

CDM/JI Initiative

Country Study

China

A CDM Market Overview of the CDM Service Unit China

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Foreword

The country report presented here is part of the CDM/JI Initiative launched by the German Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) to encourage the participation of German companies in the flexible mechanisms established under the Kyoto Protocol. At the same time, the Initiative aims to intensify bilateral co-operation with governments and institutions in the host countries for CDM and JI in order to support their respective national climate policies.

The initiative will help market players to maximize their use of the opportunities presented by the Clean Development Mechanism (CDM) and Joint Implementation (JI). It particularly targets small and medium-sized enterprises (SMEs) that participate in the EU emission trading scheme in Germany, but also technology providers. The SMEs often lack information about CDM and JI project implementation and relevant networks in host countries, which are needed to leverage investments for projects and to complete emissions-trading agreements. The activities conducted as part of the initiative take a long-term approach and pursue a clear objective of continuing cooperation efforts when the first Kyoto Protocol commitment period ends in 2012. Innovative instruments like the programmatic approach, with the potential to scale up the flexible mechanisms and to tap new sectors, are therefore also part of the scope of the Initiative.

On behalf of the BMU, GTZ aims to develop portfolios of CDM projects in India, China and Brazil that can be implemented before 2012. CDM projects in these countries operate in a very competitive environment, and specific market information provided by GTZ can facilitate the successful implementation of CDM projects. Other countries to be prioritized by the Initiative are in the Middle East and North Africa (MENA) Region, which has numerous sectors with considerable CDM potential.

As an initial step in its country activities, GTZ was assigned to prepare six CDM country studies in Brazil, China and India, as well as Egypt, Morocco and Tunisia in the MENA region.

The aim of the country studies is to identify information gaps and offer suggestions for overcoming these. The studies first present an overview of the national CDM market by analysing the CDM projects that have been submitted, approved and processed to date, together with the methodologies used. National institutions, international organisations and other relevant actors are taken into account, thereby providing a detailed picture of the national CDM market. Secondly, the study identifies untapped sectors and new potential for CDM projects. The studies provide a basis for developing a project portfolio that focuses particularly on high quality, innovative projects which still need support in order to gain market access.

We hope the reader finds this and the other five reports useful as an orientation for the CDM in the countries concerned.



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Executive Summary

China hosts the largest and most dynamic CDM market in the world. About 35 % of the global CDM projects are developed in China. As these are in average larger compared to other CDM markets, China's global market share of the annual Certified Emission Reductions (CERs) in the pipeline (under development) is 56 % and 52 % for the projects that have been registered with the CDM Executive Board (EB) of the United Nations Framework Convention on Climate Change (UNFCCC). China has experienced rapid growth in both the number of projects and number of CERs since 2006. More than 70 % of China's CDM pipeline is at validation. A next sharp increase of the projects registered by the CDM Executive Board (EB) of the UNFCCC can be expected although the CDM EB might examine projects more strictly in view of additionality.

The average size of CDM projects in China is decreasing but varies from sector to sector. Biomass projects have significantly increased in size and Biogas projects have significantly decreased in size. Hydropower, Windpower and Energy Efficiency projects have taken the lead in the CDM pipeline (80 % of the number of projects and 40 % of the expected CERs). The market for 'low hanging fruit projects' (HFCs, N₂O) has slowed down. In general, a high variation in CER issuance (min. 12 % - max. 132 % for Windpower) can be observed. Indeed, CDM Projects in China are vulnerable to low performance (lower issuance of CERs than calculated in the Project Design Document, PDD). This is because of operational reasons, local market conditions and the complexity of the verification and the monitoring plan in the Project Design Document (PDD).

The regional dimensions for the CDM market in China are important as well as the availability of natural resources; but also different policy initiatives/incentives in the provinces support the CDM development at different scale. Large State-Owned Enterprises (SOEs) and Municipal Enterprises (MEs) dominate the CDM ownership. More intermediaries facilitate between owners and buyers and are involved in the CDM project management. The choice of the proper CDM developer and Designated Operational Entity (DOE) is crucial for the quality and speed of implementation. More than 60 % of the Chinese CERs are bought by funds and aggregators.

Market dynamics drives new CDM sectors in China. Low risk type projects are preferred by buyers; therefore Biomass Power and Biogas Power projects are desired. Also Windpower remains attractive due to extra project revenue from electricity production, although underperforming in view of issued CERs. Industrial energy efficiency (waste gas, waste heat recycled for power generation) has become more attractive for investors and buyers given the large size of the projects. Energy efficiency from Waste Heat Recovery (WHR) and fuel switch are generally good performers and preferred by buyers.

Four new sectors were introduced in the CDM pipeline during the last 12 months. The sectors Biomass, Biogas Power and Windpower are growing with reliable project developers (e.g. SOEs). Programmatic CDM (PCDM) or Programme of Activities (PoA) is not supported by the government in its present format. Nonetheless, it could have a positive impact on sustainable development and Greenhouse Gas emission reduction in China if modified by UNFCCC. The post 2012-regime is uncertain - especially its impact on the CER price and the voluntary market. It is recommended that the positive effects of CDM be investigated and that new technology in the energy sector needs to be promoted separately with own financial incentives, making it a stand-alone tool for GHG emission reduction.

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List of Abbreviations

ADB	Asian Development Bank	MFA	Chinese Ministry of Foreign Affairs
CBM	Coal-bed Methane	MOA	China Ministry of Agriculture
CDM	Clean Development Mechanism	MOF	China Ministry of Finance
CDM EB	CDM Executive Board of UNFCCC	MOP	Members of Party
CDMF	Clean Development Mechanism Fund	MoST	Chinese Ministry of Science and Technology
CDM PMC	CDM Project Management Centre	MtCO₂eq.	megatons of carbon dioxide equivalent
CER	Certified Emission Reduction	N₂O	Nitrous oxide
CH₄	Methane	NCCCC	National Coordination Committee on Climate Change
CMA	China Meteorological Administration	NDRC	National Development and Reform Commission
CMM	Coal-mine Methane	NLGCC	National Leading Group on Climate Change
CO₂	Carbon dioxide	PCDM	Programmatic CDM
CO₂eq.	Carbon dioxide equivalent	PCER	Programmatic Certified Emission Reduction
COP	Convention of Parties	PDD	Project Design Document
DNA	Designated National Authority	PFCs	Perfluorocarbons
DOE	Designated Operational Entity	PIN	Project Idea Note
EB	Executive Board	PoA	Programme of Activity
EE	Energy Efficiency	RE	Renewable Energy
EIA	Environmental Impact Assessment	SF₆	Sulphur hexafluoride
ERI	Energy Research Institute	SOE	State Owned Enterprise
ERU	Emission Reduction Unit	tCERs	Temporary Certified Emission Reduction
EU	European Union	UK	United Kingdom
EU ETS	European Union Emissions Trading Scheme	UNCED	United Nations Conference on Environment and Development
EUR	Euros	UNEP	United Nations Environment Programme
GHG	Greenhouse Gases	UNFCCC	United Nations Framework Convention on Climate Change
HFCs	Hydrofluorocarbons	USD	US Dollars
JI	Joint Implementation	VERs	Verified Emission Reductions
KP	Kyoto protocol	WB	The World Bank
ktCO₂eq.	kilotons of carbon dioxide equivalent	WHR	Waste heat Recovery
ICERs	Long term Certified Emission Reduction	WWF	World Wildlife Fund for Nature
ME	Municipal Enterprise		
MEP	China Ministry of Environmental Protection		

1. The CDM in China

Key observation: China provides more than 50 % of the global Certified Emission Reductions (CERs) and EU based entities are buying more than 80 % of these.

The United Nations Framework Convention on Climate Change (UNFCCC) is an international treaty that is a result of the United Nations Conference on Environment and Development (UNCED). Clean Development Mechanism (CDM) is defined by Article 12 of the Kyoto protocol as a project-based emission reduction mechanism. The Kyoto Protocol was adopted at the 3rd session of the Conference of the Parties (COP3) to the United Nations Framework Convention on Climate Change (UNFCCC) held in Kyoto, Japan, in December 1997. China ratified the Kyoto Protocol in August 2002 as a non Annex I party (no emission caps).

The Kyoto Protocol became operational on February 16, 2005. China's CDM market had a comparatively low start with less than 30 projects in the pipeline in 2004 and 2005 while India, Brazil and Mexico were leading the CDM pipeline at that time. The development of CDM projects in China gained momentum (and consecutively took the lead) in 2006 and is currently the largest and most active CDM market world-wide.

Europe and China are leading the fast-growing international business of CDM. EU countries and EU-based entities are buying more than 80 % of all emission credits globally and China's share of the market ([projects registered at UNFCCC's CDM Executive Board](#)) as seller of Certified Emission Reductions (CERs) is more than 50 %, generated from roughly one quarter of all UNFCCC registered projects world-wide. As of October 1, 2008, China has 271 projects registered with the CDM Executive Board (EB) of UNFCCC, with total estimated annual Certified Emission Reductions (CERs) of 117 megatons of carbon dioxide equivalent (MtCO₂eq.). In total, 1445 CDM projects have been approved by the Designated National Authority (DNA) of China up until October 1, 2008. An outline of the CDM market in China, the current activities and players, as well the future will be discussed in the below in this document.

1.1 The Designated National Authority (DNA) of China and CDM Policy

Key observation: The National Development and Reform Commission (NDRC) holds the key role for CDM policy and measures in China.

Parties participating in the CDM shall set up a designated national authority (DNA) for the CDM (UNFCCC Kyoto Protocol CMP/2005/8/Ad1, p12, paragraph 29). The designated national authority (DNA) is the national authority responsible for the approval procedure of the CDM project upon compliance with internal laws and policies and international CDM regulations. In October 2003, the National Coordination Committee on Climate Change ([NCCCC](#)) was established in order to implement the affairs on climate change under the guidelines of the State Council of China. It is hosted by the National Development and Reform Commission ([NDRC](#)). The management of CDM projects in China involves major institutions. On the top-level, the National Leading Group on Climate Change (NLGCC), headed by Premier Wen Jiabao, was established under the State Council with an office within the National Development and Reform Commission (NDRC). It was

first formalised by [China's National Climate Change Program](#), issued by NDRC on 04 July 2007, and represents 18 ministries. The NLGCC is responsible for the review and coordination of important CDM policies.

Formally, the DNA is the National Development and Reform Commission (NDRC). The DNA represents China at the UNFCCC and approves the projects after their revision by the National CDM board. The National CDM Board is co-chaired by NDRC and the Ministry of Science and Technology (MoST) and vice-chaired by the Ministry of Foreign Affairs (MFA). The National CDM Board hosts expert groups from different institutions which advise NLGCC on CDM policy and designs operational and practical approval procedures. Members of the National CDM Board are the Ministry of Finance (MOF), Ministry of Agriculture (MOA), Ministry of Environmental Protection (MEP), and China Meteorological Administration (CMA). The CDM Project Management Centre (CDM PMC) assists the DNA in project approval and enforces/applies China's National CDM measures. The CDM PMC was established under NDRC's Energy Research Institute (ERI).

