GEOPOLITICS OF CLEAN DEVELOPMENT MECHANISM: A COMPARATIVE ANALYSIS OF INDIA AND BRAZIL

Dissertation submitted to the Jawaharlal Nehru University
in partial fulfillment of the requirements
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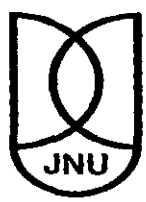
of

MASTER OF PHILOSOPHY

IRANI CHATTERJEE



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Certificate

This is to certify that the dissertation entitled "**Geopolitics of Clean Development Mechanism: A Comparative Analysis Between Brazil and India**" submitted by me in partial fulfillment of the requirements for the award of the degree of **Master of Philosophy** of Jawaharlal Nehru University, is my original work. This dissertation has not been submitted for any other degree of this University or any other university.

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Abbreviations

AM	Approved Methodology
AR	Afforestation and Reforestation
CCS	Carbon dioxide Capture and Storage
CDM	Clean Development Mechanism
CER	Certified Emission Reduction
COP	Conference of the Parties (to the UNFCCC)
CO_2	Carbon dioxide
DNA	Designated National Authority
DOE	Designated Operational Entity
EB	CDM Executive Board
ER	Emission Reduction
ERU	Emission Reduction Unit
EU	European Union
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GWP	Global Warming Potential
HFCs	Hydrofluorocarbons
IET	International Emission Trading
IPCC	Intergovernmental Panel on Climate Change
JI	Joint Implementation
KP	Kyoto Protocol
LULUCF	Land Use, Land-Use Change and Forestry
OECD	Organization of Economic Cooperation and Development
Party	Country or regional integration organization which has ratified the KP, unless otherwise specified.
PDD	Project Design Document
PFCs	Perfluorocarbons
PP	Project Participants
SD	Sustainable Development
SF6	Sulfur Hexafluoride
SSC	Small Scale CDM
TT	Technology Transfer
UNFCCC	United Nations Framework Convention on Climate Change.
WMO	World Meteorological Organization

Content

Acknowledgement

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Lastly, I am alone responsible for the conclusion, for the views and for the errors that the dissertation may contain.

July 27, 2007
New Delhi

Irani Chatterjee

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Chapter 1

Introduction

Chapter 1: Introduction

The excessive warm summers occurring in the US first drew attention to the term Global Warming. The phenomena is known as **Green House Effect** which is referred to as the blanketing effect of certain gases, **(carbon dioxide, methane, nitrous oxide, hydroflurocarbons, per fluorocarbons, sulphur hexafluoride, water vapor)** which allows the incoming shortwave solar radiation but traps the outgoing long wave radiation while escaping to space. The Swedish scientist Svante Arrhenius first put forth this theory about a hundred years ago. It was initially considered as a vague concept that seems far removed from our everyday life. But soon, the severe storms, floods, droughts and the change in temperature in the last decade have served as a reminder that urgent action is required to be taken to control the increasing climatic abnormalities. The gases are known as the greenhouse gases and has a global warming capacity measured as "global warming potential". Table 1.1 shows the global warming potential of the greenhouse gases.

Table 1.1: Greenhouse Gases and Global Warming Potential.

Greenhouse Gas	Chemical Symbol	Global Warming Potential
Carbon dioxide	CO2	1
Methane	CH4	21
Nitrous Oxide	N2O	310
Hydroflurocarbons	HFC-23	11,700
	HFC-125	2,800
	HFC 134a	1,300
	HFC 152a	140
Perflurocarbons	CF4	6,500
	C2F6	9,200
Sulphur Hexafluride	SF6	23,900

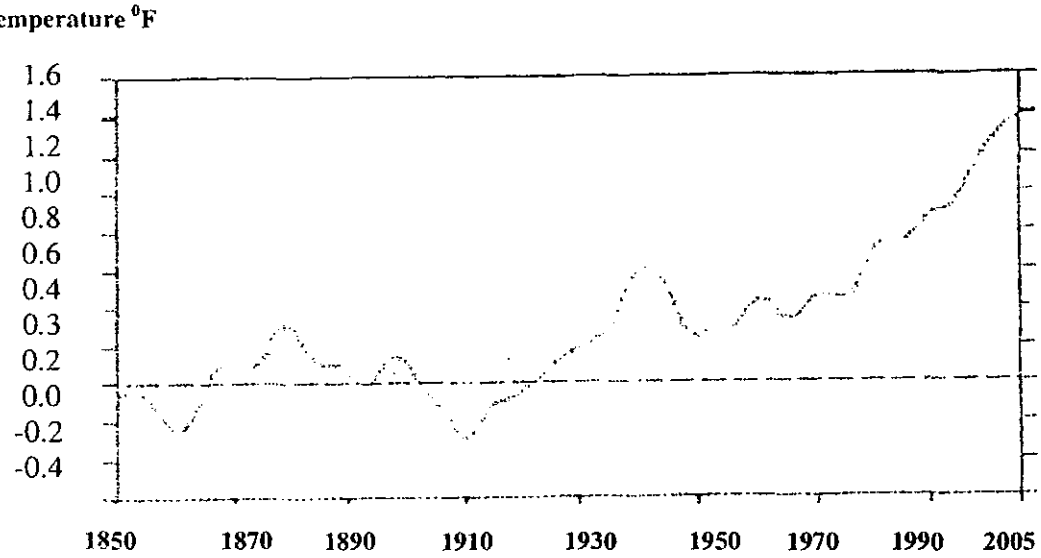
Source: Pembina Institute. 2003. *A User's Guide to the Clean Development Mechanism.* Drayton Valley, AB: Pembina Institute.

