



The Implementation of the Clean Development Mechanism in China

Looking towards a greener future?

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ABSTRACT

The Kyoto Protocol that aims to reduce the releasing of greenhouse gases is one of the most serious co operations on environmental issues with nearly 190 countries having signed it and 166 countries having ratified it. This means the treaty covers both industrialized and developing countries and one of the most important collaborations is found between these groups. China is a country with a very complex economical structure that is constantly changing due to strong growth and internal restructuring. It is still classified as a developing country which makes it eligible for the Clean Development Mechanism (CDM), one of the flexible mechanisms in the Kyoto Protocol concentrating on collaborations between developing and industrialized countries. The mechanism is built on the investment in clean technology in developing countries by industrialized countries in the exchange for certified emission rights (CERs). These can later be used by the investing country to meet its own obligation under the Kyoto Protocol. This essay will try to answer the question how the CDM has been implemented in China. This is done with the help of economic theory and a look at the economic situation in China today. Due to the intricate structure of the Chinese system it is difficult to draw any definite conclusion. But it is possible to say that according to theory, China lacks the appropriate tools for implementing emissions trading. Their system today is more appropriate for other policies such as imposing environmental fees. But there is a great will and potential in China for participating fully in international co operations and the country has made major changes in the recent history pointing towards a more open and dynamic economy. Based on this, it is very probable that China will fulfill its full CDM potential in the near future and eventually engage in full emissions trading.

Key words: China, pollution control, Kyoto Protocol, Clean Development Mechanism, emissions trading.

Abbreviations

C	Carbon
CAC	Command and Control
CCICED	China Council for International Cooperation on Environment and Development
CDM	Clean Development Mechanism
CER	Certified Emission Right
COP	Conference of the Parties
DNA	Designated National Agency
EB	Executive Bureau
EI	Economic Incentive
EPB	Environmental Protection Bureau
ETS	European Trading Scheme
EU	European Union
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GHG	Green House Gas
HDI	Human Development Index
IPCC	International Panel on Climate Change
JI	Joint Implementation
MAC	Marginal Abatement Cost
MBI	Market Based Instrument
MFA	Ministry of Foreign Affairs
MNC	Multinational company
MOP	Meeting of the Parties
NC4	National Coordination Committee on Climate Change
NDRC	National Development and Reform Commission
NPC	National People's Congress
P	price
PRC	People's Republic of China
Q	quantity
RFF	Resources for the Future
RMB	Renminbi, 1 RMB = 1 yuan, Chinese currency
SDPC	State Development and Planning Commission
SEPA	State Environmental Protection Administration
SOE	State Owned Enterprises
TI	Transparency International
TVE	Township Village Enterprises
WTO	World Trade Organization
YB	Yearbook

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1. Introduction

In the past few years a lot has been written about the outstanding growth that China has achieved. But less focus has been made on the environmental issues that have followed such fast growth. Today China is heading towards becoming the world's largest energy consumer and largest polluter. The growth also gives the largest population in the world a higher income and better quality of life, meaning more cars and more domestic appliances which are contributing factors to the greenhouse effect. Environmental destruction places a heavy burden on the economy of 7%, and only health-related pollution issues occupy 3% of the national GDP. 50 000 people are calculated to die prematurely in China's biggest 11 cities because of high pollution¹. At this magnitude, the environmental problem is no longer an issue for China, it becomes global. The People's Republic of China has a relatively long history of environmental protection and is also part of international co operations. One of the most important recent co operations is the Kyoto Protocol which was issued in 1997 by the Intergovernmental Panel on Climate Change (IPCC). As a developing country, China takes part in one of the flexible mechanisms called the Clean Development Mechanism. The accession to the WTO together with other circumstances has changed China and made the country eager to appear as a serious co operator in international contexts. China is expected to become the number one host country for CDM projects, but having been a centrally planned socialist country for decades makes the implementation a bit complicated. Taking part in the CDM is meant to be a preparation for developing countries before engaging in full emissions trading and that means China would eventually participate. This essay looks on the economic theory that lies behind the market mechanism of emissions trading. To see if China is able to effectively introduce these tools an evaluation of the economy and the institutional setup is made. The method is therefore only based on qualitative analysis.

1.1 Purpose

The purpose of this essay is to examine:

How has the market instrument Clean Development Mechanism in the Kyoto Protocol been implemented in the transition economy of China?

¹ Wing-Hung Lo, Fryxell & Wai-Ho Wong, p. 389

Does China have the institutional framework for using market based instruments for emissions abatement?

1.2 Disposition

After the introductory chapter the essay will continue with information about the climate change we are facing today and why we must do something about it. *Chapter 3* addresses the economic theories that deal with public goods such as air and how to regulate emission abatement efficiently. Following this is a chapter on background information on China's economic and environmental situation and the relevant institutions. What the Kyoto Protocol is and how the Clean Development Mechanism works is accounted for in *Chapter 5*. In the next section, *Chapter 6*, the implementation of the Clean Development Mechanism in China is evaluated. What obstacles are there in China and what opportunities? *Chapter 7* discusses whether China will fulfill its CDM potential and all the issues linked to the topic ending the chapter with a conclusion.

1.3 Why China?

As mentioned in the introduction, China is the fastest growing country in the world and this will have big consequences on the environment. Because of the size of the country the consequences are not only limited to local conditions but will quickly become global. The complete process of climate change is still unknown to us, because we cannot yet tell exactly what effects it will bring and in what timeframe. Therefore the growth of China is alarming as we are not sure of the effects such huge contribution of GHG will bring for us in the future. It is also crucial that China participates in international co operations because international action is the only way to combat climate change. The way that China handles its growth together with combating climate change can pave way for other developing countries facing a similar economy which makes the case interesting.

2. Climate change

The greenhouse effect has been known for a long time among specialists. Arrhenius mentioned the process as early as 1869². There is a natural global warming that increases the world's temperature to fifteen degrees Celsius making the planet habitable. The optimal amount of greenhouse gases is therefore higher than null, because of the atmosphere's own capacity of absorption. The accumulation of greenhouse gases in the atmosphere has been described as a blanket that covers the earth, and under the blanket it becomes warmer. The most important GHG is water steam which is responsible for a major part of the natural process and the amount of water steam is dependent on the temperature, which in its turn is dependent on other GHGs such as carbon dioxide. About two thirds of the sun's radiation is absorbed into the surface and into the atmosphere. The remaining third part is sent back into space, meaning that the total input of energy must be the same as the output, otherwise there will be an increase in temperature. It is the excessive releasing of carbon dioxide from human activity that causes this blanket to become thicker and thicker³. The environment has its own absorptive capacity as mentioned above, and these absorbed pollutants are called fund pollutants. The problem is stock pollutants that accumulate in the atmosphere and are not taken care of naturally⁴. An example of this is the pollutants that have accumulated and subsequently caused a large hole in the ozone layer. Because of human activity there is an excess of stock pollutants circling in the atmosphere which causes the average temperature to rise, speeding up the natural climate change to dangerous levels.

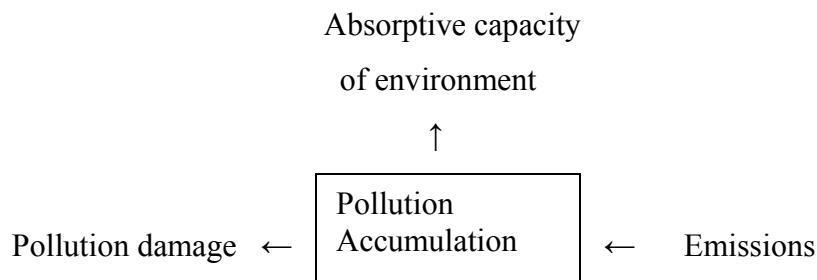


Figure 1. Pollutants in the atmosphere.

Source: Tietenberg 2007

² Oberthur & Ott, p. 1

³ www.wwf.se

⁴ Tietenberg, 2007, p.258

The consequences of this climate change are many and alarming such as disturbances in the eco-systems with such severe consequences as the disappearance of hundreds of species, the disappearances of coastlines and even small island countries and so forth. The list is long. Today we cannot see all the consequences of the greenhouse effect because of the slow adaptability of nature and because of short-lived particles that have a cooling effect in the atmosphere⁵. But we can see that the rise in temperature is too high in too short of a period from a historical perspective, which is distressing.

For China, the greatest threats are acid rain and the big burden of the environmental destruction on the economy and its population's health. China is also facing an increasing desertification of its landscape due to draught, with sandstorms reaching into Beijing as an effect. If the temperature continues to rise, the country will also face major drought as a consequence of the melting down of the Himalayan glacier, providing millions of Chinese with their annual water supply. If this were the case all these millions would be forced to flee and would place even greater environmental burden in the already heavily populated areas in China. Sixty percent of the Chinese population inhabit the central and east part of the country⁶, and would then place even bigger pressure on resources. Because of these negative effects there must be a radical reduction in the amount of GHG that we release into the atmosphere. The way of life today in most industrialized countries consumes resources from future generations and leaves them a planet with an uncertain future. People that live a western lifestyle live above available resources up to ten times in some countries such as the Arab Emirates and Sweden.

The future in some numbers:

- \$300 billion is expected to be the annual global cost of climate change⁷
- China emits 15% of total global emissions and is only increasing its share⁸
- Electricity demand is expected to rise with 9-10% 2007 in China⁹

⁵ Nordqvist, p. 7

⁶ China Statistical Yearbook 2005

⁷ Stern report

⁸ Tangen & Heggelund, p. 303

⁹ www.china.org

- The costs of climate change can reduce the global economy with up to 20%¹⁰
- One flooding in China due to climate change 2001 cost \$3,6 billion in damage¹¹
and with current emission trends this cost will only increase

¹⁰ Stern report

¹¹ Peterson

3. Economic theories

In order to achieve sustainable growth, Tietenberg¹² suggests there are five principles to pursue. These are: the full-cost principle, the cost-effectiveness principle, the property right principle, the sustainability principle and finally the information principle. In this chapter an outline of these principles together with corresponding economic theory is made.

3.1 The principles

The *full-cost principle* requires all those that have made some destruction to compensate the ones suffering from the destruction. All humans have a right to a healthy and safe environment and any invasion of that right should be made up for. When producing a good it means that a good that is produced with a heavy environmental burden should be more expensive than the good that is environmentally friendly. This means that there is a price to the environment that is mostly under-paid. In this case it means that before the system of tradable permits was introduced; there was no price on the input of air. It also implies that the responsible for pollution should be the ones bearing the full cost of the negative effects, which is seldom the case in reality.

According to the *cost-effectiveness principle* all environmental policies must be cost-effective in order to create enough incentives to implement them. In many cases cost-effectiveness and environmental protection have been considered two worlds apart, but with new instruments they are no longer incompatible. Many firms in developing countries still see the introduction of environmentally friendly technologies simply as a cost. In the following literature we will see that the most cost-efficient tool according to theory is emission rights trading.

The *property rights principle* concerns the fact that there is huge environmental waste due to the fact that it is no ones property. Communities should own all natural resources within their borders and in this way letting all inhabitants take advantage of it accordingly. If royalties are distributed it gives the resource-rich communities the

¹²2007

corresponding value of their resources. By assigning property rights to pollute firms that do not pollute as much as assigned will become richer because the property rights they own can be sold.

If the three principles above are implemented then the forth *principle of sustainability* comes along with greater facility. The key issue is to use resources so that they are preserved for coming generations. To value a natural resource can be difficult, especially to put a value on the resource for future extraction. If a species is extinct today, it might not matter for future generations because they might not find it usable, or it could also be worth so much more than the current value. This is a question only future generations can take a stand to and therefore the preservation of species is crucial in order for them to be able to make a stand at all. Another issue concerning the sustainability principle is that the depletion of natural resources is not included in the national income calculations. According to the Hicksian definition all other incomes should be accounted for, otherwise there is a risk of overusing the assets. With the depletion of natural resources that occurs today, many countries would have a declining national income.

Finally, the *information principle* is simply based on informing the population. Research has shown that the average citizen is prepared to use certain amount of the income to help preserve the environment. Therefore, information is crucial. It can mean that there is greater freedom of press on the issue, using more channels of media to get the attention desired¹³. Unfortunately, in a majority of developing countries the freedom of press is limited and the common knowledge about the environment is quite low.

3.2 Public goods

Public goods are characterized by two main assumptions: there is nonrivalry, or indivisibility, meaning that one individual's consumption does not make the other one worse off and also there is non-excludability, implying that even if an individual fails to pay for the good, they cannot be excluded from using the good¹⁴. Another definition is

¹³ Tietenberg, 2007 p. 479-484

¹⁴ Tietenberg, p. 73

that a good is public when an individual produces a positive externality that all individuals in the economy can enjoy¹⁵. The environment, including water and clean air are such goods. As the public good can be enjoyed without any cost there is a tendency to overuse these goods. Water and air are commonly therefore used as places to dump waste and are used in an inefficient way. The difference between a public good and an externality is sometimes not very clear. If an industrial plant emits damaging substances into the air, the closest proximity will suffer from these emissions making it an externality. But clean air is a public good as long as it is not damaged.

Externalities arise because of market failure and one of the core problems with externalities and the inefficiency it produces is due to the lack of property rights. Externalities can be both positive and negative and in the case of pollution it is mostly negative. A plant that emits dangerous substances into a river will affect life in the water and other organisms living of the river¹⁶. A solution to this problem is to assign property rights to the river, in accordance with the property rights principle. Furthermore, in accordance with the principle of full-cost, along with the property rights also comes the responsibility of bearing the consequences. The greenhouse effect is an externality problem where the ones that are affected are the ones to equally bare the costs.