In brief, the NDRC hosts the NCCCC and NLGCC offices, co-chairs the national CDM Board, serves as China's DNA, and supervises the specific CDM administration activities. The NDRC and DNA therefore hold the key role in China's CDM market.

1.2 Regulatory Framework and CDM Management in China

1.2.1 CDM Measures in China

Key observation: The Designated National Authority (DNA) mainstreams the CDM in China by defining priority areas, incentives (CER taxation), and eligibility requirements.

In June 2004, the "Interim Regulations for CDM (Draft)" were released by the National Coordination Committee on Climate Change to implement the CDM in China. On the same date, the "[Measures for Operation and Management of Clean Development Mechanism Projects in China](#)" were issued by the co-chairs and vice chair of the National CDM Board (NDRC, MoST, MFA). These measures were modified by the NCCCC on October 12, 2005 and provide general rules and project procedures as well as admission requirements. Nonetheless, the 26 articles of the CDM measures set the outline for successful CDM implementation.

The DNA's approval of CDM projects strongly depends on some key characteristics which seek to cover the technical and policy dimensions. The following aspects are checked considering national regulations and international CDM rules:

- ownership qualification,
- PDD contents and quality,
- baseline methodologies and GHG emission reductions,
- CER price review,
- funding and technology transfer conditions,
- crediting period,
- monitoring plan and
- assessment of sustainable development benefits.

In particular, the DNA has to check the Project Design Document (PDD) against the Energy Conservation Law, Renewable Energy Law, and other related legislative frameworks that include special financial incentives to promote energy efficiency, renewable energy, and coal-mine methane/coal-bed methane (CMM/CBM) in China. Additionally, the following requirements have to be fulfilled:

Eligibility Requirement for Project Owners: Only Chinese funded or Chinese-held enterprises (with at least 51 % of the equity share owned by Chinese entities or citizens) within the territory of China are eligible to conduct CDM projects with foreign partners. This provision has been frequently criticised as an obstacle to technology transfer; companies are reluctant to bring advanced technologies into projects they do not own. Moreover, the Chinese Government has decided to be the ‘owner’ of the emission reduction resource, while emission reductions generated by specific CDM projects belong to the project owner and revenue from the transfer of CERs shall be owned jointly by the Government of China and the project owner ([article 24 of the China CDM Measures](#)). Therefore, foreigners can only be buyers of CERs and cannot directly benefit from the CER revenues.

Priority areas for CDM projects in China: Priority areas are regarded as those that contribute to sustainable development. These are energy efficiency improvement, development and utilization of new and renewable energy, and methane recovery and utilization. The development of CDM projects in these areas is encouraged by the government (and consequently others are discouraged) through taxation of the CERs. Sectors generating CERs at low cost (‘low-hanging fruits’) and with limited contribution to sustainable development are highly taxed. The taxation rate for CERs is listed in [Table 1](#).

Project type	HFC	PFC	N ₂ O	Priority Areas ¹	Forestation
Tax rate in % (of the CER price)	65 %	65 %	30 %	2 %	2 %

Table 1: Taxation of CERs from different types of CDM projects in China (Source: [NCCCC](#))

Review of CER Price by Chinese DNA: Since the beginning of the CDM market, the DNA performs (unofficially) a price review on the CERs resulting from CDM project activities in China. In the Chinese carbon market, there is an imposed “tacit” floor price value for CERs, which is reported to have increased from Euro 8 to Euro 9 but is project dependent, favouring the priority areas. CER prices have to be submitted by the owner/developer as a condition for approval of the CDM project application. The price of the CERs is fixed at the time of the submission for the Letter of Approval (LOA) from the DNA to the project owner.

Requirement on Environmental Impact Assessment (EIA): According to Chinese laws and regulations, especially the Environmental Protection Law and the Law on Environmental Impact Assessment (EIA), buildings or construction projects in China shall conduct and submit EIA reports during their initial design stage. This applies as much to CDM projects as to any other project and obtaining EIA is one of the pre-conditions for DNA approval.

¹ energy efficiency improvement, development/utilization of new/renewable energy, methane recovery/utilization

Requirement on Feasibility Study and other Approval Procedures: Apart from the EIA, all projects in China including CDM projects involving engineering/construction require approvals from the appropriate government agencies before construction can begin. For example, different stages of the project feasibility study need to be approved by the National Development and Reform Commission, or if the project involves land use then approval from the relevant land resource administration agency must be obtained.

1.2.2 The CDM Project Activity Cycle

Key observation: The CDM Executive Board of UNFCCC and the Chinese DNA set the outline for the CDM Project Activity Cycle.

The first step for CDM application in China is the submission of the CDM application to the National Development and Reform Commission (NDRC) which hosts the DNA. The process is illustrated in [Figure 1](#). The national CDM approval procedure can be obtained from the [CDM Country Fact Sheet: China](#) of the Institute for Global Environmental Strategies. Further guidance (online) can be assessed from the recently published 'CDM rulebook' of Baker & McKenzie and the '[CDM Information and Guidebook](#)' of the UNEP project Capacity Development for CDM (CD4CDM).

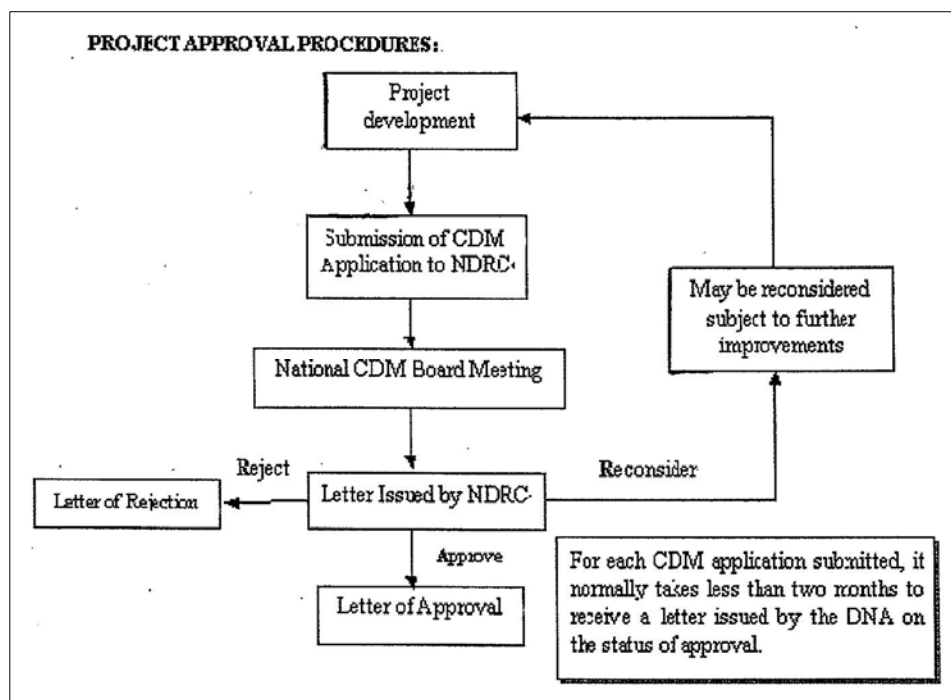


Figure 1: Approval procedure for CDM projects in China (source: [NCCCC](#))

The entire CDM project activity cycle ([Figure 2](#)), including the administrative procedures with the CDM Executive Board of UNFCCC presents some differences from country to country, but it is essentially made of 5 steps: Design, Validation/Registration, Monitoring, Verification/ Certification and issuance. These steps are further explained below and follow the CDM project activity cycle in [Figure 2](#).

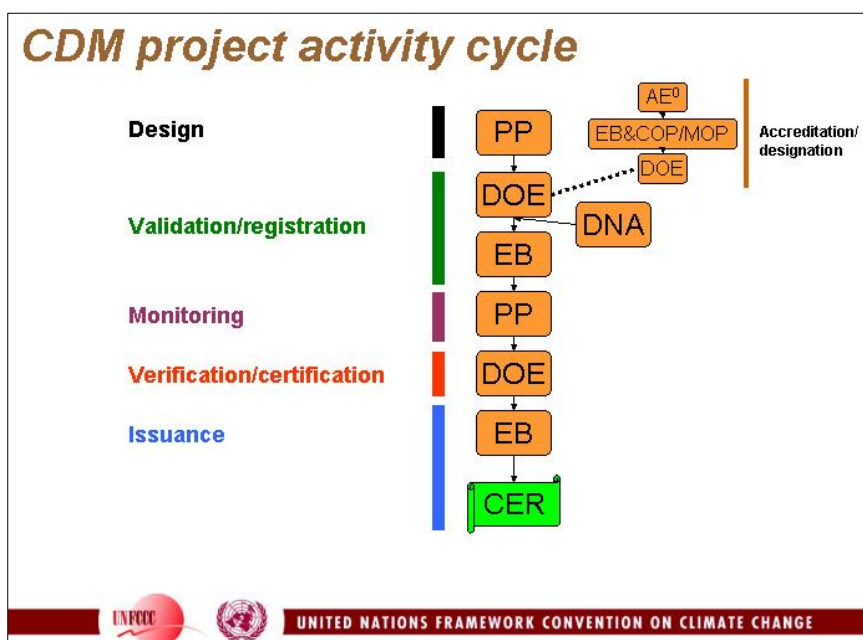


Figure 2: The CDM Project Activity Cycle (source: [UNFCCC](http://unfccc.int))

Design: Project Design is the task of the project developers or owners. It has to consider the eligibility criteria, the additionality of the project, and its compliance with the national sustainable development criteria. The project developers have to submit a Project Design Document (PDD) for validation and receive approval from the DNA and Designated Operational Entity (DOE, see below). [The Project Design Document \(PDD\)](#) and the [Guidelines for completing PDD](#) which include a glossary of terms (approval, authorization, project participants, etc.) have been developed by the CDM Executive Board of the UNFCCC on the basis of Appendix B of the CDM modalities and procedures. Project participants shall submit information on their proposed CDM project activity using the Project Design Document (PDD).

<http://cdm.unfccc.int/Projects/pac/howto/CDMProjectActivity/DesignandDevelop>

Validation/Registration: The national DNA shall approve the project upon compliance with internal CDM rules. The project has to be [validated](#) by an independent Designated Operational Entity (DOE) that will provide documentation to the CDM Executive Board of the UNFCCC regarding the approval of [new methodologies or the use of already existing ones](#). Registration is the formal acceptance by the Executive Board of a validated project as a CDM project activity. Registration is the prerequisite for the verification, certification and issuance of CERs related to that project activity. Of the 56 EB-approved large-scale [methodologies](#), 5 have been used for pipelined projects in China, partially in combination with each other (AMC2: 7 projects, AMC2 + ACM4: 4 projects, ACM4: 11 projects, ACM4+ACM1: 1 project, ACM 4+ACM2: 11 projects, AMC8: 2 projects, AMC8+ 2: 1 project, AMC 29: 1 project, AMS-I.D.: 15 projects).