1.1 Records of Climate change and Global Warming

Climate change or global warming in this case is an integrated framework or a cyclic concept that involves health hazard which leads to socio economic change in life which again encourages emission of harmful greenhouse gases (figure 1.1 of the appendix).Since 1750, the atmospheric concentrations have increased by 30%, 145% and 15% for carbon dioxide, methane, and nitrous oxide respectively (G.A. Meehl and T.F.Stocker, 2006, 148pp). Early during 1890-1990, the temperature rose to 0.5 degree to 1degree Fahrenheit (F). During the next 100 years the scientists predicted the temperature would further rise to 2degree to 6degree F. The average global temperature has risen more in the last century than at any time in the past 10,000 years (http://www.wmo.ch/web/wcp/wcdmp/statement/html/WM0998_E.pdf.).

The thermometers show that the world is warmer now than at any time since the measurements started. The year 1990 was the hottest year in the last century. The ten warmest years since thermometer records became available in 1860, all occurred between 1995 and 2005.The World meteorological Organization has reported that 2005 was the second hottest year on record surpassed only by 1998 when El Nino conditions in pacific ocean contributed to the above average temperature rise across the globe. Most scientists agree that the planet's temperature has risen 0.5 degrees Celsius* since 1900, and will continue to increase at an increasing rate. The environment is responding to this warming (http://www.ipcc.ch). This warming trend has however accelerated in recent years and is better shown in figure 1.2. (http://www.ncdc.noaa.gov/oa/climate/research/2006/jun/jun06.html).

Figure 1.2: Global climate change 1850-2005



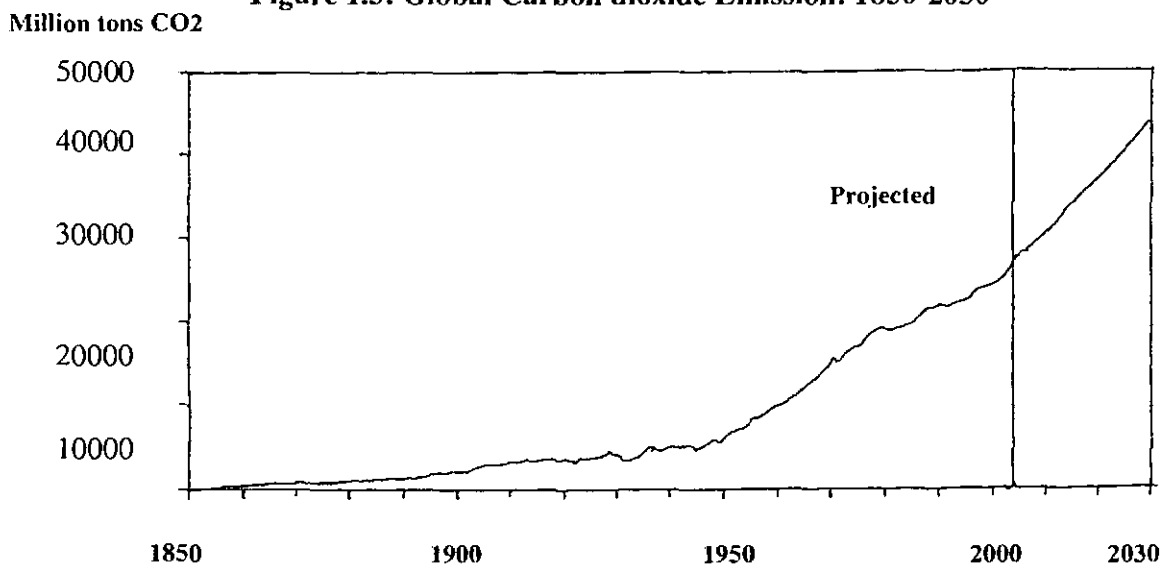
Source: Climate change 101: *Understanding and responding to global climate change,* published by Pew Center on global climate change and Pew center on the states