“Climate change presents a unique challenge for economics: it is the greatest and widest-ranging market failure ever seen”¹⁷.

3.3 Pollution control

In order to improve the externality problem of the greenhouse effect, emissions must be reduced and controlled. The control of pollution can be done in two ways, either by command and control (CAC) methods or by economic incentive (EI) methods. Both methods have their different benefits but theoretically it's shown that EI policies are economically more efficient. In developing countries the general picture is that the CAC method is applied more, which suits a not fully developed market economy that is not

¹⁵ Rosen, p. 83

¹⁶ Tietenberg, p.67

¹⁷ Stern, p. i

fully developed. Blackman and Harrington further divide these two into direct and indirect instruments. Direct policies means that the regulator must engage in the monitoring of emissions and indirect does not require any monitoring¹⁸.

	Direct instruments	Indirect instruments
EI	Emission fees Marketable permits	Environmental taxes
CAC	Emissions standards	Technology standards

Figure 2. Pollution control instruments.

3.3.1 Regulation

By regulation the state can limit firms not to produce more than a certain amount which will most likely result in inefficiency. Actors on the market have different efficiency levels and if a restriction is imposed it means that some actors produce too much and others too little in relation to their optimal output. It does not provide any incentive for firms to improve their technology, and the control of emissions incurs big costs for the government. If there is a large amount of smaller firms there will most likely be a lack of control and firms can easily avoid following regulations. Using limits will not bring any revenue for the government for investing in new technologies or improving their control.

3.3.2 Taxes and subsidies

As the case with air pollution cannot be solved among individuals there must be public responses from the government. One of the ways in which the government can intervene is through implementing a so called Pigouvian tax or subsidy. The tax is set to equal the marginal damage that the efficient level of output inflicts. This implies that the polluters marginal cost will increase and they will have to change their output level so that it again becomes optimal. An option to levying taxes is by introducing subsidies. The polluters are paid not to pollute, although this system requires that there is a fixed amount of polluters. The plant will accept the subsidy when the marginal cost exceeds the marginal

¹⁸ Blackman & Harrington, p. 7

benefit for producing the last unit. There are negative effects that this system can provoke, such as the fact that plants might move their production to areas where they know they can receive subsidies for not producing¹⁹ In China there is a system of environmental taxes which are quite high. The taxes are divided into two rates. One charge is imposed on all emissions below an official standard and another higher charge for emissions above the standard²⁰. This system is discussed further in chapter 6.

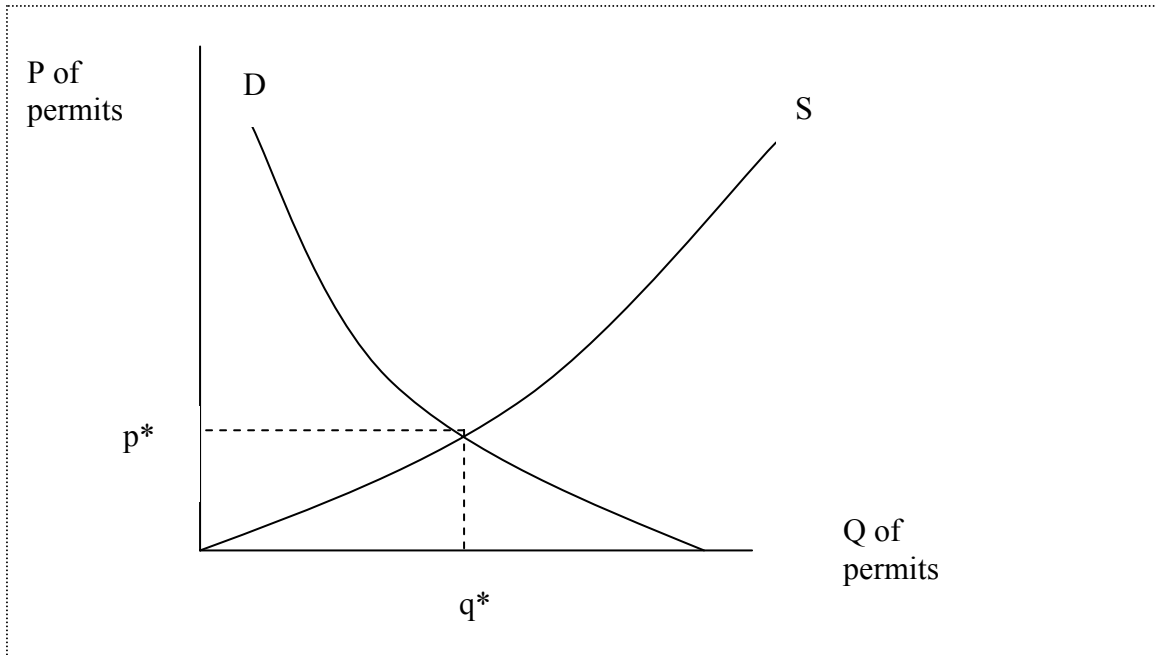
3.3.3 The solution of tradable permits

When plants produce they do so at the level where the marginal cost meets the marginal benefit where production is optimal. But when the costs are accounted for, clean air is normally not included. But if a price is put on each unit of pollution, a new type of property right is created. The system is put into force by firstly having a centralized unit decide how many permits are to be allocated in total. One emission right is equal to one unit of emission, usually expressed in tons. When the permits have been allocated accordingly, the actors that participate in the emission permit scheme can freely trade them between each other. This implies that the emission trading system works as an efficient market instrument where the optimal level is where demand meets supply. The price is set according to market principles, where price intersects with quantity demanded (p^* and q^* in the diagram below). In order to preserve a market value for the permits it is important to keep the access to available permits limited²¹.

¹⁹ Rosen, p. 92-96

²⁰ Tietenberg, p. 344

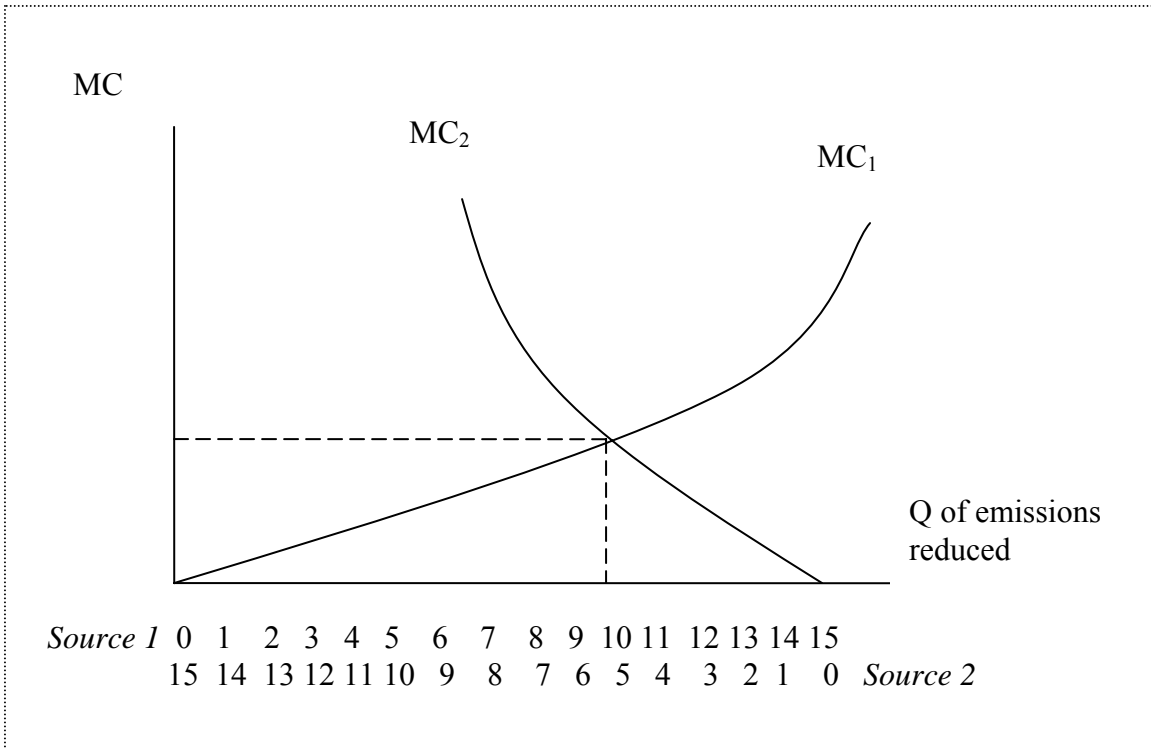
²¹ Field, p. 256



Graph 1. The market of emission rights.

When permits are allocated by authorities the process is called grandfathering. The permits are divided depending on pollution history and current level. Another method of allocating permits is by auctions. Actors then pay the price that doesn't exceed their marginal cost and where they can still make a benefit. Why tradable permits are preferred is because of their effectiveness. Because there is no regulation on the price there will be no dead weight loss for society. The cost for emission mitigation will be minimized if the marginal cost of control is equalized for all emitters²². This relationship is shown in the graph below.

²² Tietenberg, 2003 p. 346



Graph 2. Cost-effective allocation of emission reduction.

Source: Tietenberg 2003

In the diagram all the possibilities for reducing fifteen units is shown. Every point is added up by actor one and actor two's total reduction always resulting in a reduction of fifteen units. From the graph we can read that for actor one the most cost-efficient alternative is to reduce emissions up to ten units whilst for actor two the most cost-efficient alternative is to reduce five units²³. The cost of emission abatement is higher for actor two and he will instead opt for buying emission rights. Consequently, the cost for emission abatement is lower for actor one, so he will reduce emissions rather than buy emission rights.

3.4 Valuing air and life

As mentioned above, the pollution of clean air has previously not been considered an input in the production process. When using tradable emission rights, the polluter buys the right to pollute clean air. Depending on the polluting substance and evaluation method the value of air will be different. Clean air is also essential for life in any form.

²³ Tietenberg 2003, p.345

Therefore setting a value on air indirectly means setting a value on life. The World Bank found in an analysis of the pollution in the southern Chinese city of Zhengzhou that the value of life was highly underestimated. Statistically each life was assumed at \$8000, and when calculating the amount of pollution it was found that each life in reality would be worth \$270. The levels of pollution would have to be reduced by 79% in order to reach the statistical value of life²⁴.

The economic way of valuing life is by looking at the change in the probability of dying resulting from the change or reduction in environmental damage. First the reduced probability is obtained, and then the amount that each citizen in a certain population is willing to pay is multiplied with the total population. Finally, the total willingness-to-pay amount is divided by the reduced probability and this is the value of life²⁵.

When doing a monetary estimation the value is based on the amount that individuals are prepared to pay in order to avoid the risk. It is not the life itself that has a price, but rather the risk-avoidance. There are four different methods for this type of method. The most commonly applied method is survey-like method with designed questions such as what price individuals are prepared to pay in the form of taxes etc. in order to avoid risk. Another way is by estimating the difference between highly paid risky jobs compared to less paid lower risky jobs. The third method based on risk is to evaluate the cost of equipment that is risk-reducing and fourthly, to look at how much is sacrificed by society in order to reduce risk. An example of this could be how well societies avoid serious diseases²⁶. In China the first method using surveys has mostly been used. Another estimation approach for estimating the value of pollution is to analyze costs. The costs are generally more easily accounted for than the benefits. There are two ways for estimating the costs. One is the survey approach which collects information from the polluters of their costs and the other is the engineering approach. This way the

²⁴ Tietenberg 2003, p. 344

²⁵ Tietenberg 2003, p. 42

²⁶ Vennemo & Aunan, p. 222

technological and implementation costs are calculated based on pure engineering knowledge²⁷.

The issue of valuing life and air is of course not obvious or without controversy. When the emission rights are bought and sold it is the market that will set the price. It is difficult to say if this value corresponds to the “true” value of air, and indirectly on life. As the value of resources depends on the evaluating method used and the place where it is done, there is no fixed economic value for natural resources. Also, when using the methods for valuing life, only human life is accounted for, when in reality there are many more species suffering from unclean air.

²⁷ Tietenberg 2003, p. 47

4. China's economic and environmental situation

4.1 The economy

After several decenniums of central planning this is something present in today's economic structure. The ownership structure has been dominated by stately and collectively owned enterprises. Because of the independence of the 22 provinces dispersed over five autonomous regions together with the Special Administrative Regions Hong Kong and Macau there is great incentive for competition. An effect of this is local protectionism which often results in that provinces are unwilling to cooperate across their borders. The country is knowingly the most populated in the world with a population of 1,299 billion²⁸ meaning that one in five people in the world is Chinese. The mostly populated and developed areas are the central south and the eastern part where the major cities are located.

China is classified as a developing country and the level of technology is still the same as it was in the 1960's in the western countries. Because of this, the level of energy-intensity per produced unit is relatively high²⁹. During the last 25 years China has gone through a lot of changes. Amongst the most important ones are: making the five-year plans no longer mandatory but goal-oriented, de-collectivization of agriculture, state-owned enterprises lost state ownership and amongst the most important for China's development: allowance for privatization and foreign investments. After this there have been major shifts in the composition of the economy. 1992 Deng Xiaoping, the then General Secretary of the Chinese Communist Party, made his famous southern tour that became the beginning for leaving an isolated China and opening up to the rest of the world with the Open door policy. The proportion of agriculture contributing to the GDP has steadily been declining simultaneously as the service sector has increased. The size of the industry sector has remained more or less the same at half of the GDP³⁰. China is a one party state with no political campaigns or competitions. The congress is called the National People's Congress (NPC) which is the highest governmental organ and under the NPC is the NPC Standing Committee and the PRC Presidency.