Monitoring: The project participants are responsible for the monitoring of the project and report to the DOE in accordance with the monitoring plan designed for the project.

Verification/Certification: The Designated Operational Entity is responsible for verifying and certifying the GHG emissions reductions of the CDM project (ex-post determination). The DOE will then report to the CDM Executive Board.

Issuance: After having received the report from the DOE, the CDM Executive Board will issue the CERs.

1.2.3 The China CDM Fund

Key observation: The China CDM Fund will facilitate the CDM market and develop measures for CDM investment.

The establishment of a non-profit National CDM Fund was stipulated in the updated CDM measures and regulations of 2005. Approved by the State Council in August 2006, the China CDM Fund (CDMF) and its management center were established under the Ministry of Finance and began operations in March 2007, supervised by a National CDM Fund Board which is chaired by the NDRC and supported by various other ministries (Ministry of Science and Technology, Ministry of Foreign Affairs, Ministry of Environmental Protection, China Meteorological Administration, Ministry of Agriculture). The fund itself was launched with a theoretical \$3 billion budget² in November 2007 with the aim to collect tax revenues from the sale of CERs and the revenue collected upon CERs transfer benefits from CDM projects. The CDM market is not the only source of funding of the CDMF and hence also other programmes of the National Climate Change Programme (NCCP) will be implemented through the CDM Fund (CDMF) in cooperation with the corresponding ministries, the Asian Development Bank (ADB), the World Bank (WB), and other international government agencies. The World Bank supported the draft operational strategy and made an advance payment from a Prototype Carbon Fund. ADB supported the CDM Fund to set-up the CDM fee collection mechanism, supported the governance structure, and the design of the operations manual.

The CDM Fund (CDMF) will support seven operational programmes: capacity building, public awareness, energy efficiency and energy conservation, renewable energy, other activities with significant benefits for climate change mitigation and adaptation, and financial investment. The regulations have not yet been published and the guidelines for the CDM Fund are still under development, e.g. the percentage of the fund to be used for capacity building, project grant assistance, or project investments. These are expected to be released in spring 2009. Nonetheless, following CDM related activities have been identified to be supported by the CDMF:

- Enhance the institutional and management capacity of CDM regulation and policymaking.
- Enhance the participation of wider CDM stakeholders including domestic consultants and financial institutes.
- Capacity building for CDM project owners to strengthen understanding of national and international regulations and enhance negotiating skills.
- Business facilitation, basically to help support the entry of international CER buyers and investors into the Chinese carbon market.
- Strategic investment and asset management as related to CDM projects.
- Participate and support the development of CDM methodologies.
- Support the applications for Chinese DOEs to the UNFCCC.
- Monitoring the development of the international carbon market and climate regime.

² This number was released by the press in 2007, which includes the estimated Official Development Assistance (ODA), estimated CER revenues until 2020, and NCCP budget flowing into the CDMF in the upcoming years. At present, the operational budget is about 10m CNY (about 1.1 m EUR).

1.3 The CDM Market in China

1.3.1 CDM Pipeline, Registered Projects, and Global View

Key observation: After rapid growth in 2006, China now hosts 35 % of the global CDM projects and 56 % of the annual CERs (pipeline). More than 150 new projects are approved by China's DNA per quarter. 40 % of the projects which are 'at validation' are in China.

China's share of the number of CDM projects world-wide is about 35 % (Table 2). However, the Chinese projects are, on average, larger than in the rest of the world. This results in a global market share of 56 % of the annual CERs in the pipeline and 52 % of the CDM Executive Board (EB) registered projects. According to the CDM Pipeline provided by [UNEP Risoe](#), as of October 1, 2008, China had 1445 CDM projects in the pipeline, of which 271 were registered by the CDM Executive Board (EB). The annual emission reduction that can be achieved by the projects in the pipeline is 305 megatons (Mt) of CO₂eq. and 117 MtCO₂eq. for the projects that are registered with the EB. Only 4 projects have withdrawn or were rejected while an increasing number of projects (October 2008: 53 projects) have correction requests, almost exclusively in the sectors of energy efficiency through their own generation (waste heat recovery) and in hydropower.

Based on these statistics, China is the largest and most dynamic CDM market in the world. As can be seen in [Figure 3](#), the CDM pipeline for China gained momentum in the first quarter of 2007. In the 3rd quarter of 2008, still more than 150 new projects are approved by China's DNA per quarter. In comparison to India, which hosts the second largest CDM market, China added up to three times more CDM projects to its pipeline on a quarterly base in 2007.

Status	Number of China CDM Projects	Number of world-wide CDM Projects	China's share in world-wide CDM projects (%)	China Annual CER (MtCO ₂ eq.)	China's share in world-wide annual CER (%)
Registered	271	1170	23.2	117	52
Registration Request	47	80	58.8	31.69	77
Correction Request	53	94	56.4	n/a	
At Validation	1042	2565	40.6	156.6	55
Under review	20	41	48.8	n/a	
Review Request	12	17	70.6	n/a	
Total	1445	4064	35.6	305.3	56

Table 2: Chinese CDM Projects in the Pipeline as of 1 October 2008

(source: based on [UNEP Risoe](#))

However, the figure also outlines the comparatively late start of the Chinese CDM market and the uneven quarterly dynamics of DNA approved projects compared to India.

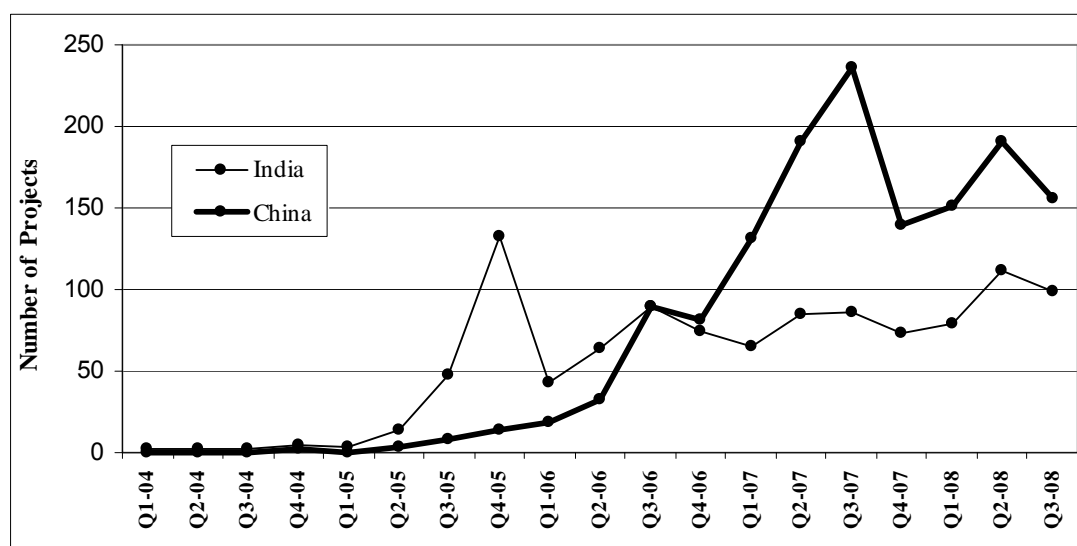


Figure 3: China's CDM Projects in the Pipeline (per Quarter) from Q1/2004 – Q3/2008
(source: based on [UNEP Risoe](#))

1.3.2 CDM Project Types, Size and Trends

Key observation: 50 % of the projects in the Chinese CDM pipeline are from Hydropower, followed by Windpower (18 %) and Energy Efficiency (16 %). The average project size is decreasing. The number of Biomass and Biogas Projects doubled in 2008.

[Table 3](#) describes the Chinese CDM projects and annual CER volume by project type as of October 1, 2008. Small hydro CDM projects dominate the CDM pipeline with a share of nearly 50 % of all projects and nearly 40 % of the EB-registered projects. The number of wind power projects has also increased substantially, almost 6-fold in the pipeline and 3-fold for EB registered projects since the end of 2006. These figures are the result of a successful Chinese climate policy fostering the redirection of these immense amounts of investment capital into the renewable energy sector in China ([Lütken and Michaelowa 2008](#)).

Nonetheless, despite a large number of renewable energy CDM projects, the share of CERs from this project type is still low. As of October 1, 2008, renewable energy only accounted for slightly more than 10 % of the total CERs in both pipeline and for EB registered projects while N₂O projects will produce 35 % of the entire CER in the pipeline. As can be seen in [Table 3](#), for Renewable Energy projects, the average CER (ktCO₂eq. per year) and project number was relatively low compared to the CBM/CMM, HFCs or N₂O destruction projects. However, the average project size for all CDM types has decreased by nearly 50 % ([Table 4](#)), which is also described in the report '[The Value of Carbon in China Carbon Finance and China's Sustainable Energy Transition](#)' for WWF HONG KONG/ BEIJING OFFICE. This is as HFC and N₂O projects are becoming fewer and smaller in the China CDM pipeline. At present, of 11 N₂O projects in the pipeline, only one is not yet EB-registered.

Type	China CDM Projects in Pipeline				China CDM Projects Registered			
	No.	% of total	Avg. CER (ktCO ₂ eq/yr)	Avg. CER (ktCO ₂ eq/yr/project)	No.	% of total	Avg. CER (ktCO ₂ eq/yr)	Avg. CER (ktCO ₂ eq/yr/project)
Afforestation	1	0.07	1	1	0	0	0	0
Agriculture	1	0.07	58	58	0	0	0	0
Biogas	21	1.45	1323	63	1	0.37	110	110
Biomass Energy	52	3.60	9828	189	11	4.06	1606	146
Cement	6	0.42	1344	224	0	0	0	0
CBM/CMM	56	3.88	25088	448	10	3.69	5930	593
EE Industry	8	0.55	1032	129	0	0	0	0
EE for own generation	228	15.78	40812	179	26	9.59	7358	283
EE Supply Side	3	0.21	1485	495	0	0	0	0
Fossil Fuel Switch	30	2.08	27960	932	8	2.95	6400	800
Fugitive	1	0.07	403	403	0	0	0	0
HFCs	11	0.76	65769	5979	10	3.69	57790	5779
Hydro	691	47.82	70482	102	105	38.75	9030	86
Landfill Gas	45	3.11	7245	161	13	4.80	2925	225
N ₂ O	28	1.94	21756	777	17	6.27	18428	1084
Reforestation	5	0.35	165	33	1	0.37	26	26
Solar	4	0.28	144	36	0	0	0	0
Wind	254	17.58	29972	118	69	25.46	7452	108
Total	1445	100 %	304867	210	271	100	117055	431

Table 3: Chinese CDM projects and annual CER volume- by project type (1 October 2008)
(source: Calculations based on data derived from [UNEP Risoe](#))

When comparing the current pipeline with the EB-registered projects, the sharpest increase of the average project size can be identified as Biomass Energy and Reforestation projects, followed by Hydro and Fossil Fuel switch CDM Projects. In turn, Biogas, CBM/CMM, EE for their own generation, N₂O and Landfill Gas projects have significantly decreased in average project size (average CER in ktCO₂eq/yr/project).