The major causes of Climate Change have been attributed to man made factors. In this regard Intergovernmental Panel on Climate Change (IPCC) has concluded, on the basis of existing science that "*the balance of evidence suggests a discernible human influence on the global climate.*" Scientists have confirmed that the earth is warming and the greenhouse gas emissions from cars, power plants and other man made sources rather than natural variations in climate- are the primary causes. Largely due to the combustion of fossil fuels, the atmospheric concentration of carbon dioxide, the principle greenhouse gas, are at a level, unequalled for more than 400,000 years.

Carbon dioxide, the major green house gas emissions from the combustion of fossil fuel have risen dramatically since the start of industrial revolution (figure 1.3 and table 1.2 of the appendix). Globally, energy related CO2 emissions have

raised 130 fold since 1850- from 200 million tons to 27 billion tons a year- and are projected to rise another 60 percent by 2030.

Figure 1.3: Global Carbon dioxide Emission: 1850-2030



Source: Climate change 101: Understanding and responding to global climate change, published by Pew Center on global climate change and Pew center on the states

1.1.1 Impact of Climate Change.

- **Rapid Changes in Global temperature and rise in sea level** with 1998, 2002 and 2003 as the warmest year on record (WMO, 2005). According to the World Watch Institute, "the Earth's ice cover is melting in more places and at higher rates than any time since record keeping began".
- **Extreme weather patterns** such as more hurricanes and droughts, longer spell of dry heat and intense rain and the retreat of glaciers. The World Meteorological Organization (WMO) announced in July 2003, "*recent scientific assessments indicate that, as the global temperatures continue to warm due to climate change, the number and intensity of extreme events might increase*".
- **Occurrence of super storms** like **Katrina, Rita** and many more that results in the killing of hundreds and thousands of lives are mainly due to the global warming. In 1998, the Hurricane **Mitch** killed nearly 20,000 people in Central America and

more than 4000 people died during disastrous flooding in China. Bangladesh suffered some of its worst floods ever the following year, as did Venezuela. Europe was hit with record floods in 2002, and then a record heat wave in 2003. In August/September 2004, a wave of severe hurricanes left many Caribbean islands and parts of southeastern United States devastated (Inter Press Service, 2005).

- **Massive extinction of species**, which aggravates the environmental crisis. Many studies have pointed out that the extinction rates of plants and animal species have been abnormally high during recent times. An analysis of the population trends, climate change, increasing pollution and emerging diseases found that 40 percent of deaths in the world could be attributed to environmental factors (Jaan Suurkula, PSRAT, 2005). The disrupting natural ecosystem has resulted in an increase in pests and diseases. A report in the journal, *Science* described the alarming increase in the outbreaks and epidemics of diseases throughout the land and ocean based wild life due to climate changes

The potential impact of climate change is both on aggregate and individual level of the countries and ecosystems (Joyeeta Gupta, CSDA, 2003). At an aggregate level, the temperature and sea level is expected to rise further with the melting of ice. There could also be a change in the precipitation quantity and pattern, soil moisture and vegetation cover. At a specific level, the magnitude of food production and water security will be affected due to failure of some ecosystem. Storms and hurricanes can be more disastrous in future. As was said, "*Global Warming is likely to produce a significant increase in the intensity and rainfall of hurricanes in coming decades, according to the most comprehensive computer analysis done so far*"(A.C.Revkin, 2004). There will be greater incidence of heat stress and vector borne diseases especially in the tropics and sub tropics.

The change in climate may lead to a mean global temperature rise of 13.5°C by the end of this century, higher than that experienced over the last 10,000 years. Such a rise may lead to changes in the global atmospheric system, shifts in the climatic zones and shifts in extreme and mean weather conditions. The global mean sea level is projected to rise 0.09 to 0.88 meters over the period of 1990 to

2100, as a result of thermal expansion of the oceans, and the melting of glaciers and polar ice sheets (Houghton et al. 1996: 3-19).