²⁸ China Statistical Yearbook 2005

²⁹ OECD

³⁰ Nordqvist, p.2

The economy is the fourth biggest in the world measured in GDP (2005) 2 224 811, compared to the US which is the number one economy with a GDP of 12 485 725 and the poorest economy Kiribati with a GDP of 63. If we instead look at the per capita figures China is no longer amongst the top countries but lies at number 110 with a GDP/capita of 1 709. Again, comparing to the number one country Luxembourg with 80 288 GDP/capita and the lowest GDP/capita Burundi with 107 puts China in relation³¹. When we look at the degree of development in the country we can see that also here, China is mediocre. It positions at place 85 out of 177 countries that have been measured according to the Human Development Index³². The most developed country in the world is Norway which is the closest to one, 0.963, China's HDI is 0.755 and the least developed country is Niger with an index of 0.281³³. Analyzing these figures, China has a relatively high human development compared to the GDP/capita. The heritage of strong socialist values, such as the great caring for employees, still has positive impact for development indicators.

The Chinese businesses are divided into three main ownership groups. They are the State Owned Enterprises (SOE), the Township and Village Enterprises (TVE) controlled by local governments and the private enterprises. The state has for long been in control of all businesses as a consequence of the planned economy system. TVEs have been a major growth factor due to the competition between different regions forcing the TVEs to be effective in order to survive and generate revenue for the region. On the contrary, the SOEs are known for their inefficiency and at many times operating on a loss. But because the government can help them out in difficult times, on a so called soft budget constraint when there is no strong need for raising revenue, there is no pressure to change. Another burden for the SOEs is their life-long commitment to their employees. It is no longer mandatory to do so by law, but the moral burden still makes many employers keep this tradition. The former employees are then entitled to housing and other privileges even when they are no longer bringing any income to the firm. After the opening up of the

³¹ International Monetary Fund 2005, www.imf.org

³² UNDP measurement of development. HDI includes life expectancy, literacy and GDP/capita. It is measured from 0-1 where 1 stands for complete equality.

³³ United Nations Development Report 2005, www.un.org

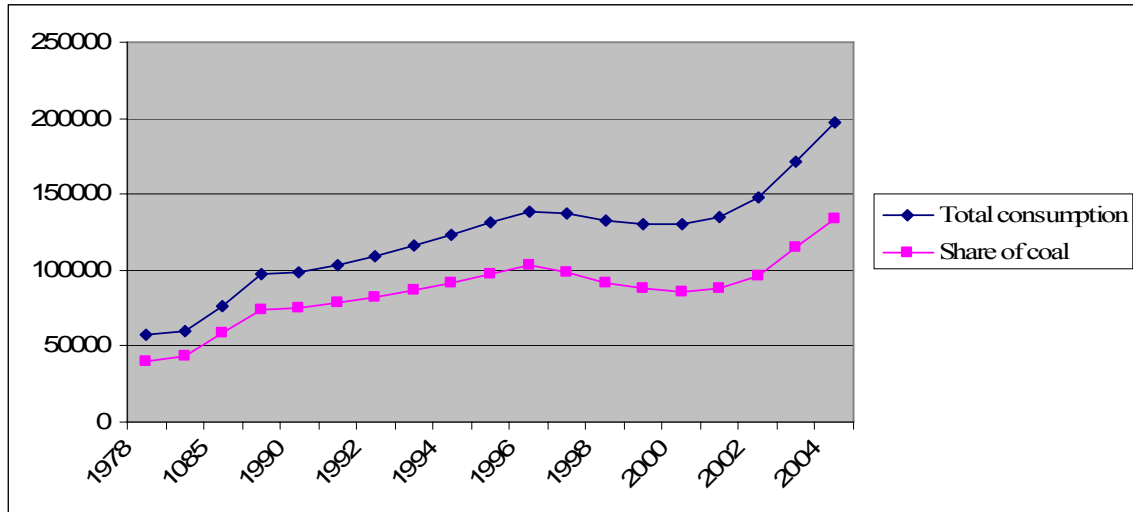
Chinese economy the private enterprises are growing and are more sensitive to outside forces such as international competition. Finally, the private enterprises have a shorter history in the Chinese entrepreneurial world but are today a growing and dynamic group.

4.2 The environment

Today China is the second largest user of energy in the world after the United States, making it also the second largest emitter with a contribution of 15% out of total emissions³⁴. With an annual growth of ten percent the latest years the country is expected to take the leading position in energy consumption very soon. The main dominating source of energy comes from coal and the second largest is from crude oil. The burden of environmental damage on the economy is expected to have from today's seven percent to thirteen percent in 2020. This is one of three of alarming points that the China Council for International Cooperation on Environment and Development (CCICED) has focused on in their most recent report. The other two are the dangerously heavy reliance on imported oil and the rapidly increasing emissions of greenhouse gases³⁵. Graph 3 demonstrates the pattern of energy consumption since 1978, when the open door policy was introduced. The graph also reveals that there is an increasing need for finding efficient energy provision for such an increasing demand. Here, foreign investment can play a huge role for the providing of cleaner technologies, especially concerning the heavy reliance on coal as a source of energy.

³⁴ Tangen & Heggelund, p. 303

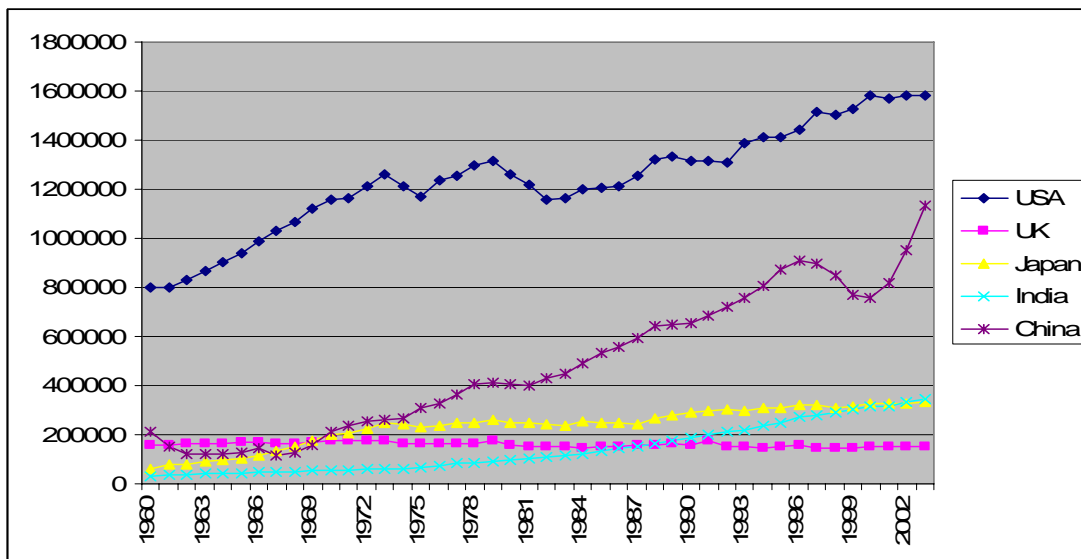
³⁵ Nordqvist, p. 5



Graph 3. Total energy consumption in China (10 000 tons of standard coal equivalent).

Source: China Statistical Yearbook 2005

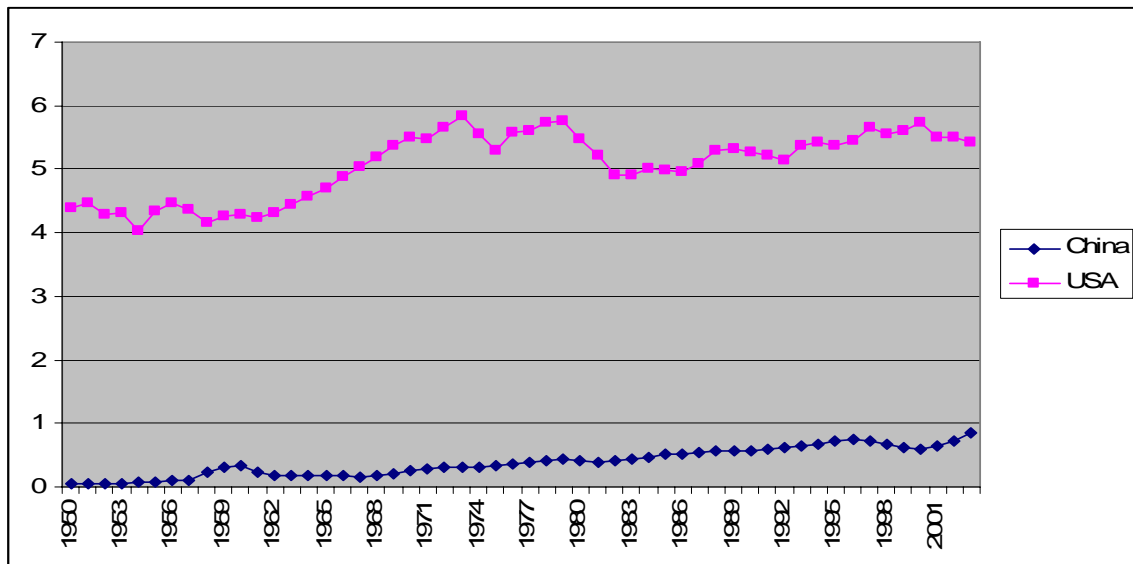
When looking at the graph below the trend is very clear. Whilst other major economies lie steady on one level or ascend like the United States at a slower pace, China breaks out in the 1970's and starts increasing its amount of emissions. Apart from one break in the trend in 1996 where emissions are decreasing for some years, the future trend sees a continuing increasing. Because the other countries have no change in their energy demand it is a perfect situation for industrial countries to penetrate the Chinese market and spread their knowledge on the energy market.



Graph 4. Total fossil fuel emissions in thousand of metric tons 1960-2003.

Source: <http://cdiac.ornl.gov>

Another trend that reveals China's explosive growth in emissions is found when comparing the CO₂ emissions per capita. Compared to the previous graph where the United States doubled its emissions in 40 years, the per capita figures look different (see graph 5 below). The level of emission per capita is relatively stable varying between 4 and 6 metric tons of C/capita. On the other hand, in China's case the emissions per capita have increased by ten times. The Chinese line looks insignificant when seeing the lines in relation to each other, but what is of significance is the trend of the lines. The US still has a higher level per capita varying at 5 whilst China is currently touching 1 metric ton of C/capita. Considering the population of the US is about one fifth of the Chinese population proves to show that China is up on the same emissions level as the US. Apart from the growth in industries and transport the emissions/capita is increasing as individuals release more GHG from their private households hand in hand with the increase in GDP/capita.



Graph 5. CO₂ emission/capita China and USA.

Source: <http://cdiac.ornl.gov>

With the help of a European satellite *Envisat* it is possible to see the rather shocking accumulation of nitrogen dioxide around Beijing and the surroundings. The amount of this gas has increased with 50% in China in the recent past and today the north-east part of China has the largest concentration in the world³⁶. This is clearly indicated by the red

³⁶ www.dn.se

spots on the figure. Other red spots are around Shanghai and the Guangdong province where several major industrial cities are concentrated and adjacent is the business centre Hong Kong. Nitrogen dioxide is a gas that comes from pollution and causes damages to lungs and to the respiratory system. Death from respiratory diseases is the number four cause in urban areas and the third cause of death in rural areas³⁷. The number one cause in both areas is malign tumors, which can also be an indirect effect from the constant exposure to pollution.

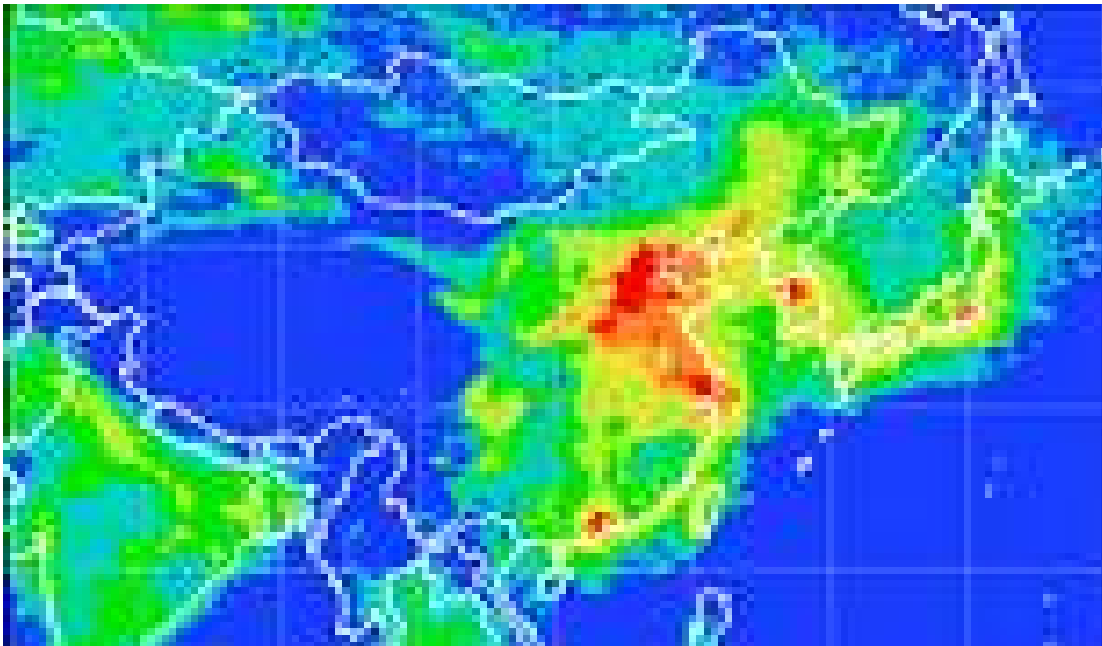


Figure 3. Satellite picture over China.