Nonetheless, the CDM project trend is further highlighted in [Figure 4](#), which displays the China CDM Pipeline (project number) per sector type on the dates 01/05/2008 and 01/10/2008. Within only 5 months, the number of Biomass projects has nearly doubled and 4 new project types now appear in the pipeline for the first time, namely EE supply side, Fugitive, Solar, Agriculture and Afforestation.

Project Type	Project Size Variation	Project Type	Project Size Variation
Biogas	- 42.7	Hydro	+18.6
Biomass Energy	+ 29.5	Landfill Gas	-28.4
CBM/CMM	- 24.5	N ₂ O	-28.3
EE for own generation	- 36.7	Reforestation	+26.9
Fossil Fuel Switch	+16.5	Wind	+9.3
HFCs	+3.5	Total	-48.7

Table 4: Variation of CDM project size between registered and overall Pipeline
(% of average CER in ktCO₂eq/yr/project) (source: calculations based on [Table 3](#))

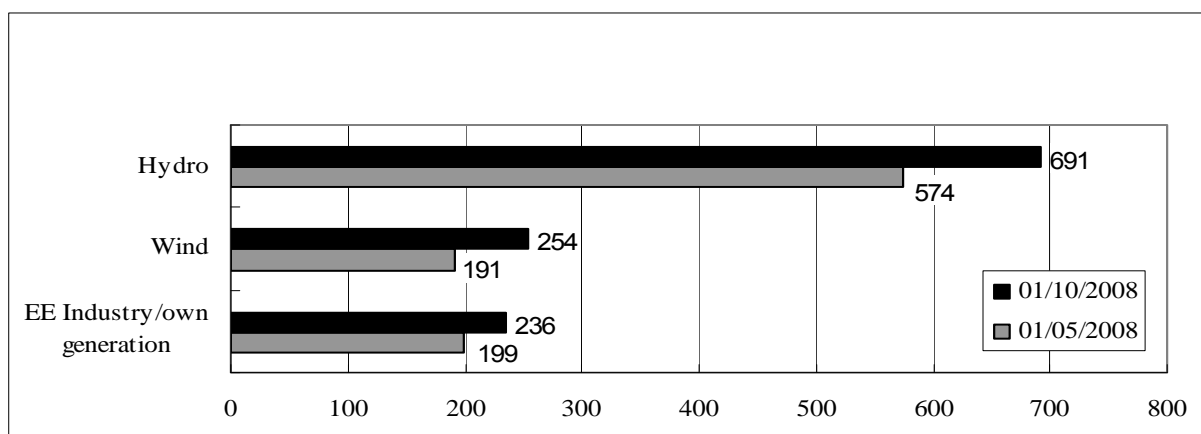
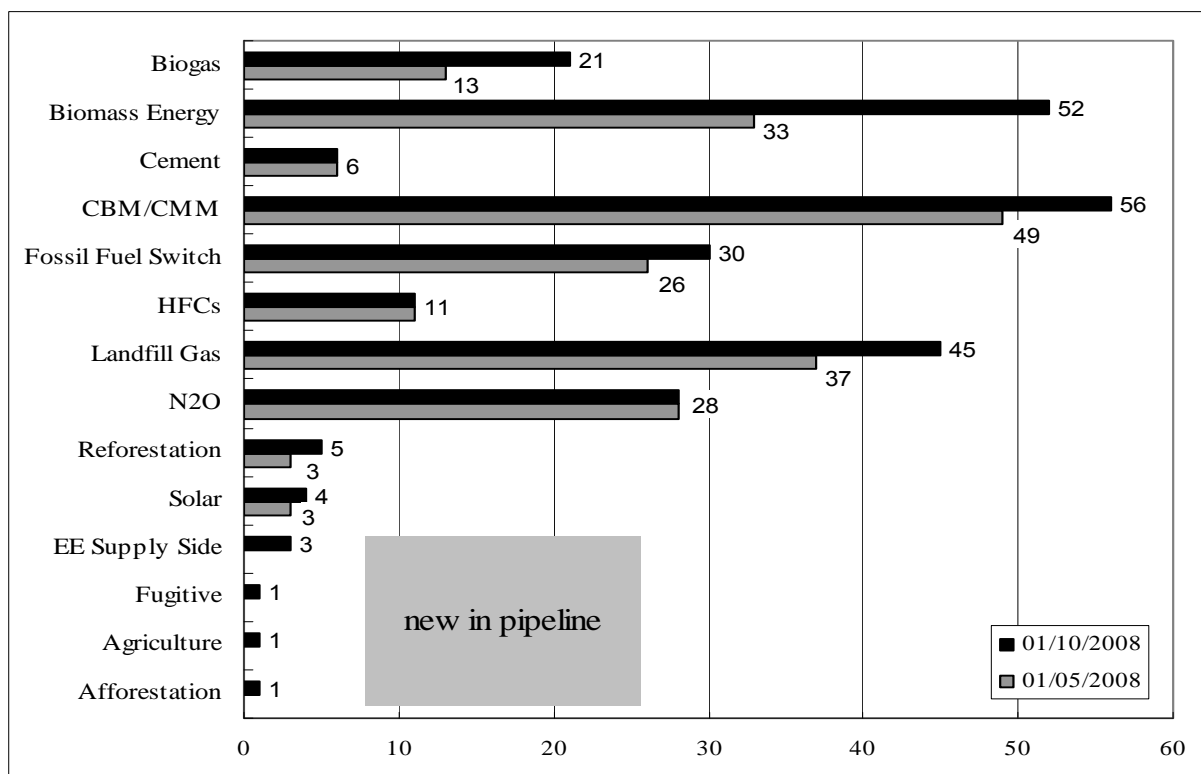


Figure 4: China CDM Pipeline (project number) per sector type for 01/05/2008 and 01/10/2008 (source: Calculations based on data derived from [UNEP Risoe](#))

1.3.3 Issuance Rates of CERs

Key observation: High variation in CER issuance (min. 12 % - max. 132 % for Windpower). CDM Projects are vulnerable to low performance (lower issuance of CERs than calculated in Project Design Documents). Experienced PDD writer is important for performance.

Until October 1, 2008, 67 CERs with a total volume of 71 MtCO₂eq were [issued by the EB](#) for CDM projects in China. This represents 17 % of all CERs issued world-wide and 36 % of the entire volume. However, the issuance rates vary largely across seven different project types, i.e. Biomass, Coal Bed/Mine Methane (CBM/CMM), Energy Efficiency (EE), Hydrofluorocarbons (HFC), Hydropower, Landfill Gas and Windpower. For industrial gas, such as HFC, the issuance rate is high and more than 100 % of the expected CERs (based on the PDD) are achieved.

Within the same sector, variations can be significant. Renewable energy CDM projects are underperforming with average issuance rates of 87 % for all CERs receiving hydropower (minimum performance 12 %, maximum performance 132 %) and 75 % for wind power. For other project types, the issuance rates are at a low level - below 30 % - except for energy efficiency (60 %).

The HFC projects account for more than 90 % of the currently issued CERs. By 2012/2020 this proportion will decrease to about 60 %. Renewable energy and energy efficiency projects will increase to more than 20 % of the delivered CERs by 2012, especially taking into consideration the large number of this project type at validation. However, several reasons lead to variations across the EB-registered projects and within one project type.

There are risks associated with monitoring through to the issuance process that may lead to either reduced CERs or a delay of issuance of CERs ([Table 5](#)), and risks associated with verification. Methodology applied and technology installed may be complex and unexpected market/local conditions (e.g. import barriers for equipment, low availability of, for example, straw for a biogas project) imply risks for performance in terms of CER issuance.

CDM project cycle	Delivery risk
Monitoring	<ol style="list-style-type: none"> 1. Delay in operation 2. Technology mismatch and underperformance 3. Mismatch between monitoring plan in PDD and actual emission reduction
Verification	<ol style="list-style-type: none"> 1. DOE capacity bottleneck 2. UNFCCC capacity bottleneck 3. Limited verification guidance

Table 5: Risks associated with monitoring through to the CER issuance process
(source: compiled by the [EU-China CDM Facilitation Project](#))

With the 51-49 % ownership rule, foreign investors or developers have limited power in the decisions that can be made on the ground in terms of external risks. Often, operational reasons lead to underperformance (e.g. suboptimal operation of landfills) or management of wind farms leading to low turbine availability rates (operational deficit or low capacity factor). Again, foreign investors cannot control this issue.

Overestimation of the potentials of the CDM project (e.g. gas generation, electricity, heat) at the modelling stage is another reason for variation of performance, although this can be alleviated by selecting an experienced PDD writer. Poor quality of PDD consultancies is one of the reasons mentioned in the [WWF report on the value of Carbon in China](#).

1.3.4 CDM Regional Dimensions

Key observation: The regional dimensions for the CDM market in China are important: the availability of natural resources and different policy initiatives/incentives in the provinces support CDM development on a different scale.

Economic development and availability of natural resources are closely related in China and unevenly distributed over the country. Specific institutional frameworks and policy initiatives for different project types (e.g. provincial guidelines for coalmine methane utilisation, feed-in tariff for electricity from renewable energy sources, government priorities for infrastructure development) as well as energy needs and electricity grid availability underline the importance of regional dimension in the CDM market. [Table 6](#) and [Figure 5](#) list and display the number of CDM projects per CDM project type and their appearance in the provinces of China as of 01/10/2008, highlighting the regional dimension in the CDM market.

Hydropower projects are highly concentrated in Yunnan, Sichuan and Hunan, where water resources are rich. Wind power projects are highly concentrated in Inner Mongolia, Helongjiang, and Hebei. Energy efficiency projects are more evenly distributed across provinces where large-scale heavy and energy-intensive industries and manufacturing are located, such as in Shanxi, Jiangsu, Shangdong, Hubei and Anhui, while the number of waste heat recovery projects is growing fast in Shanxi and Shandong. Due to their mining activities, Shanxi has the highest number of CMM projects in the CDM pipeline. Although preventing a large volume of GHG emissions, the low number of HFC and N₂O projects is concentrated in Jiangsu, Zhejiang, Shangdong and Liaoning. Fossil fuel switch projects are concentrated in Zhejiang, Jiangsu, Guangdong, Fujian and Beijing.

It cannot be clarified whether natural resources, the positive effects of sustainable development accompanying CDM, regional measures or incentives, the different capacity of regional CDM service centers or the high concentration of CDM consultancies in Beijing and Shanghai influence the regional distribution of CDM projects in China. In terms of relative importance and reduction potential, it is important to bear in mind that the number of projects in different regions is not a sufficient indicator. It only examines the sectors on regional level and not the GHG emission reduction potentials.