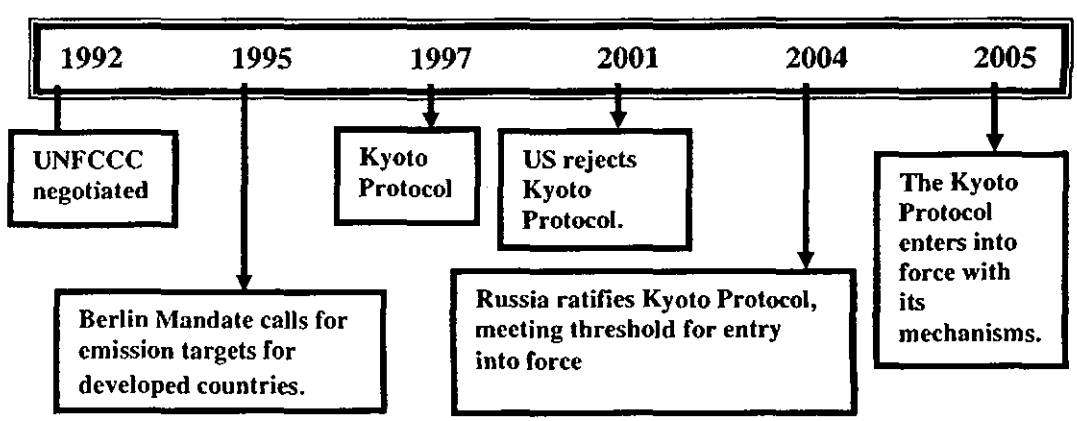
1.1.2. International Action on Climate Change.

The first big leap on the International scale as a concern to this disastrous greenhouse gas increase came from the Earth Summit in 1992, with the signing of the United Nations Framework Convention on Climate Change. The convention now has 189 parties.

The convention aimed at stabilizing atmospheric greenhouse concentrations "*at a level that would prevent dangerous anthropogenic (human) interference with the climate system*". Recognizing, the difference in historic emission of different countries, and their capacities to address it, governments agreed that they have "*common but differentiated responsibilities*". In keeping with that principle, the developed countries agreed to assist developing countries in combating climate change. They also agreed to a non- binding "aim" of reducing their emissions to 1990 levels by 2000.

In 1995, recognizing this voluntary target unachievable, governments adopted the Berlin Mandate, calling for the negotiation of binding targets for developed countries. These negotiations led in 1997 to the **Kyoto Protocol** (fig 1.4). Under the protocol, the developed countries, agreed to an average emission reduction of 5.2% below 1990 levels by 2008-2012 (the first commitment period). Individuals target range from -8 percent for European Union (EU) countries to +10 percent for Iceland. The target for US was fixed as -7 percent.

Figure 1.4, Timeline: International Action on Climate Change



1.2. The Kyoto Protocol

The Kyoto Protocol, which was adopted under United Nations Convention on Climate Change (UNFCCC), Japan, commits Developed Countries to limit and reduce their greenhouse gas emissions. The overall reductions should add up to 5.2% lower from 1990 levels in the period 2008-2012, specifying the individual target for each country (http://www.ipcc.ch/) (see, Table 1.3 of the Appendix).

The key provision of the Protocol provides countries with flexibility to meet their targets cost effectively. These include four **market-based mechanisms**:

- **The Bubble Mechanism (article 4)**; where the European Union member countries agreed to have a collective Quantified Emission Limitation and Reduction Objective or, QELROs of 8 percent regardless of the actual individual countries reduction targets
- **International Emission Trading (article 17)**; trading of emission allowances among countries with targets
- **Joint Implementation (article 6);** it is a compliance mechanism between the Annex I party that fixes up targets to reduce the harmful greenhouse gases.
- **Clean Development Mechanism (article 12);** which credit emission reductions from projects in developed and developing countries (Sari and Meyers, May 1999).

Other flexibility provisions include: setting emission targets as five year averages (table 1.5 of the appendix), rather than one year; counting six greenhouse gases altogether and not just carbon dioxide; and providing credit for carbon storage in forest and farmland.

United States renounced the Kyoto Protocol early in 2001; however the other governments proceeded to ratify it (Marrakech Accord, COP 7, 2001). With Russia's ratification in 2004, the necessary quorum of at least 55 countries representing 55 percent of 1990 developed country emissions; the protocol came into force in 2005. 166 countries have now ratified Kyoto (table 1.4 of the Appendix).

1.3. The Clean Development Mechanism

The Clean Development Mechanism (CDM) is a trading mechanism that involves the involvement of states belonging to the Organization for Economic Co-operation and Development (OECD) (**Annex 1** states, in the language of Kyoto Protocol) (table 1.6 of the Appendix). Among the Kyoto Mechanisms, the Clean Development Mechanism (CDM), one of the three market based flexible mechanisms of the Kyoto protocol, was designed to help the parties to meet their emission reduction quotas gave Annex 1 states, the opportunity to meet their GHG reduction commitments through investing in abatement projects in developing states (**Non Annex 1** states as per the Kyoto Protocol) (table 1.7 of the Appendix). The reduction of emissions then achieved, would then be calculated and transferred in the form of carbon credits back to the original investor, where they could be banked or sold to businesses with carbon credit deficit. **Annex B** countries (Turkey and Belarus) can use Assigned Amount Units, Emission Reduction Units, and Certified Emission Reductions for compliance in the first commitment period and are a party to the Kyoto Protocol.