Source: <http://www.dn.se/DNet/jsp/polopoly.jsp?d=597&a=458077>

In 2005 there was a large disposal of toxic waste in the Songhua River in the northwest part of China forcing the authorities to close down access to clean drinking water. After this incident the general awareness of Chinas environmental problem has gradually increased. Today the emissions released are estimated to pollute around 70 percent of all rivers in China. In 2005 Chinese cities released over two billion cubic meters of unclean water into lakes and rivers³⁸. Out of the total national sea area (in 10 000 km²) 6563 is clean area whilst 3206 is heavily polluted area and the remaining 7131 is lightly or

³⁷ China Statistical Yearbook 2005

³⁸ Peterson

moderately polluted area³⁹. This amount of pollution bears heavy burden on the Chinese economy. In five years, from 2000 to 2004 the direct economic loss due to pollution doubled from 17807.9 to 36365.7 (in 10 000 million yuan)⁴⁰. To sum up; the Chinese economy is growing incredibly and this implies a likewise growing demand for energy. Because China itself lacks the technological level to obtain a sustainable growth, it opens a door for foreign investors. This is where the CDM comes into the picture.

4.3 Institutions

For the first time, in 1972 at the Stockholm United Nations Conference on the Human Environment, Chinas serious environmental problem was acknowledged. As a remedy and to appear serious China implemented a wide range of environmental laws⁴¹. Since 1979 when the Environmental Protection (Trial Implementation) Law came into force there has been great development in the environmental policies. Many of the laws and bureaus are divided according to their biological characteristic, as forestry, water or air. The framework existing today was developed to suit a planned economy system and does not provide an appropriate tool if China intends to participate fully in international environmental treaties. The country must look at other market economies in order to develop a functioning system and the leading example has been the United States which has the most developed system of MBIs in environmental policy. One of the major focuses in the Chinese environmental policy is the principal that every country must together and individually combat the global threat of climate change but in reality the local pollution is mostly given priority.

The Chinese government has since the signing of the Kyoto Protocol established national CDM bureaus for the handling of projects. The Ministry of Foreign Affairs (MFA) is responsible for the international negotiations sending its vice minister for negotiations. The MFA is the organization that negotiates multilaterally in the Kyoto Protocol and the CDM. China has, through the MFA, also expressed the concern that the three

³⁹ China Statistical Yearbook 2005

⁴⁰ China Statistical Yearbook 2005

⁴¹ Shuwen, p. 618

mechanisms, amongst them the CDM, be used with restrictions⁴². Nationally the National Development and Reform Commission (NDRC) has the highest responsibility and is also the Designated National Authority (DNA) for CDM negotiations. The commission is under the State Council and operates under the slogan “Cleaner Production in China”. It is the organ for handling all CDM issues and is also responsible for all national climate change questions⁴³. The submission of CDM is handled to the NDRC which then unites with the National CDM Board and issues a letter of approval, rejection or reconsideration. The National CDM Board consists of the SEPA, The State Environmental Protection Administration, and relevant ministries on the subject⁴⁴. 1990 the government set up the National Coordination Committee on Climate Change (NC4) consisting of 13 ministries and agencies, whereof the MFA is one of the participating ministries. It is under the governance of NDRC and the director general of NC4, Gao Guangsheng, that the DNA operates. The NC4 serves for decisions and support concerning global climate change. The idea of including ministries from different areas is to interconnect the climate change issue into the policy of national development. The above institutions are the key actors for the CDM implementation. But the project must be maintained and developed, so in order to obtain a complete picture of the Chinese environmental institutional system, the remaining national organs and their functions are outlined below.

The environmental protection system is further divided into central and local level. On central level is the framework for legal and institutional issues represented by the State Council and SEPA. On local level the EPBs, Local Environmental Protection Bureaus, are the environmentally most important institutions and enjoy a high degree of independence. The EPBs are responsible for collecting and reporting data on emissions. The numbers are obtained partly from enterprises that self-report and partly from data on pollution flow⁴⁵. They are the ones to consider the economic situation of the factories before they decide to enforce any environmental regulation. Further they have the power

⁴² www.fmprc.gov.ch

⁴³ Nordqvist, p. 18

⁴⁴ cdm.ccchina.gov.cn

⁴⁵ Morgenstern et al., p. 8

to issue warnings, impose fines and revoke permits. The EPBs can also issue different kind of orders such as requirements concerning treatment facilities, suspension of production or even the closure of a facility. If an actor does not follow these requirements the EPB also has the authority to impose judicial actions. Against the heaviest violators criminal action can be taken making the EPBs legal enforcers of environmental laws⁴⁶. SEPA is overlooked by the state's Committee on natural resources and environmental protection, which also supports SEPA in their decision-making. SEPA is responsible for formulating and implementing the national plans for pollution control which comes as a directive from the state council, under which SEPA is under direct control. Further, the EPBs are responsible for representing SEPA, but in the end it is the local governments that provide the funding for the EPBs and this can vary enormously depending on the wealth of the region. EPBs tend to be better staffed and have more experienced staff in wealthier regions. Local governments are the ones to decide what resources are to be given to the EPBs and they also have the authority to change the emissions standards in their region, assuming it is not below national standards. EPBs have been described as being puppets under the local governments and therefore the actual enforcement power of the bureaus is very low. So in the end it is the local governments that possess more power than central authorities⁴⁷. This institutional setup is present in all fields in China, and is referred to as the M-form. The M-form refers to that rather than specializing according to branches, the economy is divided according to region⁴⁸. Mostly the ones working in these environmental institutions have no cooperation with the ones working with economic growth. That is one of the reasons economic growth has been the leading goal without any major integration of environmental frameworks. Below is a chart illustrating the relationship of all the institutions.

⁴⁶ Wing-Hung Lo et al., p. 390

⁴⁷ Shuwen, p. 622-3

⁴⁸ Qian, Roland & Xu, p. 1086

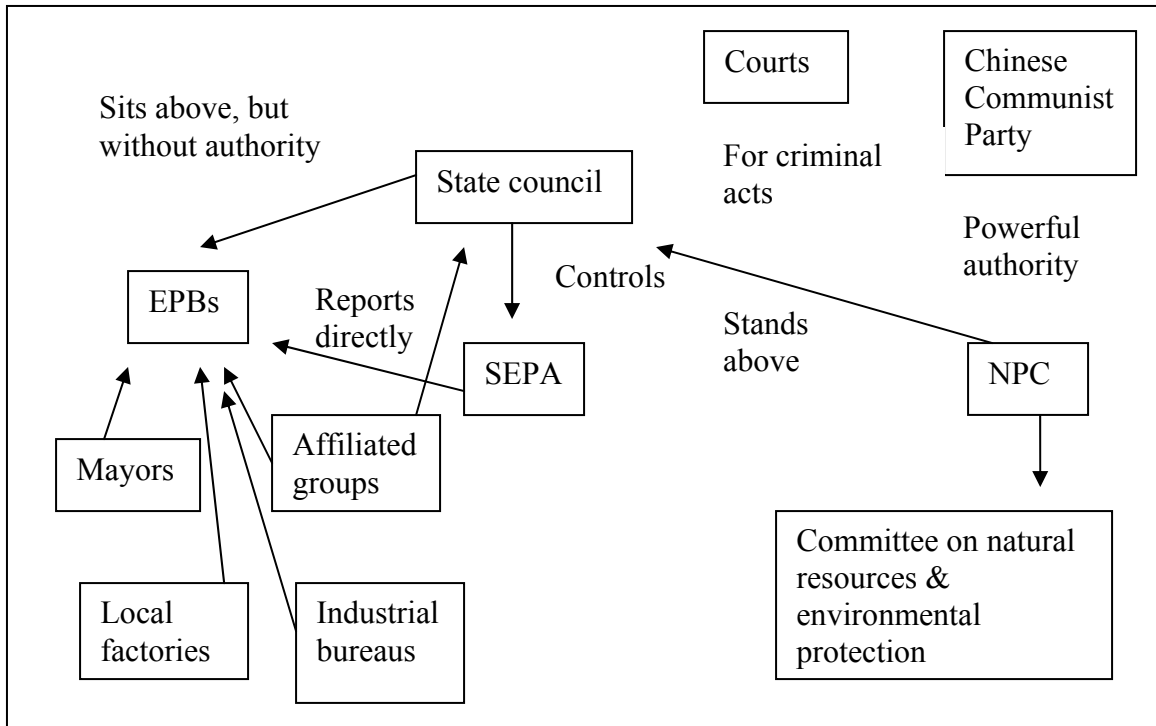


Figure 4. The institutional Chinese system for environmental regulations.

The EPBs function as a spider in the web handling a lot of issues on local level. But due to their often lack of financial assets they do not possess any independent power as would be necessary for a more efficient environmental implementation. The judicial system with the courts in front is often tied to the local governments and lack, just as the EPBs, the independent power for enforcing regulations. This is, we will see later, one of the major obstacles in the Chinese system for using MBIs.

What is present at all levels is *guanxi*: the informal relations that organize the entrepreneurial and political world. Because China's culture is based mainly on Confucianism the legal framework is weak but the personal relations are strong. When Chinese people do business they rely to a greater extent on personal relations rather than formal regulations. The *guanxi* is so deeply rooted in the business world that anyone who dares not to live up to the expectations is socially isolated from doing further business. It is a tradition that was rooted when private enterprises were not granted any protection or rules, and therefore the actors themselves were forced to put up a social safety net in order to protect themselves from eventual contract breakers. Today the private enterprises

are more vulnerable than the state owned due to their hard budget constraints, and *guanxi* has become the custom when doing business or signing treaties.

The officials that work within the Chinese bureaucracy are strongly growth-oriented. This is mainly due to one reason and that is that their chances of getting promoted in the entrepreneurial world are bigger after a career as a “business-friendly” government official. Companies will be more eager to hire an official that already has one foot in the business world and contacts in the political sphere. Due to this strong growth-orientation and the separation of politics from branch expertise, the politics are seldom based on pure environmental concern, but rather on promotion possibilities for officials. In the chart below is the share of funding for environmental protection. It is clear that the contribution from the state budget is a relatively small part. Environmental protection is not present at all levels of the state budget; instead it can go under names such as Forestry Conservation etc. Even so, the state investment is low enough to reflect the negligence of environmental values. With the introduction of CDM the share of foreign investment is expected to increase its share.

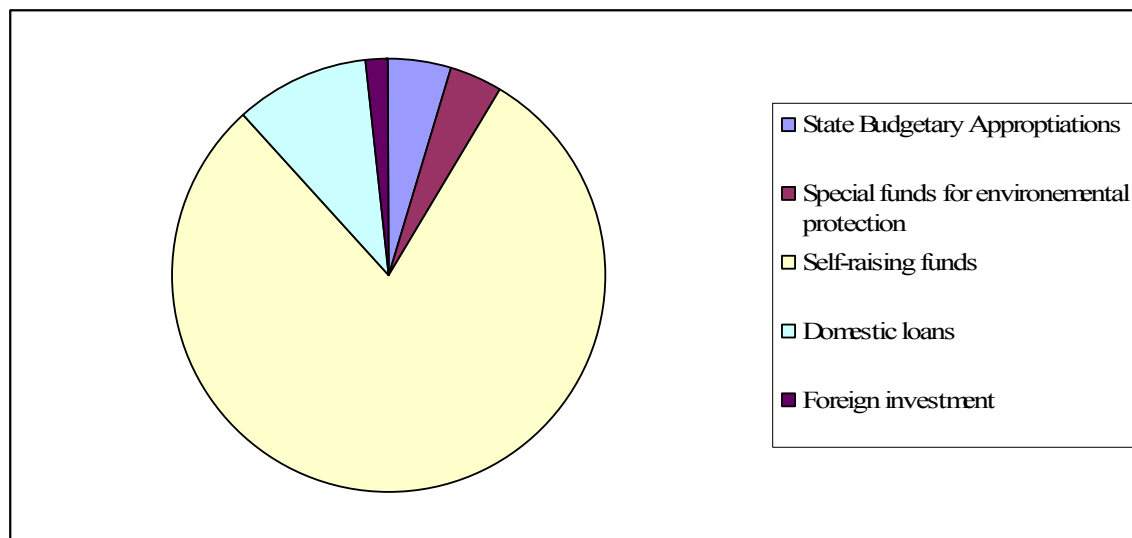


Figure 5. Source of investment for environmental protection. Source: China Statistical YB

Later we will see that the institutional setup in China can be both advantageous and become an obstacle for an effective CDM implementation. This is mostly because of the internal ambiguousness in the country that can make outcomes uncertain.