China Provinces	Afforestation	Agriculture	Biogas	Biomass energy	Cement	CBM/ CMM	EE industry	EE own generation	EE supply side	Fossil fuel switch	Fugitive	HFCs	Hydro	Landfill gas	N2O	Reforestation	Solar	Wind	Total	
Anhui			1	4		7		16							1				29	
Beijing			1					2		3				1				2	9	
Chongqing						4		1				18			1				24	
Fujian				1				2		2		31	2					8	46	
Gansu						1		1				64							7	73
Guangdong			1					2		6		15	5					7	36	
Guangxi					1			6				41	2	1	2				53	
Guizhou				1		2	4					50							57	
Hainan								3				8							13	
Hebei			1	4		1		17				2			1			24	50	
Heilongjiang				2		3		2				2			1			25	35	
Henan			4	7		8		19		2		2	2	2				2	48	
Hubei		1		4		1	1	18		1		23	2					2	53	
Hunan				2				9		1		76	2						90	
Inner Mongolia			1	1	1			7		1		1			2			78	92	
Jiangsu			4	9				21		4		3		6				7	54	
Jiangxi				1		1		9					16	2				2	31	
Jilin			1	6		1	1	8				4	1					15	37	
Liaoning		1				2		8				1	6	1				18	37	
Ningxia						1		1		1		1					3	7	14	
Qinghai										1			13	1					15	
Shaanxi			1			1		4				14			1		1		22	
Shandong			4	8			1	23				2		3	4			24	69	
Shanghai								3	1	2								2	8	
Shanxi			1	1	2	21		27		2			9	2	4			6	75	
Sichuan					1	2		4				1	124	2	5	1			140	
Tianjin			1					1					1						3	
Xinjiang								2	1		1		8	1				9	22	
Yunnan							1	3					155	3	4	2		1	169	
Zhejiang				1	1			10	1	4		5	14	1				6	43	
Total Number	1	1	21	52	6	56	8	229	3	30	1	11	692	45	28	5	4	254	1447	
% of total	0.1%	0.1	1.5	3.6	0.4	3.9	0.6	15.8	0.2	2.1	0.1	0.8	47.8	3.1	1.9	0.3	0.3	17.6	100	

Table 6: Number of CDM projects per type and province in China as of 01/10/2008³
(source: based on [CD4CDM](#))

³ N.B.: The total number adds up to 1447 instead of 1445 as projects may be implemented in more than one province.

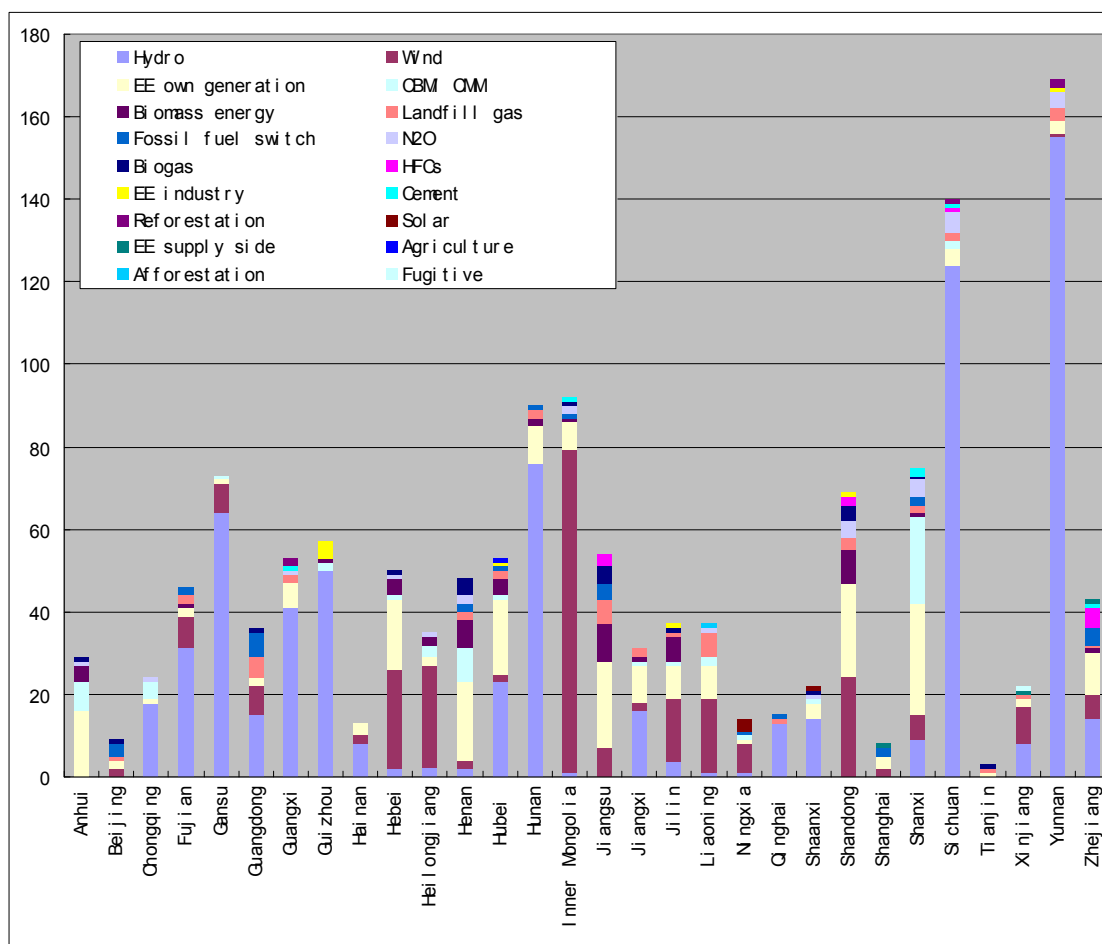


Figure 5: Number of CDM projects per type and province in China as of 01/10/2008
(source: based on [CD4CDM](#))

1.4 Stakeholders in the Chinese CDM Market

1.4.1 Project Owners

Key observation: Large-scale state-owned enterprises (SOEs) own 25-30 % and municipal enterprises and investment groups (MEs) 65-70 % of the Chinese CDM projects.

The CDM process involves several actors and stakeholders: Chinese-funded or Chinese-holding joint-venture enterprises (**project owners**) within the territory of China are eligible to conduct CDM projects with foreign buyers (cp. [Chapter 1.2.1](#)). The project owners submit their project to the DNA in the form of a PDD. They are responsible for providing all the documentation for the certification and validation process and for the implementation of the project and will benefit from the revenue obtained through the issuance and selling of the CERs (after deduction of any tax and transaction costs). Chinese project owners were mostly involved in small scale CDM projects in the first years of the Chinese CDM market, when project developers (consulting agencies) developed the highest number of CDM projects for the owners. More recently, there has been an increase in the participation of large-scale state-owned enterprises (SOEs) or municipal enterprises (MEs) and investment groups as project owner. These SOEs are involved in sectors

such as energy intensive manufacturing industries (such as iron, steel, chemicals and cement) and power generation (traditional energy sources and renewable energy such as hydro and wind). The increased presence of these large SOEs as project owners has marked a change in the market where more CDM projects are now initiated by project owners themselves, as opposed to the earlier stages where it was the project developers who were facilitating CDM development. Project owners often develop projects themselves, clearing the investment channels and technology matchmaking, while consulting agencies or other developers are hired by the owners for the administrative-methodology part (PIN, PDD) of the CDM project cycle.

It can be estimated that 65-70 % of the Chinese CDM projects are owned by MEs, 25-30 % by SOEs, and less than 10 % only by private entities.

1.4.2 Developers of CDM Projects

Key observation: Chinese Project Developers are: academic institutions, regional CDM service centres, and newly established domestic (or joint venture) consulting companies. The top 20 developers produced 45 % of the EB-registered projects (55 % of annual CERs).

At present, 52 Consulting Agencies (Project Developers) have registered with the Chinese Office of National Coordination Committee on Climate Change. The list with contact details can be derived from [NCCCC](#). The [EU-China CDM Facilitation Project](#) estimates that as of May 1, 2008, 160 CDM domestic and foreign consulting agencies were involved in 1173 CDM projects in China. 28 service providers with a base of operations in China have registered at the [UNFCCC CDM Bazaar](#). The CDM pipeline provided by [UNEP Risoe](#) can give an idea of the variety of the PDD consultants. However, CDM project developers per se are not necessarily the PDD consultants listed in the CDM pipeline published by UNEP Risoe.

Project developers are often the intermediates working on the CDM project development and hence realising the GHG emission reduction. However, the size, scope of service provided, and the level of human resource capacity vary substantially across different project developers. Furthermore, many of them, in particular the larger (and more experienced) ones, are “multifunctional”. They often provide full turn-key service - a comprehensive approach which follows the project from the identification stage (PIN) through to Project Design Document (PDD) writing, project development, monitoring and evaluation, verification and selling of CERs.

Therefore, project developers have taken on parallel roles as consultants (PDD) and CER investors or carbon traders. If they do not buy the CERs, they can be delegated by the project owner to facilitate, negotiate, and contract with CER buyers.

Large project developers dominate the CDM Pipeline and EB-registered projects. As of May 1, 2008, the top 20 developers (out of 160 or even more) have developed more than 45 % of the EB-registered projects; producing more than 55 % of the annual CERs ([Table 7](#)). The same 20 developers have also led more than 58 % of the projects in the CDM pipeline, producing 45 % of the annual CERs. Some of these top-20 have a highly diversified project portfolio, others are highly specialised. For example, the multinationals, such as Camco International and Eco

Securities⁴ cover almost all project types, including CBM, energy efficiency, wind, hydro and biomass. On the other hand, domestic consultants are much more specialised, preferring to focus on one project type only, usually either wind or small hydro (such as China Fulin Wind Power Development Corporation).

Chinese project developers can be categorized into three groups:

- **Academic institutions**, such as Tsinghua University, Hunan University, Guangzhou Energy Research Institute, with experience in PDD writing and technological knowledge
- **Regional CDM service centres**, (e.g. in Ningxia and Hebei provinces), being quasi profit-oriented consulting companies offering the whole range of CDM project development services).
- Newly established **domestic (or joint venture) consultant companies**, such as Easy Carbon, Cleanergy Investment Service, etc., offering their services also to third parties.

Developer Name	No.	CER ktCO₂/yr
EcoSecurities	18	982
Carbon Resource Management	12	3442
Millennium Capital Services	12	1108
Global Climate Change Institute, Tsinghua University	10	1526
Tsinghua University	7	736
CAMCO International	6	3096
Caspervandertak Consulting	6	39029
CWEME	6	1049
Ningxia CDM Service Center	4	577
Easy Carbon Consultancy Ltd.	5	1007
Foreign Economic Cooperation Centre of Environmental Protection	3	390
Arreon Carbon UK Ltd.	3	486
Green Capital Consulting Company	3	5306
COWI Consulting(Beijing) Co.,Ltd.	3	292
Hebei CDM Project Office	3	253
Shanghai Yangtze Delta Investment Consultancy Co	3	424
Beijing Haohua Rivers International Water Consulting Engineering Co.Ltd.	2	297
Beijing Keji Consulting Ltd.	2	1091
CREIA, Energy for Sus. Camco	2	372
Guodian Technology& Environment Group Co., Ltd.	2	1161
Total: 20	94	61642

Table 7: Top 20 developers of EB registered CDM projects (By 1 May, 2008)
(information kindly provided by the [EU-China CDM Facilitation Project](#))

⁴ Eco Securities has developed more than 100 projects in the CDM pipeline and is also a top CER buyer in China.