The Clean Development Mechanism is considered as a globalize element of the Kyoto Protocol in which it includes stakeholders and interest groups to unite in solving a universal problem. First, it bridges the developing and industrialized worlds, second, a successful CDM will require public-private partnerships, though private sector is expected play the main role, but CDM requires interference of the government. Third, being project based, the mechanism transforms the local communities into important stakeholders in the planning and progress of the project activities (Baumert et al, 2000). Finally, the CDM with its multifaceted global climate change and sustainable development objectives are the highest priorities for a broad range of local, national and international NGOs.

1.3.1. The origin and Objectives of Clean Development Mechanism

The CDM was developed as a new and innovative channel to facilitate Climate Change mitigation in developing countries. Its origin can be stressed in the Kyoto

Protocol in 2003. When Kyoto Protocol was being negotiated, the USA was trying to incorporate market driven, cost effective mechanisms wherever possible. It was clear to the then Clinton administration that developing market based mitigation mechanisms would allow US companies to engage competitively in climate change mitigation at the domestic and international level and meet the requirements of the US senate. The drive for market-based solutions led to the establishment of CDM. Article 12 of the Kyoto Protocol, identifies three specific goals for the Clean Development Mechanism.

The purpose of the CDM was defined under article 12 of the Kyoto Protocol. It has dual goals:

- To assist the non-Annex 1 parties in achieving sustainable development and in contributing to the ultimate objectives of the Framework Convention; and

- To assist Annex 1 parties in achieving compliance with their quantified emissions limitations and reduction commitments.

- To prevent industrialized countries from making unlimited use of CDM, Article 12 has a provision that use of CDM be 'supplemental' to domestic actions to reduce emissions.

The Clean Development Mechanism projects have threefold advantage:

- An **environmental advantage**, on both a local and a global level, from the reduction in Greenhouse gas emissions resulting from the project.
- A **development advantage**, both economic and social, for the host country, which gets the location benefit of the project and the transfer of technology.
- An **economic advantage**, due to improved financial viability of low Greenhouse gas emission technologies, which favors their application, and for entities, with Greenhouse gas emission reduction commitments, the possibility of satisfying these commitments at least cost.

Under CDM, a developed country entity can invest in a GHG mitigation project in a developing country by way of equity, loan or any other financing mechanisms. The mitigation project, in turn generates emission reductions that need to be verified by an independent party hence called Certified Emission Reductions (CERs). Only those GHG mitigation projects are either eligible for CDM which are additional to those that would have happened anyway in the country. Under normal circumstances, the CDM project would not be implemented due to certain financial/ technological/ investment/ prevailing practice/ other "barriers". Proceeds received under the CDM mechanism for the CERs generated by the project would make the project viable. Moreover, as per UNFCCC, the project start date should be after January 2000.