5. The Kyoto Protocol

5.1 The negotiations

In 1992 the world's countries gathered in Rio de Janeiro for a conference on climate change led by the United Nations. A convention was signed: the United Nations Framework Convention on Climate Change by 189 countries and went into force 1994 when it was ratified by 166 countries. The 189 countries that have signed together emit 61.6% of total emissions globally. Out of these countries Australia and the US have signed but have for now no intention to ratify. Countries that have neither signed nor ratified are 29 and include the Chinese republic Taiwan. The convention attempts to bring together all parties to solve the threat of global warming by international common regulations. At the first Conference of the Parties (COP1) in 1995 all countries reported what progress had been made concerning the abatement of emissions, and it was discovered that not enough effort had been made. Therefore, regulations with judicial consequences were introduced. At the third COP the participating countries signed the Kyoto Protocol. It is signed by all Annex I countries and introduces quantitative reductions during the years 2008-2012. For a detailed list of all member countries and their respective amount of reduction see appendix C. The average reduction is 5.2% of collective emissions compared to the base year 1990. The treaty came into force when it was ratified by Russia and then complying with the requirement of representing at least 55% of the emissions from the industrial countries. The requirement of getting at least 55 countries to sign was fulfilled early in the negotiations. Russia and the United States together emit half of all the pollution from developed countries⁴⁹. The problem is that the largest emitter in the world, the US, has not signed the protocol.

5.2 The flexible mechanisms

The Kyoto Protocol involves three flexible mechanisms that are meant to help the Annex I countries to meet the Kyoto goals at the lowest cost possible. After the seventh COP in Marrakech a lot of progress was made on the practical details of handling the flexible mechanisms⁵⁰. They are Emission Trading, Joint Implementation and the Clean

⁴⁹www.energimyndigheten.se

⁵⁰www.energimyndigheten.se

Development Mechanism. The flexible mechanisms were introduced to help member countries achieve their abatement goals at the lowest cost possible, one of the reasons that made Russia finally ratify the protocol. China is not part yet of the emission trading scheme but carries projects in the CDM being a host country. The essay will therefore focus on this part. The protocol was ratified by China in 2002.

International Emission Trading under the Kyoto Protocol (Article 17)

National quotas are assigned by the Protocol to Annex I countries and enables transaction between the countries starting 2008 when the commitment period begins. There are regional trading schemes already in use such as the one the European Union is using, the EU-ETS.

Joint Implementation (Article 6)

Countries in Annex I that help to finance projects in other Annex I countries receive emission reduction credits. This is to help other Annex I countries to in the future be able to engage in emission trading. It is based on basic economic theory that the GHG emission abatement should take place where it is most profitable.

5.3 The Clean Development Mechanism (Article 12)

Without any previous public debate the CDM was surprisingly introduced the last days of COP3. Together with JI the Clean Development Mechanism is referred to as project-based mechanism. The CDM is meant to make both developing and industrialized countries benefit in the way that if an Annex I country helps to finance emission reduction schemes in non-Annex I countries they get CERs, Certified Emission Reductions. The CERs are emission rights that are issued in the exchange for real emission abatements and can later be traded according to firm's abatement levels. This is what makes the CDM a market mechanism. Because the CERs are used for the investing country to meet its Kyoto target only countries that have signed the protocol are entitled to receive CERs. This is one of the most important mechanisms as it encourages investments in developing countries, helping to fill the technological and economical gap between Annex I countries and non-Annex I countries. CDM opens the door for

developing countries to eventually join the Kyoto Protocol. One of the most significant differences between the CDM and the JI and the Emissions Trading is that the CERs obtained are added to the assigned amount of the actor without subtracting it from another actor. That means, that the total amount assigned is increased and the industrial party can emit a higher amount or increase revenue by trading them⁵¹. In JI and Emissions Trading the amount of assigned amount is always the same, instead it just changes hands. According to article 12.5 there are three criteria to be fulfilled in order to obtain CERs: the participation of both parties must be voluntary, measurable and long-term effects of the mitigation of climate change and “environmental additionality” referring to the fact that the CDM project must reduce emissions that would otherwise not have occurred⁵². The protocol has assigned certain projects that are suitable for the CDM, but in reality any project that results in a less amount of green house gas emission is qualified. The size of the project or the location is not of any importance, the only thing that is important is the reduction function.

The implementation of a CDM project is not simple. The project goes through many processes before it is ready for operation. The stages are:

1. Preparation of a project design document, a baseline⁵³ study, a monitoring plan
2. Validation
3. Negotiation of project arrangements, construction and startup
4. Registration
5. Monitoring, verification and certification
6. Issuance of CERs⁵⁴

The functions of auditing and verification mentioned in article 12.7 are crucial for a CDM project’s credibility. Because these include a high degree of technical knowledge it has been suggested that these functions be performed by private consulting firms. These functions together with the certification have no special form of governance and can be performed by international or national and governmental or private actors. Further on in

⁵¹ Oberthur & Ott, p. 169

⁵² Oberthur & Ott, p. 169

⁵³ The baseline for a CDM project activity is the scenario that reasonably represents the anthropogenic emissions by sources of GHG that would occur in the absence of the proposed project activity.

⁵⁴ World Bank, p. 8-9

the process, private actors might also be involved in the buying and selling of CERs. One way for developing countries to engage in the brokering of CERs is that they can self-finance their own CDM activity and later on sell the CERs obtained to investors⁵⁵. Below is a chart trying to illustrate the process of a CDM project.

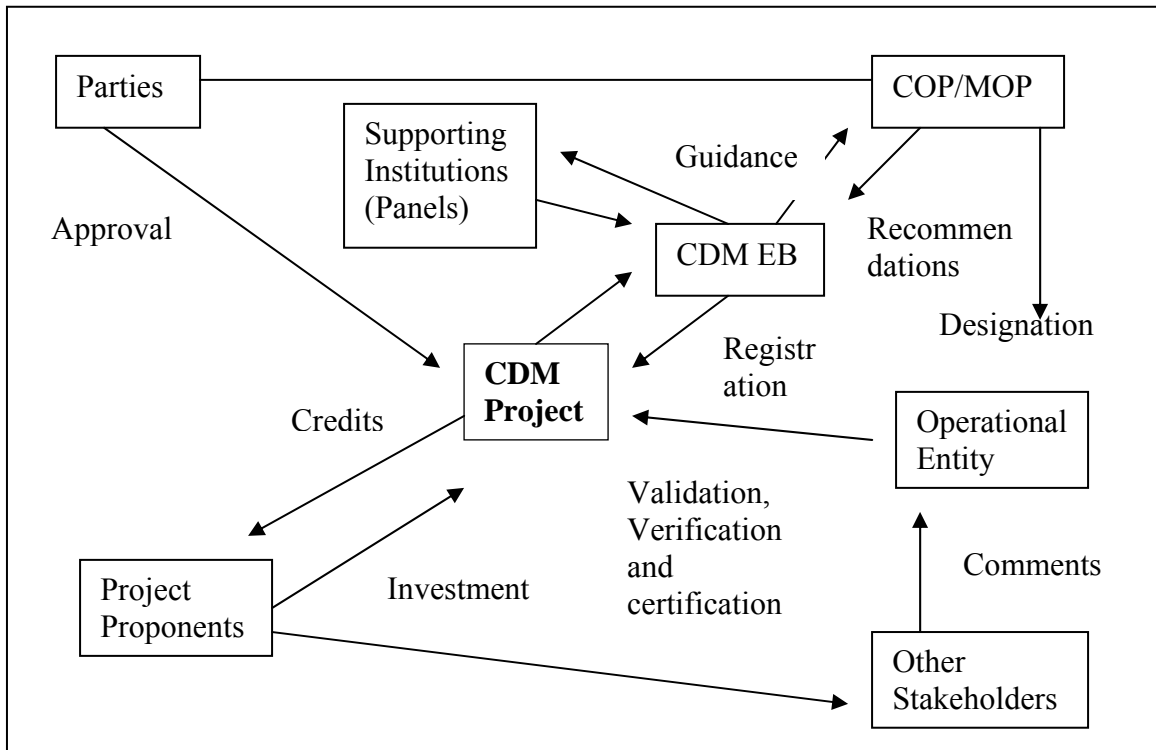


Figure 6. The relationship of the CDM parties.

Source: World Bank

The process is far from simple and involves many steps before the project is ready for operation, which is one of the disadvantages of the CDM system.

Article 12.3 reads:

Under the clean development mechanism:

- (a) *Parties not included in Annex I will benefit from project activities resulting in certified emission reduction; and*
- (b) *Parties included in Annex I may use the certified emission reductions accruing from such project activities to contribute to compliance with part of*

⁵⁵ Oberthur & Ott, p. 175-176

their quantified emission limitation and reduction commitments under Article 3, as determined by the Conference of the Parties serving as the meeting of the Parties to this Protocol.

In this article it is easy to see why the CDM is beneficial for industrial countries as it is stated in 12.3(b), they may use their investments to later comply with their compliance under the protocol. In 12.3(a) the article simply states that the hosting countries will benefit, but it is unclear in which way. The CDM article is still vaguely expressed and due to the short history of the article the norms are still being formed. After COP7 in Marrakech the institutional methodological, technical and procedural formalities were set up. The conference was a big step for China in proving it is a competent and willing country for hosting CDM projects. At the conference the CDM Executive Board (EB), which now consists of ten members with representatives from a dispersed geographical area, was established. The board supervises the CDM with the helping guidance of the COP. Article 12.4 states that CDM “shall be subject to the authority and guidance” of the COP/MOP. The board has members represented from many different geographical and economical areas because equity is an important issue for the CDM projects. One fear has been that the projects will concentrate in areas where FDI is already located forgetting about the areas where it might be mostly needed. In 1997, 10 countries attracted 75% of all FDI whilst the Sub-Saharan region only received about 1% of total FDI⁵⁶. The EB now has members from the least developed areas and the smaller islands in order to prevent this unbalanced dispersion.

There are basically two main ways for negotiating the CDM, bilaterally or multilaterally. Developing countries tend to prefer the multilateral negotiation model because they will generally have more influence in the negotiations as a host country. To the contrary the industrial countries tend to prefer the bilateral mode. It seems that in this way CDM aims at employing private enterprises and market forces in order to obtain emission reductions and in this way reducing transaction costs⁵⁷.

⁵⁶ Oberthur & Ott, p. 180

⁵⁷ Oberthur & Ott, p. 172-173

One of the key issues of the flexible mechanisms is to achieve emissions abatement at the lowest cost possible. Because developing countries are not at the same technological level or have the same experience of emission abatement as the industrialized countries do, their costs for abatement is also higher. The marginal abatement cost (MAC) is higher, implying that the cost of every unit of reduction is increasing. This means that the same amount of financial investment can reduce more units of emissions in a developing country than in an industrial country because each unit of abatement is worth more. Based in this assumption, the investment in a CDM project will yield higher returns on investments for the project sponsor. Taking this one step further, it means that the sponsor will get more CERs to meet the targets than if the money was invested in the home-country.

6. The implementation of CDM in China

The PRC has three main characteristics which makes the country suitable for CDM projects. Firstly, the country is thriving for foreign investment. It is today the country in the world that receives most FDI. Secondly, the heavy reliance on coal as an energy source creates many opportunities for alternative sources. Lastly, the relative cost of emissions abatement is low in China⁵⁸. All these factors together lead many experts to foresee China as the biggest recipient of CDM in the future. There are 16'492'133 CERs issued at the time of writing, and they are expected to be 590'000'000 at the end of year 2012 based on current trends⁵⁹. Several analyses expect to see China hold 60% of these. Since 2005 the number of registered projects is increasing and China is the leading country when it comes to emission reduction in coal mining activities. In 2004 the government put forward a national plan for the implementation of CDM. The most important elements contain rules on:

- ownership of the projects that may get approval;
- ownership of the resulting CERs;
- preferences for certain types of CDM projects, in particular renewable energy and energy efficiency; and
- all documentation needs to be submitted in Chinese⁶⁰.