1.4.3 Buyers of CERs

Key observation: 80 % of the Chinese CERs are bought by EU entities, of which 40 % are based in the UK and are mostly carbon funds. More than 60 % of the CERs will be bought by funds and aggregators, the remaining 40 % by banks, industrials, utilities and multi-laterals and/or governments.

Credits can be exchanged between businesses or bought and sold in international markets at the prevailing market price. Buyers of CERs are (a) the parties (i.e. states) that have to fulfil Kyoto emission caps and that are not able or willing to achieve the Kyoto target by domestic action alone, (b) operators of plants under the EU emissions trading scheme (ETS) that buy CERs in order to reduce the need to cut emissions at their own plants or (c) market intermediaries/traders. Buyers can therefore be enterprises, public institutions, and public or private carbon funds. End-consumers also include commercial and individual customers who are interested in lowering their carbon footprints on a voluntary basis e.g. to compensate for flight transport (“carbon offsetting”). The buyers have usually been more involved in the development of CDM projects than the owners. Consultants, in particular, are very often contracted 1) by the buyer to ensure the smooth progression of the project (thus involving the buyers in the operation of the project), and 2) by the owners to establish contact and negotiate CER prices with the buyers. Therefore, CER buyers can also be regarded as stakeholders in the Chinese CDM market. However, CDM is logically a unilaterally (Chinese) driven investment activity as a foreign investor will never ‘own’ the CER issued for the CDM project (cp. [Lütken and Michaelowa 2008](#)).

The highest share of CERs until 2012 generated in China will be bought by funds and aggregators (>60 %), the remaining 40 % are nearly equally distributed between banks, industrials, utilities, multi-laterals and/or governments. 80 % of the emission credits produced by China are bought by EU entities, of which 40 % are based in the UK and are mostly carbon funds. Several large European utility companies that are among the main CER buyers use the credits for their own targets (**direct buyers**) such as German RWE, Italian ENEL, French EDF or Spanish ENDESA. The number of carbon trading companies (**consultant buyers**) operating in China has grown exponentially; as has the number of CER buyers who develop their own CDM projects, also for reasons of investment and selling their own technology (**investor buyer**).

2 entities are listed as buyers based in China in the [UNFCCC CDM Bazaar](#). Most buyers are based overseas. All buyers of Chinese CDM revenues can be derived from the [UNEP Risoe](#) CDM Pipeline, at least for the initial stage (PDD), not taking into account the strategic CDM development (official buyers making use of CDM as a flexible mechanism and trading the CERs). A comprehensive list of buyers and funds is provided by the ‘[Handbook with Checking List and Best Practice for CDM in China. Guideline on Selling your CDM Project](#)’ as part of an EU funded project, implemented by IST, CIRPS, Helio and GEI.

While the buyers for the **compliance market** are explained above, there is a growing number of retailers acting as consultants for “carbon offsetting” in the **voluntary market**. They directly buy carbon offsets from (small) projects and resell them to companies who are involved in CSR, make events carbon neutral (such as flight of workshop attendants), or simply advertise the GHG reduction projects they have supported.

1.4.4 Designated Operational Entities (DOEs)

Key observation: The Designated Operational Entities are a bottleneck in the CDM approval procedure. DNV and TUEV-SUED are the responsible DOEs for 75 % of the Chinese CDM pipeline. No Chinese DOE has been approved yet.

A list of DOEs operating in China is provided by the Chinese Office of [National Coordination Committee on Climate Change](#). There are 12 applicant and 29 accredited operational entities ([UNEP Risoe](#)), of which 3 are from China. Only China Environmental United Certification Center Co., Ltd. (CEC) and China Quality Certification Center (CQC) have received an indicative letter so far. Of note, three DOEs ([DNV](#), [TUEV-SUED](#), and [SGS](#)) have validated more than 75 % of all CDM projects world-wide, representing also more than 75 % of the validated projects (http://www.cdmpipeline.org/does_2.htm). They can be regarded as being the most experienced DOEs in the global CDM market. DNV and TUEV-SUED are also the responsible DOEs for 75 % of the Chinese CDM pipeline. The list of accredited and provisionally designated operational entities for validation functions with the sector scopes is provided by [UNFCCC](#).

Due to the limited number of DOEs operating in China and the high number of projects in the pipeline which are under verification, there is an administrative bottleneck on the DOE level. The selection of the DOE might be relevant for the time until a project CDM project can be implemented and receives issued CERs.

2. Reflection: Strengths and Challenges of the CDM market in China

Given the huge size of China, CDM is still not a trademark for sustainable development all over China, which makes China the largest CDM market in the world. CDM projects are still concentrated in the East of China, which has generally a higher level of development than the West of China. Given the decreasing trend of HFC projects and the natural limitations that the hydro-dominated South-West of China will be facing soon, new sector types of CDM projects have been tapped.

While China's and India's DNA screen projects for sustainable development and technology transfer, China gives preference to projects on the basis of sectors (CDM type such as Renewable Energy - RE- and Energy Efficiency - EE) and whether they promote development in priority regions (West China). This underlines the positive effect that environment and energy policies have on the development of CDM projects, especially in the RE and EE sector, where PDDs are checked against the Renewable Energy and Energy Conservation Laws.

2.1 Strengths of the Chinese CDM Market

Key observation: The Chinese CDM market is mature and has a strong political support. Incentives make the Energy Efficiency and Renewable Energy CDM market strong.

Some positive criteria make the Chinese CDM market interesting for international investors. These can be China-specific criteria, criteria related to the international CDM market.

Experience: The Chinese CDM market per se has abundant experience in developing and selling CDM projects.

DNA structure: the Chinese DNA and the institutions involved have proven to be the institutional backbone of China's CDM development. There is a close interaction between the CDM market and policy makers. Government support is market-oriented through regulatory measures, e.g. adjustment in policy priority areas such as Renewable Energy, and support of technology transfer.

Incentive measures: Taxation of CER revenues is an extremely efficient market control tool to steer the project types developed, to guide them to the energy conservation law priority areas and to access important issues connected with carbon markets. The floor price set by DNA can give security to Sellers⁵. CDM has put sustainable development and emission reduction on the political agenda and is therefore supported by the government.

National CDM Fund: it will further facilitate the CDM market with financial incentives, capacity building, and leading them to new project types.

SOEs: State-owned companies entered the market offering large-scale projects with high CER revenue. With an increasing number of SOEs participating in the CDM, EE can be tackled on a large scale. The Renewable Energy Targets of the large SOEs (3 % installed capacity) largely involve them in renewable energy CDM projects.

Project Developers and Consultancies: Owners and interested buyers of CERs can delegate the project development to a local project developer or consultancy (more than 160 in China).

2.2 Challenges of the Chinese CDM Market

Key observation: The investment and financing markets are not attractive for international developers due to the 51/49 ownership rule. Regional CDM service centers play a less important role for tapping the resources than expected.

Some challenges, both related to internal and external factors, that international investors might be faced with in the Chinese CDM market are listed below.

Efficiency: Regarding the GHG emission reduction potential in China, the number of CDM projects could be higher⁶. Efficiency of the DNA is generally appreciated, but the bottleneck EB (external factor) and DOE (internal factor) still causes delays in implementing the CDM cycle.

Financing and institutional setup: Transaction costs for intermediaries are lowering the revenue from CDM and the up-front payment to be made by owners is a hurdle. On the other hand, the DNA is involved between buyers and owners when fixing the CER floor price. Renewable energy is undergoing rapid development and using renewable energy sources for electrification programmes can be cost-efficient and improve the security of supply.

⁵ The view on floor price is very "mixed" among buyers and often negative.

⁶ In view of questions addressing additionality, there is also some internal criticism that the Chinese DNA has approved too many projects.

51/49 rule: Ownership restrictions discourage foreign investment in clean energy technologies as the investor will not own the project. For instance, Europe is investing in small-scale wind technology only for Intellectual property Rights (IPR) reasons. However, the wind turbine manufacturing sector is developing rapidly, boosted by a 70 % 'localization' demand (70 % of the value of the turbines must originate in China). Additionally, ownership of the CER issued is never with the foreign investor, which makes the CDM unilateral in financial terms.

Language: Language is a barrier for local owners and developers regarding UNFCCC procedures and for foreign developers or buyers regarding the DNA procedure (English and Chinese).

Capacity of Regional CDM service Centres: Regional CDM Centers are not yet at capacity for CDM development and matchmaking with foreign buyers or traders. Only 3 out of 27 Regional CDM Centers have developed EB-registered CDM projects so far. Once outside Beijing or Shanghai, foreign investors will face problems and regional CDM owners are facing problems finding appropriate counterparts (also a language problem which is reported to be lower in India).

Methodologies: The high potential for energy efficiency CDM projects has not been tackled. Methodology development for other project types started earlier and energy efficiency methodologies have progressed slowly.

2.3 Analysis of Preferred Sectors and Project Size

Key observation: EU buyers prefer advanced and large (CERs >100 ktCO₂eq./year) CDM status projects and "low delivery risk" sectors and methodologies. Sectors are Biogas, Wind, Energy Efficiency and Fuel Switch.

The carbon market is not only based on compliance but is a profit-making business. Global buyers prefer projects generating higher volume of CERs with less uncertainty in delivering CERs, though delivery of GHG offsets cannot be guaranteed. In a nutshell, projects with technical and financial capability (lowering project risk), environmental and socio-economic benefits (in line with CSR of buyer), based on new technology (business opportunity and additionality lowering rejection by EB) are currently preferred in China. The preferred sectors are clearly placed in the Government's priority areas for CDM projects in China: energy efficiency improvement, development and utilization of new and renewable energy, and methane recovery and utilization.

EU buyers predominantly prefer advanced CDM status projects with **higher volume (CERs >100 ktCO₂eq./year)** and **"low delivery risk"** projects and methodologies, checking the empirical data on issued CERs vs. PDD projected CERs and the reputation of the seller. They are still willing to pay CDM costs upfront (PDD, Validation, Registration, Verification, or even new methodology) if this framework has proven positive.

