NEMA) (107 of 1998).

South Africa Designated National Authority (DNA), 2009. South Africa CDM Project Portfolio: 21 October 2009. South Africa DNA, Ministry of Energy.

Sutter, C. and Parreno, J.C., 2007. Does the Current Clean Development Mechanism (CDM) Deliver its Sustainable Development Claim? An Analysis of Officially Registered CDM Projects. *Climate Change,* 84 (1)**,** 75-90.

NDRC [National Development and Reform Commission], 2005. Beijing Declaration on Renewable Energy for Sustainable Development.

NDRC [National Development and Reform Commission], 2009. China's Position on the Copenhagen Climate Change Conference.

National Energy Regulator South Africa (NERSA), 2009. *South Africa Renewable Energy Feed in Tariff (REFIT): Regulatory Guidelines March 26 2009*. NERSA: Pretoria.

UNEP [United Nations Environment Program, Risøe Centre], 2009. CDM/JI Pipeline Analysis and Database. Avalable online at http://cdmpipeline.org.

UNFCCC [United Nations Framework Convention on Climate Change], 2007. *Climate Change: Impacts, Vulnerabilities and Adaptation.* Bonn: UNFCC.

UN [United Nations], 1998. Kyoto Protocol to the United Nations Framework on Climate Change. Available online at http://unfccc.int/resource/docs/convkp/kpeng.pdf. (Accessed 21 June 2009).

Wara, M., 2007. Is the Global Carbon Market Working? *Nature,* 445, 595-596.

Wara, M. and Victor, D., 2008. A Realistic Policy on International Carbon Offsets, PESD Working Paper, Stanford University.

Welch, C., Marschan-Piekkari, R., Penttinen, H. and Tahvanainen, M., 2002. Corporate Elites as Informants in Qualitative International Business Research. *International Business Review*, 11**,** 611-628.

Yeoh, P., 2008. Is Carbon Finance the Answer to Climate Control*? International Journal of Law and Management*, 50 (4), 189-206.

Youngman, R., Schmidt, J., Lee, J., De Connck, H., 2007. Evaluating Technology Transfer in the Clean Development Mechanism and Joint Implementation. *Climate Policy* 7(6) 488-499.