The first CDM project was established and in operation in January 2002. In Inner Mongolia a wind farm project was put up by CERUPT, the CDM credit procurement of the Dutch Government with a price of 4 \$ per ton of CO₂⁶¹. Currently in China there are 23 large scaled projects ongoing at one single location and only two small-scaled. This can be compared to India with more than 40 small-scaled projects and about 25 large-scaled. According to the national CDM site, updated in April, there are more than 100 projects currently under application process and in total, 164 projects have been approved by the DNA in China, whereof 72% of these are on renewable energy⁶². The pattern in

⁵⁸ Szymanski, p. 27

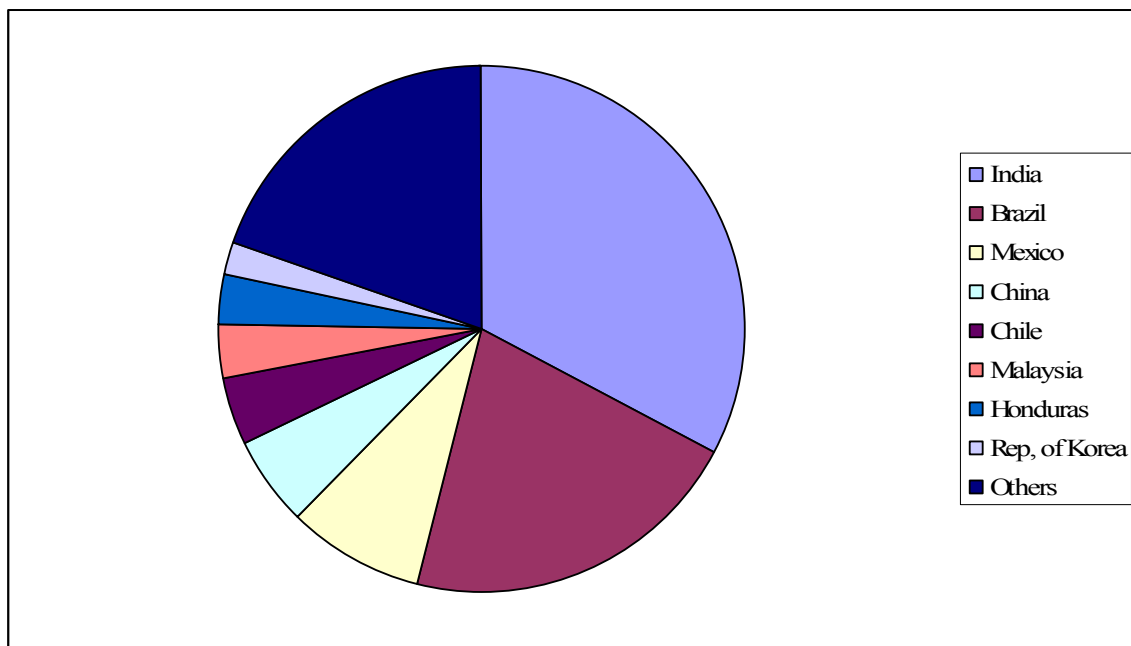
⁵⁹ <http://unfccc.int/cdm>

⁶⁰ Vrolijk & Jinze, p.46

⁶¹ World Bank, p. xxiv

⁶² cdm.ccchina.gov.cn

the rest of the world is that Brazil and Mexico run a great deal of projects and Indonesia has a few. But what is so characterizing for China is that a majority of the projects are single location and large-scaled. This is not the case for the other countries where the projects are either small-scaled or run on several locations. The reason for this is that there are big transaction costs associated with CDM projects. Smaller projects don't have the same absorptive capacity of transaction costs meaning they at many times are prevented from continuing the process. According to an analysis conducted by the World Bank, all enterprises with smaller amount of emission (< 10 000 tons of CO₂ / year) will not have a possibility to introduce CDM at market prices⁶³. To remedy this, there are special simplified requirements for small-scaled projects in order to not discourage investment. At the time of writing, 349 projects had been fully registered in 2006 in total, China holding 5.73% of these. The single three countries hosting more projects are the ones mentioned above, in order of quantity: India, Brazil and Mexico (32.66%, 21.20% and 8.31%). In the pie-chart below the dispersion of the projects are illustrated.



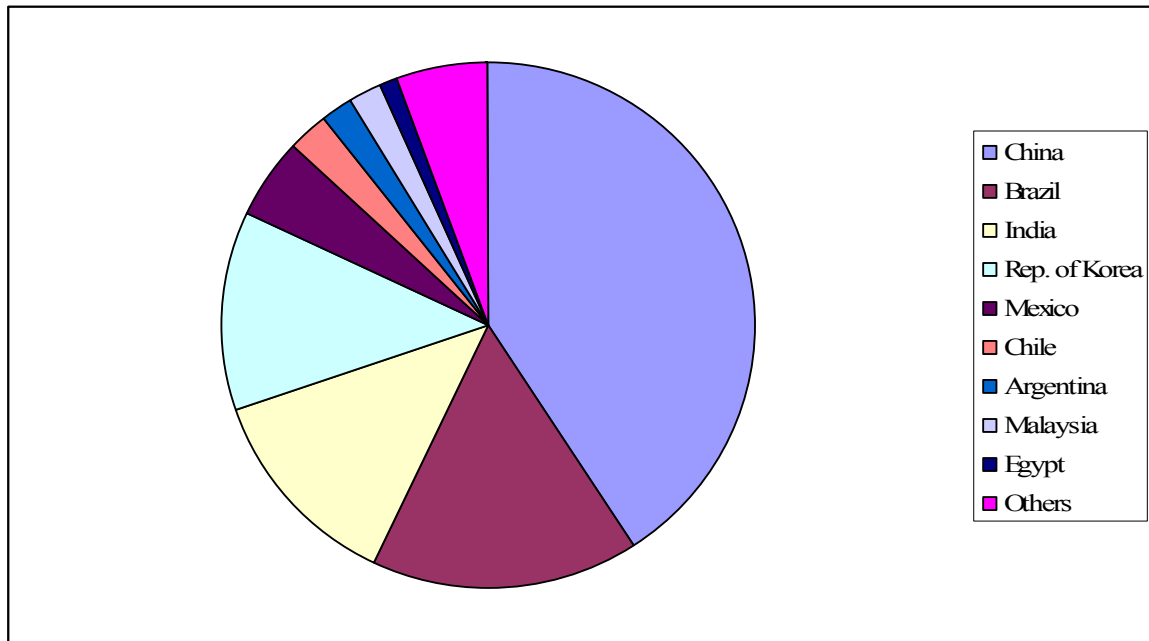
Graph 6. Total percentage of 349 registered projects 2006.

Source: <http://unfccc.int>

Although when looking at the *expected* average annual CERs, China holds a striking majority of 40.78% and the second largest country Brazil holding only 16.22%. These

⁶³ Vennemo & Aunan, p. 225

figures can vary slightly from day to day, but China is without doubt still the leading host country. The graph below illustrates this expected dispersion.



Graph 7. Expected average annual CERs totally 90'263'712.

Source: <http://unfccc.int>

When a project is to be approved several things will be looked at, apart from general economic development, more specifically the ability of job creation, technology transfer and to what extent SOEs are included⁶⁴. The Chinese government has expressed its priority for renewable energy projects and that these take place in the less developed Western part of China. In the beginning the government will probably not allow sink projects or unilateral projects, that is, it will not allow that projects be carried out by Chinese actors without any involvement of an Annex I country. Unilateral projects are not preferred mainly because of two reasons: there will be no technology transfer from other countries and no income of foreign capital contributing to the Chinese economy⁶⁵. As mentioned above these are two of the top criteria when the government decides on projects. At the same time, the national CDM rules require Chinese ownership of the project, but with involvement of foreign actors (see appendix E).

⁶⁴ Szymanski, p. 30

⁶⁵ Tangen & Heggelund, p. 305

The special administrative regions of Hong Kong and Macau are not included in the Kyoto Protocol implementation according to a statement by the Chinese Government.

6.1 State Owned Enterprises

As article 12.9 reads both private and public entities are subject to the CDM. It is suggested in the case of developing countries that public entities will take most part of the CDM projects because their private sector is often underdeveloped⁶⁶.

SOEs are numerous in the fields of utilities, heavy manufacturing and resource development. This group of enterprises is the one that is not accustomed to strong legal enforcement. Governmental ownership collides with the fact that the government has monopoly in enforcing environmental policies. Further, the strong organizational heritage is often very present in these plants, which implies that the wellbeing of the employees comes first, not investing in new technologies. The SOEs are also problematic because a majority of them operate with a loss. SOEs are said to have a soft budget constraint meaning they can always ask the state for help if they need financial backup. Due to this soft budget the state run firms have no intentions for improving their technology in order to make it more efficient. SOEs have a huge economic importance, many social welfare functions and rely on heavily subsidized coal which makes the government reluctant to change their structure⁶⁷. Because of that the state is the one to issue the environmental regulations, if a SOE asks to not pay any fee it will not have to do it. The reason that the state is not eager to claim fee-collection is that if the enterprise pays higher fees it means higher costs which in turn means less tax-income for the state. Managers of SOEs generally look to make short-term profit in order to raise their probability for promotion instead of seeing long-term benefits for a sustainable approach.

Although, SOEs are prioritized when the evaluation of a CDM is made as they often lack the incentive to improve their technology on their own. CDM provides a legitimate example for steering SOEs towards environmental technologies.

⁶⁶ Oberthur & Ott, p. 176

⁶⁷ Shuwen, p. 645

6.2 Township Village Enterprises

These local enterprises have been one of the keys in the success of the Chinese economy. Due to the fact that there has been intense competition between local governments the TVEs have been forced to develop a high level of efficiency. Even so, the level of technology is poor and the usage of resources high so the economic efficiency is financed by environmental destruction and has contributed a great deal to local pollution⁶⁸. As with the SOEs, the TVEs have been able to avoid paying environmental fees to the local EPBs if they are making a loss in their budget. Again, the problem of the government running enterprises is present, but it is moved down to a regional level. Enterprises that do make a profit might refuse to follow regulations. The managers of the firm can think that the cost is simply too high, and just not implement the regulation, whereas the local officials might not charge them since the TVE business brings revenue to the region. A difference between the central and local governments is that the local have strong competitive pressure between each other and have therefore put as a priority economic growth in front of anything else instead of social values in the SOEs. Very characteristic for these firms is that apart from their low level of technology, they are widely dispersed over a big geographical area making the control of these enterprises very difficult. Due to this, the use of CAC policies is difficult because the task of controlling becomes impossible. In 1996 there was an attempt to improve the high pollution that TVEs emit called the *Limited Time Treatment*. In this phase 72 000 TVEs went under investigation in 15 different industries causing 65 000 to actually shut their business⁶⁹. Another policy was introduced attempting to control TVEs called the *three synchronizations*, but was based on the controlling of the enterprises which made it fail. Instead, the TVEs are highly suitable for CDM projects because of their poor technology and their geographical dispersion and are also suitable for MBIs as they already have encountered intense competition and therefore have experience of market forces.

⁶⁸ OECD

⁶⁹ Shuwen, p. 627

6.3 Private enterprises

Although China is still considered to be a developing country it has a high level of industrialization. The largest private actors are found in the heavily coal-dependent industries such as steel- and cement production. This group of private enterprises has been allowed to establish along as Chinas doors have been opening towards the rest of the world. These firms are the ones with the greatest incentive for implementing MBIs as they have hard budget constraints, that is; they must be efficient enough to survive on the market. Amongst these actors we also find a big potential group for CDM projects which are the multinational companies. A MNC that is already established in China knows about all the local procedures and has contacts that know about relevant conditions. This way, they have a head start and can minimize their transaction costs. The complicated rules of Chinese ownership and foreign involvement are also already settled in these firms. Further, private enterprises can provide a market for the new technologies that are introduced via the CDM projects.

6.4 Obstacles

The constraints that developing countries mostly face for implementing environmental regulations are financial, institutional and political. This is also the case for China.

6.4.1 Transaction costs

It is according to economic theory a market failure when transaction costs hinder the free movement and decreases the total volume of trade. This creates a deadweight loss due to the decreased volume of trade moving from the optimal position. In order to obtain optimal trade actors must minimize the transaction costs.

Before deciding on a project the investor must find a proper location to set up the project and find out about local conditions. As the Chinese government also requires the documents to be in Chinese, the investor must also hire translators for handling the documents. After applicants get approval from the CDM National Authority the project must also be approved by a third independent party. This third party must then validate, monitor and certify and some organizations that do this are Ecosecurities Ltd, KPMG and

PricewaterhouseCoopers. The World Bank has made an estimation that this part alone will reach a cost of at least \$250 000 per project. Also, investors will need the help of lawyers and consultants for defining ownership of credits earned and monitor the project⁷⁰. The projects that are large-scale must also be approved by the government as do other FDI meaning that the approval time and cost becomes double. As CDM is a market-based instrument there is a risk that transaction costs that are too high will scare investors away. In the case of small-scaled projects the transaction costs have been given priority as there have been attempts to reduce them in order to facilitate transactions.

6.4.2 Lack of experience

The lack of relevant experience is mainly divided into two fields; there is no knowledge of market instruments and no experience of environmental priority in politics in China. The CDM tool is based on the economics of tradable permits as the most cost-efficient way for emission reductions. The tool is based on market principles with free trade within participating actors. The fact that China has had a planned socialist economy for the last decades clearly is an obstacle when considering an effective implementation. EPB officials and other local actors have no experience of using MBIs and can at many times feel suspicious and hesitant to introduce them. Local governments have been a key issue for the rapid and strong growth that China is experiencing due to their unique focus on economic growth as discussed previously. The local bureaucrats have for the last years been focused solely at obtaining economic success without considering any other goal. Now that the winds are changing it is against their custom to implement projects that might not be strongly focused on economic gain but rather on the environmental aspect. China in spite has high technical expertise about the CDM projects dominated by technical experts and engineers. The problem is that these are concentrated in Beijing at a limited amount of institutions. Even if the technical expertise is high, China lacks economic and market specialization for a full implementation. When the investors explore whether to proceed with a CDM project in the host country the number one criteria is that the host country's authorities are cooperative. This is particularly crucial for private investors because they have higher insecurity. Another important factor that

⁷⁰ Szymanski, p. 29

investors consider is the amount of projects that have been implemented and how successful they have been⁷¹. The first CDM project to be registered was the windmill project hosted by CERUPT. The project was submitted in 2002 but was not registered until June in 2005 by the CDM Executive Board⁷². Three years is too much time for the implementation of a project. During that time the technology might have developed to the extent that the technology used in the project no longer is cost-effective and modern. This slow processing is a factor that might scare many investors away. China is still behind many other developing countries in the field of experience which is demonstrated by the amount of projects registered. Because the experience factor is important for investors it clearly has a negative impact for the amount of projects in China.