Biomass Power and **Biogas Power** projects are still desired by buyers. **Wind farm development** is capital intensive but desirable for power generation (extra project revenue though underperformance of issued CERs). **Industrial energy efficiency** (waste gas, waste heat recycled for power generation) has become more attractive for investors given the size of the projects. **Energy efficiency from Waste Heat Recovery (WHR)** and **fuel switch** are generally good performers and preferred by the buyer and investor sides. Moreover, [the World Bank](#)

estimates that Energy Efficiency and Fuel Switch Projects will have the second highest share of the global CERs delivered until 2012 (nearly 500 mtCO₂eq.), being second by only a small percentage after HFCs. Methane flaring from landfill is a risky CDM project in terms of reliability of CER issuance and technical project risk; also bagasse and livestock methane is very risky.

2.4 Marketing Channels in China

The official marketing channel for CDM projects in China is the website of the [NCCCC](#). It provides a [list of CDM projects in planning or under preparation](#) that are looking for a project partner. In theory, the Regional CDM Service Centers should be the main marketing channel for CDM facilitation in the provinces, but these are not as active as other owners and/or developers or retailers. In practice, marketing is done through various channels. The UNFCCC CDM Bazaar provides a [table with seller projects](#) which is a voluntary database of registered users. However, the stakeholders use their own company networks for marketing their activities and products. Therefore, the CDM marketing channel in China is diverse and cannot be described precisely.

2.5 Sectors that have not yet been tapped for CDM project development

Key observation: Market dynamics drives development of new sectors.

4 new sectors were introduced in the CDM pipeline in the last 12 months: solar energy, energy efficiency in the industry, supply side energy efficiency and cement.

The eligible sectors for CDM project development are determined by the UNFCCC CDM EB and the DNA. During the last few months of 2007 and early 2008, four new categories were introduced as potential CDM projects in China: **1) solar energy (solar cooker project in Ningxia), 2) energy efficiency in the industry sector, 3) supply side energy efficiency and 4) cement.**

Energy efficiency is increasing its share in the CDM pipeline. Only a small amount of initial investment was made in the beginning and most of these projects entered the pipeline between October 2007 and January 2008. However, the only **completely new entry** is solar energy, with the others being extensions of successful project types rather than new distinct categories.

On the energy efficiency side, the success of projects in sectors unfamiliar with environmental degradation issues raised the industry's awareness about economic CDM opportunities, proven by successful cases. The latter were required in the industrial sector before a shift to CDM was achieved. Energy efficiency generation projects have now become the second most popular project type after these success stories were written. The cement sector is another example of this. Methodologies now relate to alternative raw materials and additives in the cement blend. In contrast, solar energy projects have allowed CDM to be used in areas previously considered to be too far from commercialisation for CDM to play a role in their development. This may be due to the nature of the specific sector players that, unlike industrial ones, are more open to CDM opportunities and their benefits as a not-purely commercial tool. On the negative side, wind, landfill gas and biomass energy share have decreased, perhaps due to the perception that the last two project types are the most risky in terms of CER issuance success. Sectors that have **not been tapped at all** are CO₂ capture, EE distribution, EE households, EE service, Geothermal, PFCs, Tidal, and Transport.

In summary, it can be said that CDM project activities have scarcely, only recently or not yet impacted the main areas of concern: coal-fired power generation, energy-intensive industry other than steel and cement production, buildings and transportation (the latter two not being the Government's priority). However, project types that are expected to grow in the next 4 years are Energy Efficiency in Industrial and Power Sectors and Industrial Process change (Cement, etc.).

3. Outlook and Future Potential

3.1 Voluntary Market (Verified Emission Reductions, VERs) Status

Key observation: The Voluntary Market in China is scattered, but demand and supply is increasing. It might increase with the demand for higher quality CERs/VERs.

VER stands for Voluntary Emissions Reductions or Verified Emissions Reductions. These refer to the increasing market for carbon credits outside the Kyoto Protocol compliance regime. The voluntary market is much smaller than the compliance market, but general market opinion is that the wider scope of the voluntary market, and growth led by the private sector (reverse to the public policy in the compliance regime), will lead to strong potential.

VERs are derived from project-based emissions reductions from a wide range of technologies and project types. There are generally three sources of VERs at the moment; pre-registration CDM, "special situations", and small-scale projects ([WWF 2008](#) gives an overview on the Voluntary Carbon Market).

The first refers to **CDM projects** which have already been operational for a period of time, but due to causes such as political uncertainty, changes in CDM-level or host country regulations, have not yet been registered with the CDM Executive Board. As the crediting period for CERs may only commence after successful registration, projects which have been operational prior to this registration do not have the opportunity to commercialise their emissions reductions, despite real and verifiable reductions. These may, however, be sold in the voluntary market.

The second type, "**special situations**", refers to technologies or methodologies for emissions reductions which have not yet been approved in the compliance regime, typically in the sectors of land use change and forestry, carbon capture storage, transport including biofuels.

Lastly, there is a variety of **small-scale**, community-driven projects which simply have insufficient resources to satisfy the strict requirements and specialised consultancy services required for the CDM project cycle. Therefore projects opt for the lower cost option of VERs.

Forestry VERs are the key area where the voluntary market can take the lead in China on a small scale. Low volume VERs are preferred as demand is limited to what "offsetting" companies can sell to corporate firms and individuals. Buyers of VER prefer to buy only one or a maximum two years of VERs, unless it is Gold Standard VER (with higher quality and price). According to [The World Bank](#), the total volume traded on the Voluntary Market in 2007 was 65 MtCO₂eq., of which 23 MtCO₂eq. (value: 72m USD) were traded on the CCX and 42 MtCO₂eq. (value: 265m USD) through other voluntary offset markets. The Voluntary Market is highly fragmented, heterogeneous, and less controlled than the compliance market. Prices range from USD 1.80- 50/ tCO₂e with the highest price paid for a credit in 2007 being a massive USD 300 ([WWF 2008](#)).

Although the price for VERs is very unstable, the voluntary market is showing great signs of growth. Reports estimate that volumes transacted in these markets in 2008 could more than double to 150 MtCO₂e, maintained by a greater number of pre-CDM registration VERs in the market.

There is no central coordination system for the voluntary market in China. It is difficult to find data on the extension of voluntary projects and their volumes in China. The voluntary carbon emission market in China has 25 validated projects, however, more and more companies and NGOs are brokers on the VER market in China and the demand is rising among project developers in China ([WWF 2008](#)).

A recent report submitted to the European Parliament by Avril Doyle, MEP and appointed Rapporteur for the European Parliament on the Commission's [Proposal for a Directive on the Review of the EU Emissions Trading Scheme \(EU ETS\)](#), proposes that “gold-standard type” CDM credits should be used in ETS phase III. It is yet to be seen whether this would impact the VER market in China.

3.2 Post-2012 Market Assumptions

Key observation: The Demand for CERs in the EU ETS and the development of the Chinese CDM market is closely linked with the proposed changes in the EU ETS. There is a risk of oversupply and low CER price. The use of “gold-standard type” CDM credits in EU ETS phase III might be a good chance for China.

In December 2007, the Conference of the Parties of the UNFCCC (COP 13) and of the Kyoto Protocol (MOP4) adopted the ‘Bali Action Plan’ paving the way for post-2012 negotiations and aiming at the conclusion of such an agreement by the end of 2009 in Copenhagen (COP15).

The European Union Emissions Trading Scheme (EU ETS) has created private sector CDM/JI demand of 1.4 billion CERs and EU member States have created additional CDM/JI demand for 5-6 million CERs. The EU ETS is by far the largest Carbon Trading Scheme. The review of the ETS has shown that “the incentive effect of the current ETS has been cushioned by the generous number of allowances handed out in the first phase. The structure of the ETS, with national allocation plans, has raised the risk of distortions in terms of competition and the internal market. The scope of the EU ETS, in terms of the sectors of the economy covered and the gases included, has also limited its ability to drive emission cuts.” ([The EU Commission, COM \(2008\) 30, final](#)). Based on the lessons learned from Phase I (2005-2007) and II (2008-2012), the EU is looking at options for strengthening the Scheme in Phase III (2013-2020, under construction).

In January 2008, the European Commission proposed that the EU should, as the first major international player, give its support to the continuation of the CDM after 2012. But it also proposed to limit access to CDM credits in Europe if there is no global climate change agreement for the post-2012 period. In addition to the CDM, the new agreement should explore new innovative instruments that can provide the necessary financing on an even larger scale and at the same time better take into account the needs of the least developed countries that currently hardly benefit at all from the CDM. The EU Commission proposal in case no post-Kyoto agreement can be reached would allow 2.63 gigatons of CERs to be used until 2020 independent of an international

agreement. About one third of the necessary reduction effort towards the EU's 20 % GHG emission reduction target can come from CDM/JI ([rising to 30 % if there is an international agreement committing other developed countries to "comparable emission reductions and economically more advanced developing countries to contributing adequately according to their responsibilities and respective capabilities"](#)), the other two thirds ensure real emission reductions in Europe.

There is a risk that too generous a use of CDM can dilute the effectiveness of the ETS by increasing the supply of credits and thereby cutting demand for allowances, and reducing the incentive for governments and companies to promote emission reductions at home ([The EU Commission, COM \(2008\) 30, final](#)). Indeed, unlimited access to CDM/JI would have a price impact and discourage EU countries and companies from taking the first mover advantage in the low carbon economy. However, the carbon market will be subject to discussion before an agreement is made at Copenhagen. More thoughts on the EU ETS are provided by [J. de Sépibus](#).

However, if there is no post-2012 agreement for the CDM, there is high risk of [oversupply](#) of CERs, which would cause massive price reductions, making CDM less attractive. As stated by the [World Bank in May 2008](#), the number of JI/CDM credits considerably exceeds the reduction required from operators with respect to their 2005 emissions.

Therefore, the central issue of the Chinese CDM now, is the post 2012 landscape as additional development of national schemes (Australia, Japan, USA) creates uncertainty on demand and pricing. Market risk is tied to demand. Demand is tied to regulatory risk (the renewal of Kyoto and development of national schemes). Therefore, the European Commission has given the clear signal to operators that they may use the CDM credits in the EU ETS after 2012.

A recent report submitted to the European Parliament by Avril Doyle, MEP and appointed Rapporteur for the European Parliament on the Commission's [Proposal for a Directive on the Review of the EU Emissions Trading Scheme \(EU ETS\)](#), proposes that "gold-standard type" CDM credits should be used in ETS phase III. This recommendation aims to put a "quality" label on CDM projects by focusing on the renewable energy and energy efficiency sectors. Indeed, it is estimated that the global carbon market rules will be selective to the geographical distribution of emission reduction credits and project type (quality). However, there are still questions that remain unanswered about whether this type of thinking has the potential to have a significant impact on the future CDM market.

At this moment, nobody can speculate about the compliance market and the impact on the Chinese CDM. However, the demand for CERs in the EU ETS and the development of the Chinese CDM market is closely linked with the proposed changes in the EU ETS to take effect after 2012, having a clear picture after COP15 at Copenhagen in November 2009.

3.3 Best-suitable Cooperation Partners⁷

Key observation: The experienced Municipal Enterprises (MEs) and State-owned Enterprises (SOEs) can be valuable partners for cooperation, especially in the booming sectors Energy Efficiency and Renewable Energy. The selection of experienced consultancies and developers is most crucial for the project success.