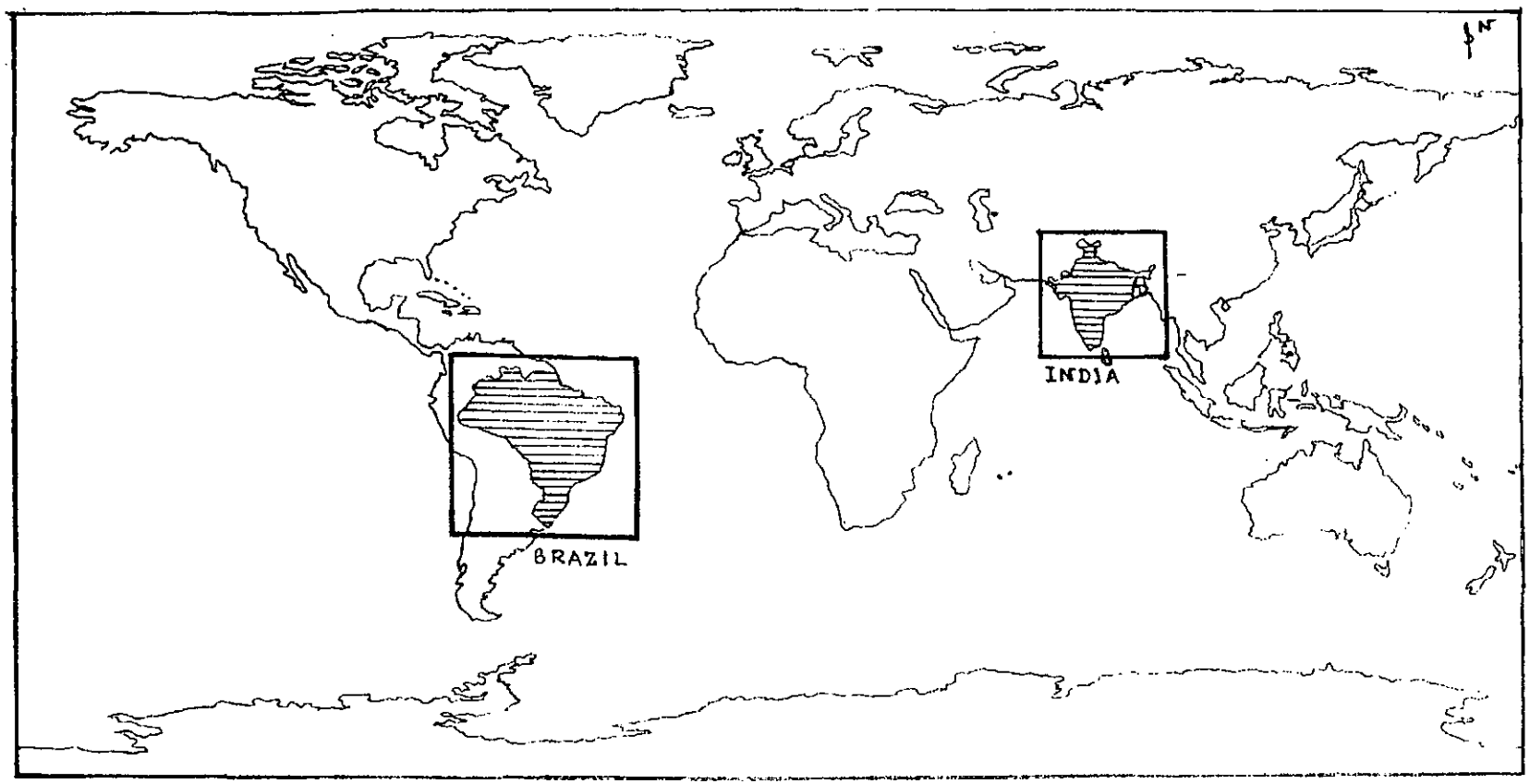
1.4. The objective of the study

The objective of this study is to bring out the geopolitical dimension of the Clean Development Mechanism (CDM) as it is reflected in the projected intentions and moves of the prominent movers in this respect, with particular reference to the study of the impacts of these geopolitical moves i.e. the policy formulations and implementations by the influential major players and the resultant implications for the host countries (India and Brazil in this case). The degree of sustainability and the role of private companies are also studied in the paper. In this context, the CDM projects are being studied, though in-depth formulations of the design document are avoided in the scope of this study.

This dissertation addresses the utmost importance of the geopolitics of political acceptability and workability of Clean Development Mechanism by and in developing countries like India and Brazil to depict a wide range of functioning of the mechanism since the political, social and economic structures of the countries taken as case studies differ largely.

1.5. The relevance of the study area

The following dissertation deals with the case study of India and Brazil since the two countries enjoy very high position with respect to the Clean Development Mechanism.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India is regarded as the most attractive Non Annex 1 countries for CDM project development (TERI 2005). This is due to large GHG reduction potential and the relatively strong capacity of Indian private companies in both GHG mitigation technology and understanding of CDM rules (Krey, 2003). India acceded to the Kyoto Protocol in August 2002 and one of the objectives of acceding was to fulfill prerequisites for implementation of Clean Development Mechanism (CDM) projects, in accordance with national sustainable priorities, where, a developed country would take up greenhouse gas reduction project activities in developing countries where the costs of greenhouse gas reduction project activities are usually much lower with the purpose to assist developing country parties in achieving sustainable Development and in contributing to the ultimate objective of the Convention and to assist developed country Parties in achieving compliance with their quantified emission limitation and reduction commitments (Ministry of Environment and Forests, India).

Brazil was the first to sign the United Nations Framework Convention on Climate Change (UNFCCC). The country has large potential for CDM projects and has unique scientific and technical expertise to deal with the climate change and the Kyoto protocol issues. The country was the first to put forth the idea of Clean Development Fund (CDF) in a meeting of the Ad Hoc Group on Berlin Mandate in 1997 (just prior to COP3 in Kyoto). Money from this fund would be collected from the developed countries who fail to meet up the greenhouse gas emission. The money collected would then go to the sustainable development project of the developing countries. The idea of the CDF was changed to the Clean Development Mechanism.