6.4.3 Subjective bureaucracy

When it comes to the implementation of environmental policies in China there is no certain outcome. One of the major contributions to this uncertainty is the fact that leaders of bureaucratic institutions have great power over the completion. The leaders in local governments have long been led by the pro-growth strategy neglecting the environmental burden this might cause. The EPBs that are mentioned in the first chapter function as legal enforcers. But in reality they don't execute the power as they should. Because of the lack of resources, the bureaus can only focus on certain sectors or certain polluters. Here the phenomenon of *guanxi* plays a huge role, which is the way of organizing business through informal relations based on principles such as reciprocity. Because of the personal importance of the enforcer it is important that an official is chosen that believes strongly in environmental values. *Guanxi* is present in state-owned-enterprises but is found in all kinds of business relations. There is even a word for using contacts in the governments as a mean of obtaining ones will: *gongguan*. Yongqiang and Zhilong suggest in their article that firms have different ways for steering the decision-making of the government. They are: business congressmen's direct participation in politics, *guanxi*, commonwealth contributions, money giving, to be an enterprise of a local government or

⁷¹ Tangen & Heggelund, p. 306

⁷² Vrolijk & Jinze, p. 46

to engage in a trade organization⁷³. The conclusion of this is that it is not the politics that are of relevance, but rather who is responsible for them. The Congressmen that sit in the NPC work only half-time and are often CEOs for companies or have another position in the entrepreneurial sector. Their political decisions are therefore often characterized by their business interest. For many officials the time in politics is an excellent way of making a later career in the entrepreneurial world. When an ex-official is hired the enterprise knows the newly-hired has good contacts in the political sphere making the effect on decision-making easier. As local officials enjoy a high degree of independence there is no guarantee that centrally determined policies are implemented regionally. This lack of political effectiveness is referred to as enforcement gap⁷⁴. More specifically it is referred to when policies are announced on central level but never become implemented regionally due to the skewed opinions of local leaders.

6.4.4 The climate for foreign investors

CDM projects are foreign investments. A foreign investor faces different requisites than does a domestic investor in China. Local officials are many times afraid of losing influence in the region if the share of foreign ownership is too big. The Chinese interim measures state in §17 that a minimum of 51% must be held by Chinese owners. This makes negotiation difficult for foreigners. Generally a foreign investor will want to hold a majority in order to maintain control. The building of Joint Ventures is also difficult when foreigners are not allowed majority shares. A consequence of these rules is that it becomes difficult for investors to keep their technical know-how from spreading. The Chinese state also encourages unilateral negotiations, contrary to the basic CDM idea, and §20 states that Chinese CDM projects are to be registered directly at the CDM board. The fundamental idea is that industrial countries should buy the CERs at state level although this might not be the most efficient option.

Large scale projects needs the same approval as do other Foreign Direct Investments at the same time as they need separate CDM approval. Further, large scale projects also

⁷³ Yongqiang and Zhilong, p. 77

⁷⁴ Wing-Hung Lo et al. p. 389

need approval by both local and the central government⁷⁵. The facts speak for themselves that the system does not facilitate for foreign participation. China has since the beginning of the introduction of CDM been hesitant as to what purpose the industrial countries actually have for investing in CDM projects. The CDM mechanism was mostly seen as a device for developed countries for dumping their pollution somewhere else. Today this image is no longer present to the same extent as the general opinion is shifting towards a more positive attitude of CDM projects.

6.4.5 Lack of transparency

There is a strong lack of public awareness on environmental issues in China. The provincial Development and Reform Commissions have no experience of CDM, and they are the ones responsible for approving projects locally. The availability of data can be scarce which makes the development of baselines and providing additionality of projects difficult. Strong incentives for local authorities are societal groups that put pressure on decision makers. Studies have shown that public awareness does increase the effectiveness of implementation. As China lacks both societal environmental groups as well as a general knowledge amongst people this incentive is not strong⁷⁶. Social stability is one of the strongest concerns in Chinese politics, and generally political activism is seen as a threat against this. Due to this strong value the population is seldom seen as a constructive actor⁷⁷. According to the information principle, media is an important medium for informing people about environmental issues and because media is not completely free or uncensored in China it imposes an obstacle. However, the trend is moving towards more reporting on environmental happenings as approved by the central government.

Because of the strong bureaucracy in China, most of the projects have been run by bureaucrats in Beijing which also hold the CDM negotiations, not involving the actual project developers⁷⁸. At the time of writing, a massive corruption-scandal is unrevealed

⁷⁵ Tangen & Heggelund, p. 306

⁷⁶ Wing-Hung Lo et al , p.392

⁷⁷ Nordqvist, p. 15

⁷⁸ Tangen & Heggelund, p. 306

in the power concentrations in Shanghai. The communist party's internal investigation bureau researched 147 000 cases of corruption in 2005 and has since 2003 held charges against 67 000 governmental officers for corruption. In 2006 until august 17 000 charges have been made reflecting only a part of the total amount⁷⁹. These figures reflect two important facts: corruption is still present at the highest governmental levels in China and the government is taking action to combat this. The presence of corruption is also a significant factor for investors. China ranks 57 out of 91 countries surveyed by Transparency International (TI) with a transparency value of 3.5 (out of ten) sharing position with Argentina. The most transparent country of the surveyed is Finland with almost complete transparency (9.9)⁸⁰. The strong occurrence of corruption is also a failure in the market causing non-efficient outcomes and skewing the allocation of projects. Corruption-treatment is therefore tightly connected with an effective CDM implementation.

6.5 Opportunities

As China's heaviest energy-source comes from coal, most investments are likely to end up in this sector. But there are trends that point to other directions. According to consultant Scott Roberts, the coal-energy sector is no profitable option for foreign investors. Because of the restructuring of the State Power Corporation environmental goals have been set aside and foreign investors are redirected when local actors have not kept up to agreements within the power sector. Together with other circumstances it leads investments to more likely end up in the production of highly efficient boilers, energy-efficient boilers, biomass gasification, electric and gas-fired public transportation and solar heat among others⁸¹.

One of the main reasons to invest in a CDM project is that the company will be ahead of other actors in the field of GHG abatement which is becoming a growing issue. The CDM can be used by multinational companies as a tool to gain governmental support and

⁷⁹ Peterson

⁸⁰ www.transparency.org

⁸¹ Szymanski, p. 29-30

eventually social support. Environmental awareness is increasing amongst consumers and companies must adapt to the change in consumer behavior.

To combat the poor institutional backup for CDM in China, by May 2002 three large assistance projects were set up with a fourth on its way to create an effective system for CDM implementation and increase local knowledge. China is building a high expertise on the policy-making of CDM concentrated in the Ministry of Foreign Affairs, the State Development Planning Commission and the Ministry of Science and Technology. Other institutions include Qinghua University and the Energy Research Institute, under the SDPC with technical knowledge⁸². Internationally China is gaining more and more credibility for CDM. Point Carbon, an organization that keeps track of energy and environmental markets, ranks China as the second best potential CDM host country after India and followed by Chile⁸³. In this list Mexico is practically the only country climbing down, although it is today one of the biggest host countries, in terms of projects hosted.

6.5.1 Technology transfer

According to the World Bank, taking advantage of full CDM potential can have such impact on Chinas economy as an increase in GDP with 0.5% from 2005 to 2030. They calculate that CDM would add \$475 million annually in foreign investment in 2010. Because of the advancement in technology localization, the multiplier effect will also increase over time⁸⁴. Technology transfer is one of the main advantages from participating in CDM. According to a study by Wang & Yan the highest potential for energy technology transfer is in clean coal technology, energy efficiency improvement and renewable energy technology⁸⁵. Developing countries often lag behind in technology and this is an opportunity to catch up without having to pay for the property rights or invent the technology by themselves. Even though China has a commonly known problem of deficient property rights, this is a step in the right direction. With the transfer of technology also comes new employment generations. Local staff will need schooling

⁸² Tangen & Heggelund, p.304

⁸³ www.pointcarbon.com

⁸⁴ World Bank, p .127

⁸⁵ Wang & Yan, p. 43

and a market needs to be set up for the newly imported technologies. The maintenance of the project also requires competent staff on set with expertise. The generation of employments is also one of the most important factors for the Chinese state when considering a project.

6.5.2 Environmental benefits

In general, statistics show that although emissions are increasing and so the total amount of natural disasters in China, the trend towards environmental protection is also growing. In 2000 the total investment in the treatment of environmental pollution was (in 100 million yuan) 1014.9 and four years later the investment had almost doubled to 1909.8⁸⁶. This shows that there is a will to combat the threat of climate change and an awareness of the consequences. These figures point in the right direction for CDM implementation due to the increasing knowledge of environmental depletion. Introducing cleaner technologies into the growth-machinery of China will have impacts on the environment. In order to get more exact measurements of the effect, baseline studies can be applied, comparing what the GHG emissions would have been without the CDM project.

In different reports performed on developing countries it has been found that the statistical life ranges in value from 240 000 to 8,6 million RMB. It seems the pattern is that studies conducted in China value lives in China lower than what studies from other developing countries do. Chinese studies value life at 1 million RMB or lower whilst other studies range between 2 to 3 million RMB or even higher. Studies conducted in industrial countries generally value lives higher, but considering they use the wage based method on a higher basis it is normal. A wage in an industrialized country is on average 20 times the one of a Chinese worker. This fact also influences on the willingness to pay for risk-reduction. The Chinese workers cannot afford to spend as much on risk reduction, therefore causing a much lower value on the value of risk. It is estimated that if China would take advantage of it's whole CDM potential, depending on the type of research made, it would save between 2 700 to 38 000 lives. The major change in avoided life years lost is expected to be in the population aged below 50, which would

⁸⁶ China Statistical Yearbook 2005

have impact on the national life expectancy⁸⁷. If this were to occur the country would also raise its HDI. Vennemo and Aunan research in their article that between 34 and 161 lives could be saved for each million ton of CO₂ reduced. If the statistical value of life is used of 1 million RMB it means that 34 to 161 million RMB are also saved per million ton of CO₂ reduced⁸⁸. These arguments should be reasons enough for employing full CDM potential in the country.

6.5.3 Institutional setup

The advantage of M-form organized economies is that local knowledge can be used to a greater degree. When CDM projects are introduced, local leaders have more information of the regional conditions and what type of projects will be needed. Having a centrally planned economy might cause efficiency loss due to the lack of deep local knowledge. M-form allows for pilot projects to be conducted on regional level, allowing a trial period before they are implemented on a wider geographical scale. An example of this is the pilot projects on emissions trading in different regions that have been conducted. Already in 1994 SEPA launched various regional emissions trading schemes. In 2004 the Taiyuan pilot project was setup in accordance with the Asian Development Bank and Resources for the Future as an administrative body. The Chinese government has also introduced a project in several large cities with the aspiration of going national with emissions trading. It is still too early to say anything about the results, but there have been many concerns regarding the economic setup in China⁸⁹. In the same way, CDM is allowed a trial period regionally before implementing it on a wider basis. Although there are some disadvantages with the local setup system, the advantages can rule them out if they are applied in a correct manner.

6.5.4 International cooperation

In order to increase China's adaptability for handling CDM projects there are a number of foreign governments or international organizations that have set up several projects for economic assessment, institutional buildup etc. Such investors include the EU, the World

⁸⁷ Vennemo & Aunan, p. 230

⁸⁸ Vennemo & Aunan, p. 223

⁸⁹ Shuwen, p. 642

Bank, Asian Development Bank and Japan⁹⁰. It proves to show that China's environmental problem is not only a national concern. If China participates in international arrangements it is also a tool for maintaining global political stability. The more dependent the countries are of each other economically, the less is the risk for conflict.

Today USA has not ratified the Kyoto Protocol which means they are not entitled to engage in CDM projects and earn CERs to trade with. American multinationals can however through their foreign subsidiaries reach the market anyway but it still leaves a majority of American actors outside. If USA will ratify the protocol there is a massive inflow of CDM project investment to be expected in China. As the US elections are coming up in 2008 a change from the republicans to the democrats or the change of president might be a turning point for Chinas hosting of CDM projects.

⁹⁰ cdm.ccchina.gov.ch/eng

7. Discussion and Conclusion

7.1 Will China fulfill its potential?

As outlined in the essay China is predicted to become the number one host country of CDM, some even referring to CDM as the China Development Mechanism. But it is doubtful if China holds all the relevant conditions in order to make full advantage of a MBI. One that argues against the using of MBIs in China is Ruth Greenspan Bell which made an investigation for RFF⁹¹ and she concludes that there are some conditions that need to be present in order for MBIs to function properly. Deep understanding of markets, reliable resources (such as independent judicial institutions), access to information, knowledge of the real costs of compliance and genuine monitoring are the basic conditions⁹². Further, Alan Krupnick identifies seven basic conditions that are often present in developing countries and which hinders the successful implementation of emissions trading. The characteristics are: importance of minimizing costs, scarce capital and cheap labor, less attention to maintenance, market distortions- such as state monopolies, weak pollution control institutions, corruption and strong needs for revenue⁹³. These conditions are often present in China, which would then imply that their economic system is not yet mature to handle MBIs. Shuwen instead argues in her article that China should develop its environmental fee system which has been operating since 1982. The system is not working flawlessly due to corruption and inefficiency among local governments, but still the levy system is better suited for the Chinese economical environment than is the emissions trading. Although, she argues, there are negative parts of using the more regulatory tools such as a loss of social innovation. When firms are not faced with any economic incentive to improve their emission standards there are no incentives to find new and more efficient technologies, causing the country to lag behind internationally⁹⁴. Another problem of the levy system is that the prices are still set at the 1982 price level making the pollution too cheap.