With more and more CDM projects successfully registered, similar projects may be examined more strictly by EB, as it tries to ensure additionality to what might be considered to be the baseline scenario. However, the Chinese CDM market has proven to be flexible with high potential in the RE and EE sectors. Finding the most suitable project partners and, as outlined in chapter 1, the selection of consultancies and [developers](#) is most crucial for the project success. Moreover, the experienced **SOEs** in the Chinese CDM market can be valuable partners for cooperation, especially in the booming RE and EE sectors (either driven by the RE targets for SOEs or the quantitative and energy standard targets introduced by the Energy Conservation Law).

The largest player in China's **cement** industry, Anhui Conch Cement Corporation Ltd., has more than 50 branches across China, and 21 of them have implemented CDM projects in the fields of WHR and utilization for power generation already. There is good knowledge in that company about the CDM project cycle and methodologies in particular.

In the **steel industry**, by May 1, 2008, a total of 6 CDM projects in energy efficiency have been successfully registered with the EB. There are 50 such projects in the pipeline. These also involve some of the largest steel producers in China. The five largest power generation SOEs have a large number of CDM projects, and are highly concentrated in CDM project types such as **wind power** and **hydropower**.

There are also a few CDM projects in the fields of **fuel switch** and **biomass**. These are China Datang Corporation (DT), China Huaneng Corporation (HN), China Huadian Corporation (HD), China Power Investment Corporation (ZDT), China Guodian Corporation (GD).

These so-called '**Big Five**' have each established close co-operation with domestic and international CDM actors and some have even set up their own in-house departments to develop CDM projects⁸.

Datang Corporation undertakes CDM project development with the help of its subsidiary, the China National Water Resources and Electric Power Material & Equipment Corporation Ltd. Currently, Datang Corporation has 19 CDM projects approved by NDRC, most of which are wind power projects.

⁷ We are grateful to Dr. FENG Shengbo from CDM PMC and Dr. Nannan LUNDIN from the EU-China CDM Facilitation Project for providing the information of the SOEs.

⁸ The activity of the SOEs in the CDM market, particularly developing Renewable Energy, might be connected with the RE supply-side targets for the provinces and SOEs (being listed with Renewable Energy Targets in the 11th 5 year plan), resulting from the Renewable Energy Law and the Renewable Energy Medium and Long Term Plan, setting a target of 5% installed capacity until 2012 and 8% until 2020 in the energy mix. In addition, a compulsory 3% quota of installed renewable energy (excluding hydro) is being mandated for all large-scale power generators at both the national and regional levels.

China Huaneng Group established a CDM Leadership Team, which incorporates CDM into group management, linking CDM considerations directly to strategy and planning decisions. Apart from the Leadership team, the Group has set up the Huaneng Renewable Energy (Holding) Corporation Ltd. to work directly with Green Capital Company and Easy Carbon in the development of a CDM project. Up to now, Huaneng Group has 17 CDM projects approved by NDRC, mainly wind power, hydro power and fuel switch projects.

China Huadian Corporation established the China Huadian Corporation New Energy Development Company Ltd. to implement CDM projects. China Huadian Corporation has the least number of projects approved by NDRC, however, the high emission reduction achieved in each fuel switch project means that its total annual emission reductions are the second in terms of volume.

China Power Investment Corporation set up the China Power Complete Equipment Co. Ltd to develop CDM projects. According to estimates from CDM PMC, they currently have 14 projects approved by NDRC, mainly in wind, hydro power and fuel switch projects.

China Guodian Corporation manages CDM project development through its three subsidiaries; the Guodian Longyuan Power Company Ltd., Guodian Power Development Company Ltd. and Guodian Kehuan Company. Guodian Longyuan Power Group uses China Fulin Wind Power Consulting Company and Easy Carbon Consulting Company Ltd. for technical support in CDM developments. Recently, China Guodian Corporation has 42 CDM projects approved by NDRC, mainly wind and biomass power projects.

3.4 PCDM (or Programme of Activity, PoA)

Key observation: PCDM or PoA is not supported by the DNA in its present format (UNFCCC guidelines). It could have a positive impact on sustainable development and GHG emission reduction in China.

The potential generation of CERs is assumed to be significant under the Programme of Activities (PoA) or Programmatic CDM (PCDM). However, this generation is still potential only without proper means of being tapped. As there seems to be an oversupply of CERs in the market already, also for a future climate regime, it should be considered that additional generation of CERs from PCDM might lead to a downward trend in CER prices. Programmatic CERs (PCERs) are unlikely to compete with traditional CERs in a low-price regime. The number of JI/CDM credits considerably exceeds the reduction required from operators with respect to their 2005 emissions ([World Bank 2008](#)). This is also the main concern that [Pan Jiahua and Søren E. Lütken](#) mention in their response to the Executive Board's invitation for public input.

The Chinese DNA has already addressed the consequences of this scenario by disallowing PCDM in China (or better yet, not updating the CDM measures) despite interest in establishing such projects. This interest arises particularly from the industrial sector (demand and supply side driven) and the developers and institutions that will make a profit from writing the new methodologies, making the market factor important for the consideration of PCDM. There are large difficulties in applying the PCDM without major changes in the EB regulations (compare the comments of [Climate Focus](#), which was invited by the CDM Executive Board to provide suggestions for further improvement of the PoA concept).

The Danish research project on the [Programmatic CDM in China](#) in collaboration with the NDRC, the Chinese Academy of Social Science (CASS), and other leading Chinese research institutions has initiated Chinese research towards new CDM options for the post-2012 period. The result of the study is that the PCDM has great potential for GHG emission reduction and sustainable development in China. The potential of PCDM in China for constructive energy saving, green lighting, rising energy efficiency on small boilers, marsh gas for residents, solar energy heaters, substitutes for fuel and tree planting have been investigated and three pilot studies have been carried out. However, there has to be full use of the advances of industry organizations and scientific research institutes in solving the technical problems in PCDM development to really reduce transaction costs of PCDM project development. ([Zeng and Li, 2008](#)). The regulations of the CDM EB are technologically and administratively challenging and make the implementation of PCDM difficult. PCDM is therefore not yet supported by the Chinese DNA⁹.

As long as the rule that multiple methodologies for programmatic CDM are not allowed and the CDM EB is not allowed to challenge each CPA for up to 6 months after its addition; and to allow use of the baseline methodology version in force at PoA, PCDM might not work in China, especially considering the transaction costs. While there is a high GHG mitigation potential of demand side energy efficiency (EE) projects, they are difficult to organize geographically. There are small unit savings, but a large quantity, in scattered locations. Multiple stakeholders, split incentives and diverse stakeholder interests are involved. This makes for complicated coordination, high transaction and management costs which result in lack of information, asymmetrical information, and misinformation. There is also a lack of expertise, tools and indicators for energy management. There is a high perceived risk because it is difficult to evaluate life-cycle saving based projects. PCDM would have a higher chance if EB allowed (1) a combination of different technologies in one project, (2) flexibility in technology adoption (3) soft (management) measures to be taken into account and easily verified.

Stronger support for the idea of promoting PCDM, in line with “gold standard CDM” has recently emerged from the EU side. Several European governments are interested in “pilot PCDM” or feasibility studies and supporting the development of PCDM methodology. Also the China CDM Fund is interested in working on PCDM feasibility studies and new methodologies. Many research activities are going on for PCDM in China, which are not harmonised. The GTZ is working on a feasibility study on PCDM for EE in existing buildings. The UK is following the study results that the Sino-Danish PCDM project has delivered. ADB is undertaking a Biogas feasibility study. The China Standard Certification Center is doing work on PCDM demand side EE ([CDM bazaar](#)).

However, PCDM is more than technology, management and writing new methodologies. PCDM might have a higher political standing than the current CDM market, as it might have a large impact on the price of CERs. Therefore, the new regulation by the EB (originally to be better informed about the workload coming for DNAs, EB, and DOEs), that was implemented by the Chinese DNA, for any CDM project activity with a starting date on or after August 2, 2008, the project participant must inform NDRC unless the project PDD has been published for global stakeholder consultation before the project activity start date, will better facilitate the PCDM. The DNA will then be informed

⁹ Oral communication with Dr. Søren E. Lütken, Chief Representative of Caspervandertakconsulting Beijing and former programme manager at the Danish Embassy in Beijing for the Programmatic CDM research programme.

about all ongoing activities regarding PCDM and be able to make their decision on whether or not to support PCDM.

4. Conclusions

The size and volume of the Chinese CDM market has developed rapidly; as has the capacity of the project owners, investors, and buyers. For the future of the CDM in China in terms of the preference of the CER buyers, the share of large scale projects needs to be improved. More sectors, especially the power sector, should initiate CDM activities and more energy efficiency projects should be promoted by the CDM Fund. Investments for cleaner technologies should be encouraged by the government which could be facilitated through the CDM fund and the SOEs or industry.

It has become clear that domestic regulations need to be further refined based on the very special conditions of the provinces and the CDM project cycle, mainstreaming investment and making best use of the GHG emission reduction potential of China. Given the current discussions on the additionality of CDM projects in China ([Lütken and Michaelowa 2008](#); [Wara and Victor 2008](#)), it is yet to be seen how many of the 1551 projects in the CDM pipeline projects will be approved by the CDM EB and how the post-2012 development will influence the CER price.

However, the CDM and international Climate Policy have reached China and have made a great investment for building institutional Climate Change Policy, implementation of real action, and formulation of GHG emission reduction policies and incentives. The diversity of project types has highlighted the role of policymakers to steer project activities toward fulfilling national policy targets e.g. based on the renewable energy law.

Therefore, the CDM market had an impact on China's governance and might further be attractive regardless of the CER price development, issuance rates at EB, or an international post-Kyoto scheme. In line with the CDM, the voluntary market is still an attractive target for climate protection initiatives which might be becoming even more attractive with increasing energy prices and Chinese imports of coal.

When examining all energy related investments in China, the size of the CDM market in terms of carbon-emission reduction revenue is only approximately 5 % compared to investment in new power plants, energy infrastructure and fuel imports. Therefore, the CDM being a project-based mechanism has little impact on the structural issues of the Chinese energy market. Nonetheless, it has introduced market mechanisms, in addition to the regulatory-driven energy supply in China, and improved the functional aspects, such as price signal and transparency. As CER revenue for efficient technologies displaces coal-fired electricity, there is greater incentive for project owners to invest in new and rewarding technologies instead of just considering the capital cost.

Finally, CDM has introduced a mechanism for sustainable development (whether the sustainable development has increased or not) rather than solving the energy challenges (world-wide and in China). CDM is simply not a business tool for foreign technology suppliers, only for investors in the financial sector.

It is recommended that the positive effects of CDM be investigated and that new technology in the energy sector needs to be promoted separately with its own financial incentives, making it a stand-alone tool for GHG emission reduction.