The two countries are located in two different continents (India in Asia and Brazil in South America). In this regard, the countries enjoy difference in climate, physiographic, political and cultural setting. Despite of the varied factors, both the countries have one this in common; they stand in almost the same economic development ground. Both are regarded as developing country and more or less resemble in the socio economic decisions taken up by the government. Both the

countries fall under non-Annex I party to the Kyoto Protocol and are interested in carrying out CDM project activities. So, the involvement of these two study areas and their comparison can actually open up new arenas of research in the Clean Development Mechanism study.

1.6 Chapterization

The study is structured into **six main chapters**.

Chapter 1: Introduction is the introductory chapter dealing with the compilation of the works to be done in the research paper followed.

Chapter 2: The Clean Development mechanism puts the basic idea of Clean Development Mechanism starting from its origin to the present day. This chapter also lays down the project activities in CDM and the rules and norms to undergo a CDM project. The contemporary geopolitics of CDM is also dealt in this chapter.

Chapter 3: The Clean Development Mechanism: Brazil and India, narrows down the focus of the study to the host countries or Non Annex 1 countries like India and Brazil. This chapter outlines the present position of these countries as regards to the CDM projects. A comparative analysis of the position of these countries with regard to CDM is also projected in the chapter. It also points out the geopolitics behind such position and vice versa.

Chapter 4: Clean Development Mechanism, Sustainable development and the role of private sector, deals largely with the question of sustainability criteria promised by the Clean Development Mechanism. In this context, the role of Private Sector in Clean Development Mechanism is also portrayed.

Chapter 5: conclusion, brings out the major findings from the whole study and also describes the problems faced by the Clean Development Mechanism thereby

putting forth various suggestions and potential area for research to improve the mechanism.

1.7. Methodology.

Methodologically, this study is split into two parts

The first part is concerned with the definition of Clean Development Mechanism in general and its projects in particular. The methodological approach to define these builds on the survey of relevant literature, technical paper studies and previous research works on this subject and as well as on information of the current CDM projects. The definition partly integrates the concept of CDM in the present political scenario.

The second part deals with the methodology used in analyzing the various Clean Development Mechanism projects particularly in India, and Brazil. The estimation and explanation of the Carbon Emission Reductions by the projects ensure a proper understanding of the present position of the countries with regard to Clean Development Mechanism.

The CDM projects till December 2006 are taken in this regard.

Chapter 2

The Clean Development Mechanism

Chapter 2: The Clean Development Mechanism

The preceding chapter was an introduction to the study of the topic of Clean Development Mechanism and basically a prologue to what the following chapter is going to deal with along with the bases for the selection of the study area and the methodologies to be adopted. The present chapter portrays the basic idea of Clean Development Mechanism starting from its origin to the present day. The chapter also lays down the project activities in CDM and the rules and norms to undergo a CDM project. The contemporary geopolitics of CDM is also dealt in this chapter.

The Kyoto Protocol's Clean Development Mechanism (CDM) was established in 1997 with a dual purpose of assisting non- Annex I Parties in achieving sustainable development and assisting Annex I Parties in achieving compliance with their quantified greenhouse gas (GHG) emission commitments.

2.1. The Development of CDM.

The CDM was developed as a new and innovative channel to facilitate climate change mitigation in developing countries. It had its origin back to the negotiations of the UNFCCC. The UNFCCC decided that Parties should aim to implement policies and measures jointly to combat the spread of the global evil of climate change and global warming. Commencing in 2003, the CDM rose as a product of the mixture of interests designed to serve multiple parties.

With the negotiation of Kyoto Protocol, the USA was trying to incorporate market driven, cost effective mechanisms wherever possible. Indeed, the USA was the main proponent of emissions trading and other flexible mechanisms (Sharma, Bhattacharya, Garg, 2004). The Kyoto Mechanism is basically a consequence of the domestic limitations placed on the former Clinton administration by the Byrd- Hagel Resolution,

adopted in June 1997 by the US Senate. This made a vague statement that the adoption of emissions reductions quotas would be detrimental to the US economy, unless they apply both to the Annex I and non- Annex I Parties. It was clear to Clinton administration that developing market based mitigation mechanisms would allow US companies to engage competitively in climate change mitigation at domestic and international level and meet the requirements of the US senate (N Matsuo, 2003). The drive for the market-based solutions led to the establishment of the CDM based on the recommendations of the US findings for a joint implementation mechanism.

Since GHG emissions have a global effect; therefore the mitigation can occur where it is most cost efficient. The CDM offered a solution to reduce the costs of climate change mitigation for industrialized countries. From an economic point of view, it gave Annex I Parties maximum flexibility as to where they made emissions reductions.