⁹¹ Resources for the Future

⁹² Shuwen, p.644

⁹³ Shuwen, p. 635

⁹⁴ Shuwen, p. 634

There is no doubt that China today has a larger potential than what is used, if compared to other developing economies such as India and Brazil where the CDM has had a much bigger success. India is a neighboring country that is experiencing similar growth, and is therefore comparable to China. India is today ranked as the number one host country for CDM and has a lot more experience on the subject. China consequently has a nearby pool of knowledge to learn from. One of the obstacles in China is that there are mainly large-scale projects which are time and money consuming before they even get started. China could probably learn a great deal to a lower cost if more small-scale projects were introduced, taking advantage of the facilitated rules for smaller projects. This way, the experience of handling a project is gained but at a lower cost and with less time loss. Another crucial building block for a more efficient implementation is to train the local officials, both in the governments and in the EPB. If their level of knowledge about CDM and the alarming climate change is raised the enforcement gap can be decreased. The officials need to be informed about the economic incentive that lies behind these projects and how beneficial it can be to engage in full emissions trading in the future.

“Furthermore, expectations will influence the CDM as much as the real situation. Since CDM projects still need some time to materialize, expectations about the future are the major driving force for attracting investments”⁹⁵.

As the quote above says, the expectations will steer the CDM, and with the huge potential that China is sought to have, it will become the leading host nation. Investors will rush to implement their projects and stimulate a Chinese carbon market.

7.2 The time issue

If China were to use its whole CDM potential in the energy sector it would have registered several hundreds of projects in 2005/6 as suggested by the World Bank⁹⁶. Today there are 30 projects registered for this year. There is a time issue when handling the CDM projects, as for now; the future is unclear what will happen after 2012. The

⁹⁵ Oberthur & Ott, p. 185

⁹⁶ World Bank, p.129

CERs might not have as high value as today and trade might stagnate. Also, comparing China with similar economies, the country lags behind. It is therefore highly relevant that China take advantage of the CDM potential within a short time span bringing the most of it. Economic incentives must be introduced for local leaders in order for them to see the benefits of introducing the CDM projects. Taking the time issue one step further, Stern puts heavy emphasis on the fact that the costs today for hindering further climate change are smaller than the costs for repairing it in the future. Sustainable growth is hence most costly today but in the long run the most efficient option.

The CDM functions mainly as an emissions abatement instrument, the main purpose is not to make revenue. Instead, the mechanism is seen as an efficient tool for handling the threat of climate change. The short-term effects of a CDM project are not characteristically revenue creating. In order to create long-term revenue, a market for clean energy needs to be established in China. As for today, the dirtier energies are cheaper than the environmentally friendly ones creating no incentive for trade.

7.3 The moral dilemma

There is a huge moral problem concerning the abatement of emissions in developing countries. It is discussable whether the industrial countries have the right to restrict the developing countries in their growth and forbid them to emit what we have already and are currently emitting. The global climate change problem is a consequence of the industrial countries pollution and according to the full-cost principle these should also be the countries bearing the full cost. Even so, the ones that will experience the most serious consequences are the developing countries due to their geographical location and poor infrastructure. In the Stern report, focus is laid on the fact that the industrial countries are the ones that should clean up their own mess. China also names the industrial countries as morally responsible for the pollution problem. In order to appear serious in the matter, industrial countries should themselves make sure they keep the emission abatement levels introduced into the Kyoto protocol before they want to restrict other countries. There is a risk China will not fulfill the Kyoto requirements unless industrial countries fulfill theirs

or until they have reached an economic level of the industrial countries per capita⁹⁷. Therefore CDM offers a great opportunity for industrial countries to not only meet their own abatement levels, but to also meet their moral responsibility.

Another controversial issue is the question of whether developing countries should apply policies that are originally designed for industrial countries. Even though the policies have had success in some countries it does not automatically imply they will have the same effect in countries with a different economic structure. Criticism has been put to the issue that actors such as the World Bank strongly promote free trade in developing countries which might be harmful if they are not implemented with care. Another criticism is that these actors promote policies that are only in the best interest of the Western countries. The Western economic ideology might not always be the solution to the problem.

7.4 The statistical problem

As mentioned earlier in the essay information is not always transparent in China. When dealing with statistics from China one shall bear in mind that the source might not always be completely reliable. The Chinese Statistical Yearbook does not cover some of the analysis made in this thesis, whereas collection of data has been made from other sources and therefore caution must be made when drawing conclusions. However, a general trend might be able to deduct from the information. In the article written by Vennemo and Aunan about life saving, the results vary greatly when it comes to the calculations of lives saved. Depending on the method used and the source of data, the results have a wide range with millions in difference. The article illustrates the data problem in China well, showing that no data is to be taken as accurate until proven by further research. Due to the transparency problem discussed in the previous chapter, certain data may not be available or simply biased according to national interests. In another article by Zeng & Yan, the expected emissions of CO₂ are accumulated, and depending on the source, the estimated emissions are between 1370 to 2045 million tons of coal for the year 2020⁹⁸.

⁹⁷ Nordqvist, p. 29

⁹⁸ Zeng & Yan, p. 13

The difference is not as big as in the former article but they are still significant when doing regressions.

7.5 Conclusion

The global community is facing a problem of environmental depletion. It is no longer an issue as to whether it is happening or not but rather how to hold back the possible effects. China is facing such growth that they stand before a major challenge on the environmental front both locally and globally. Pollution is causing multiple deaths and a huge burden on the economy and something must be done. China possesses many characteristics of a developing country such as poor technology and shortage of financial assets. For these problems, the CDM offers an opportunity of technology and cash transfer. It is clear from this essay that the implementation of CDM in China is not without complexity. The potential is there, but not the framework. China is one of the countries with the highest potential due to its low marginal abatement costs and its heavy reliance on primary energy sources such as coal and oil. The opportunities are many for investors; however, they do face challenges on the way towards implementation that might make some of them to be reluctant.

After looking at the economic theory on CAC and EI policies, it seems China today is more suitable for CAC policies. At the same time, as the essay has proved, CAC policies don't fit into the system at all times either. The research studied for this essay also argues that China does not have the proper setup for participating in emissions trading. But China has made many vast changes in the last few years, and the joining of international co operations was impossible some decades ago. The China we read about today in the newspapers is a dynamic economy that quickly adapts to its surroundings. The fact that the Chinese government has initiated pilot projects on emissions trading and that a lot has been done to improve the CDM apparatus shows that China is changing direction. It is therefore reasonable to predict that China will come to fulfill its CDM potential and eventually engage in full emission rights trading. The economic structure is unique and in constant movement and China will probably find its own way for implementing MBIs for emission abatement. It would therefore also be reasonable to expect China to fulfill the

potential in a nearby future. The country has today applied a positive attitude towards the CDM and has in a fast pace instigated various projects concerning the effective implementation of CDM which shows China is eager to participate.

If the CDM is implemented correctly it can be a successful helping tool towards obtaining a sustainable development. It is important to emphasize that it is only a helping device, affecting only a minority of the country's total industrial plants. It must be seen as one contributing factor and not be mistaken for the remedy to solve China's environmental problem. The growth China is enjoying today brings many advantages for the population, but there are dark sides of the growth, such as many dying from the pollution. The Chinese population's will to live a Western life-style needs to be complemented with environmental ideologies by increasing general awareness. The fundamental idea of CDM needs to be brought down to a consumer-level as well. Economic growth is essential, but China must stop and ask, at what environmental cost?

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APPENDIX A

Article 12 in the Kyoto Protocol to the UNFCCC

1. A clean development mechanism is hereby defined.
2. The purpose of the clean development mechanism shall be to assist Parties not included in Annex I in achieving sustainable development and in contributing to the ultimate objective of the Convention, and to assist Parties included in Annex I in achieving compliance with their quantified emission limitation and reduction commitments under Article 3.
3. Under the clean development mechanism:
 - a. Parties not included in Annex I will benefit from project activities resulting in certified emission reductions; and
 - b. Parties included in Annex I may use the certified emission reductions accruing from such project activities to contribute to compliance with part of their quantified emission limitation and reduction commitments under Article 3, as determined by the Conference of the Parties serving as the meeting of the Parties to this Protocol.
4. The clean development mechanism shall be subject to the authority and guidance of the Conference of the Parties serving as the meeting of the Parties to this Protocol and be supervised by an executive board of the clean development mechanism.
5. Emission reductions resulting from each project activity shall be certified by operational entities to be designated by the Conference of the Parties serving as the meeting of the Parties to this Protocol, on the basis of:
 - a. Voluntary participation approved by each Party involved;
 - b. Real, measurable, and long-term benefits related to the mitigation of climate change; and
 - c. Reductions in emissions that are additional to any that would occur of the absence of the certified project activity.
6. The clean development mechanism shall assist in arranging funding of certified project activities as necessary.

7. The Conference of the Parties serving as the meeting of the Parties to this Protocol shall, at its first session, elaborate modalities and procedures with the objective of ensuring transparency, efficiency and accountability through independent auditing and verification of project activities.
8. The Conference of the Parties serving as the meeting of the Parties to this Protocol shall ensure that a share of the proceeds from certified from certified project activities is used to cover administrative expenses as well as to assist developing country Parties that are particularly vulnerable to the adverse effects of climate change to meet the costs of adaptation.
9. Participation under the clean development mechanism, including in activities mentioned in paragraph 3(a) above and in the acquisition of certified emission reductions, may involve private and/or public entities and is to be subject to whatever guidance may be provided by the executive board of the clean development mechanism.
10. Certified emission reductions obtained during the period from the year 2000 up to the beginning of the first commitment period can be used to assist in achieving compliance in the first commitment period.

APPENDIX B

Annex I countries

Party	Emissions (Gg CO ₂)1990	Percentage
Australia	288,965	2.1
Austria	59,200	0.4
Belgium	113,405	0.8
Bulgaria	82,990	0.6
Canada	457,441	3.3
Czech Republic	169,514	1.2
Denmark	52,100	0.4
Estonia	37,797	0.3
Finland	53,900	0.4
France	366,536	2.7
Germany	1,012,443	7.4
Greece	82,100	0.6
Hungary	71,673	0.5
Iceland	2,172	0.0
Ireland	30,719	0.2
Italy	428,941	3.1
Japan	1,173,360	8.5
Latvia	22,976	0.2
Liechtenstein	208	0.0
Luxembourg	11,343	0.1
Monaco	71	0.0
Netherlands	167,600	1.2
New Zealand	25,530	0.2
Norway	35,533	0.3
Poland	414,930	3.0
Portugal	42,148	0.3
Romania	171,103	1.2
Russian Federation	2,388,720	17.4
Slovakia	58,278	0.4
Spain	260,654	1.9
Sweden	61,256	0.4
Switzerland	43,600	0.3
United Kingdom of Great Britain and Northern Ireland	584,078	4.3
United States of America	4,957,022	36.1
Total:	13,728,306	100

APPENDIX C

Annex I countries

Party	Quantified emission limitation or reduction commitment (% of base year or period)
Australia	108
Austria	92
Belgium	92
Bulgaria*	92
Canada	94
Croatia*	95
Czech Republic*	92
Denmark	92
Estonia*	92
European Community	92
Finland	92
France	92
Germany	92
Greece	92
Hungary*	94
Iceland	110
Ireland	92
Italy	92
Japan	94
Latvia*	92
Liechtenstein	92
Lithuania*	92
Luxembourg	92
Monaco	92
Netherlands	92
New Zealand	100
Norway	101
Poland*	94
Portugal	92
Romania*	92
Russian Federation*	100
Slovakia*	92
Slovenia*	92
Spain	92
Sweden	92
Switzerland	92
Ukraine*	100
United Kingdom of Great Britain and Northern Ireland	92
United States of America	93

* Countries undergoing transition to a market economy.

APPENDIX D

Number of CDM projects registered as of 9th November 2006.

Country	Number of projects
Argentina	6
Armenia	2
Bangladesh	2
Bhutan	1
Bolivia	1
Brazil	76
Cambodia	1
Chile	14
China	30
Colombia	4
Costa Rica	2
Dominican Republic	1
Ecuador	7
Egypt	1
El Salvador	2
Fiji	1
Guatemala	3
Honduras	10
India	120
Indonesia	6
Israel	1
Jamaica	1
Malaysia	12
Mexico	51
Mongolia	1
Morocco	3
Nepal	2
Nicaragua	2
Pakistan	1
Panama	4
Papua New Guinea	1
Peru	3
Philippines	6
Republic of Korea	7
Republic of Moldova	3
South Africa	4
Sri Lanka	3
Tunisia	1

APPENDIX E

“Interim Guidelines for Implementation of CDM Project”

CDM Projects shall:

- Conform to China’s sustainable development strategy and policies/general requirements of economic and social development programs
- Result in no new obligations for China other than those under the UNFCCC and the Kyoto Protocol
- Must be approved by the Chinese government
- Be additional to the current Official Development Assistance and other financial obligations under the UNFCCC
- Promote transfer of environmental-friendly technology
- Be undertaken in a transparent efficient and traceable manner
- Conform with priority areas for CDM cooperation energy efficiency improvements as well as new and renewable energy
- Be led by China-owned enterprises or China-controlling ones located in China