The CDM was adopted at the very end of the Kyoto negotiations, and so, many gaps remained in the design of the mechanisms framework and of the administration that would manage it. Progressive Conference of the Parties (COP) meetings were planned to adopt and formulate the workings of the mechanism (Matsuo, 2003). The COPs responsibility was to 'elaborate modalities and procedures', ensuring that the CDM was a transparent, efficient and accountable process.

2.2. The Framework.

The Clean Development Mechanism was established under the 1997 Kyoto Protocol as a way of promoting sustainable development by the minimization of the costs of limiting greenhouse gas emissions. In return for investing in a CDM sustainable development project, the developed countries/companies can earn companies "certified emission reductions" that the countries may use to meet their Kyoto commitments.

The establishment of the CDM in the Kyoto Protocol involves the formulations of principles and rules and norms in which CDM project activities would operate. These modalities and procedures were put forth in the Marrakech Accords (COP 7, 2001). The Accord lay down several issues – including the functioning of the CDM Executive Board (EB), which supervises the CDM, participation requirements, as well as validation , registration and monitoring issues.

Article 12 of the Kyoto Protocol clearly denotes the mandate and purpose of Clean Development Mechanism as to assist the Non- Annex I parties in "achieving compliance with their quantified emission limitation and reduction commitments". The Non- Annex I parties participating in the mechanism will "benefit from the project activities resulting in **Certified Emission Reductions (CERs)**." The Annex I parties, on the other hand, "may use the CERs accruing from such project activities to contribute to compliance with part of their Quantified Emission Limitation and Reduction Commitments.

The Article also states, that the "emission reductions resulting from each project activity shall be certified by operational entities, to be designated by the Conference of 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. Reduction in emissions that are additional to any that would occur in the absence of the certified project activity" (http://www.cd4cdm.org).

These CERs, to be obtained from the year 2000, can be used to "assist in achieving compliance in the first commitment period. A share of the proceeds from the certified project activities would be used to cover administrative expenses as well as to assist the developing country parties that are particularly vulnerable to the adverse effects of climate change to meet the costs of adaptations."

The Clean Development Mechanism was not discussed until the last day of Conference of Parties-3 (COP-3) at Kyoto, and came as a surprise to a lot of people following the negotiation process.

A term close to CDM was first introduced in the Brazilian submission to the conventions secretariat for adopting a protocol to the Framework Convention for Climate Change or FCCC. The Brazilian submission proposed the establishment of the *Clean Development Fund or CDF*, which is more of a non compliance fund that could be used to meet the mitigation and adaptation needs in the developing countries. However, the CDM introduced by the Kyoto in no way similar to the Brazilian proposal. In a nutshell, Clean

Development Mechanism, as described in the Protocol, is a project based mechanism between the developed and the developing countries with credits. In addition to this, CDM has a new provision for proceeds to be used towards administrative and adaptation measures.

2.3. Clean Development Mechanism objectives and expectations regarding potential benefits.

The Clean Development has a distinct legal entity; gifted with executive board and authorized to certify what constitutes a Carbon Emission Reduction (CER). The Article 12 of the Clean Development Mechanism states that the purpose is to assist non- Annex I parties in "achieving sustainable development and in contributing to the ultimate objective of the Convention". The purpose of Clean Development Mechanism is to support the efforts to act against climate change in two ways:

- Firstly, through the implementation of efficient activities, technologies and techniques that emit less GHGs, thereby contributing to the sustainable development. The host country is responsible for the definition of priority sustainable development issues and the way the CDM projects can contribute.

- Secondly, through the possibility for the Annex 1 countries to reduce GHG emissions beyond their borders. The CDM projects can, generate emission reduction credits, allocated partially or in full to Annex1 operators.

CDM is a means to realize the North- South redistribution of income (the north being the developed countries primarily, falls in Annex I countries and the south covers the non Annex I countries). All these objectives may all be worthy, for a environmentally meticulous nation concerned about climate change and limiting emissions of GHGs.

2.4 The finance for CDM

The funding channeled through the Clean Developed Mechanism should assist developing countries in reaching some of their economic, social, environmental, and

sustainable development objectives, such as cleaner air, and water, improved land use, accompanied by social benefits such as rural development, employment, and poverty alleviation and in many cases, reduced dependence on imported fossil fuels. It also fosters green investment priorities in developing countries.

2.5 Expectations from the Clean Development Mechanism

The CDM offers an opportunity to make progress simultaneously on climate, development and local environmental issues. For developing countries that might otherwise be preoccupied with immediate economic and social needs, the prospect of such benefits should provide a strong incentive to participate in the CDM (TEDDY, 2004). The mechanism implants new and high yielding technology transfer to the developing countries by the industrialized nations thereby heading towards a prospective future of the country.

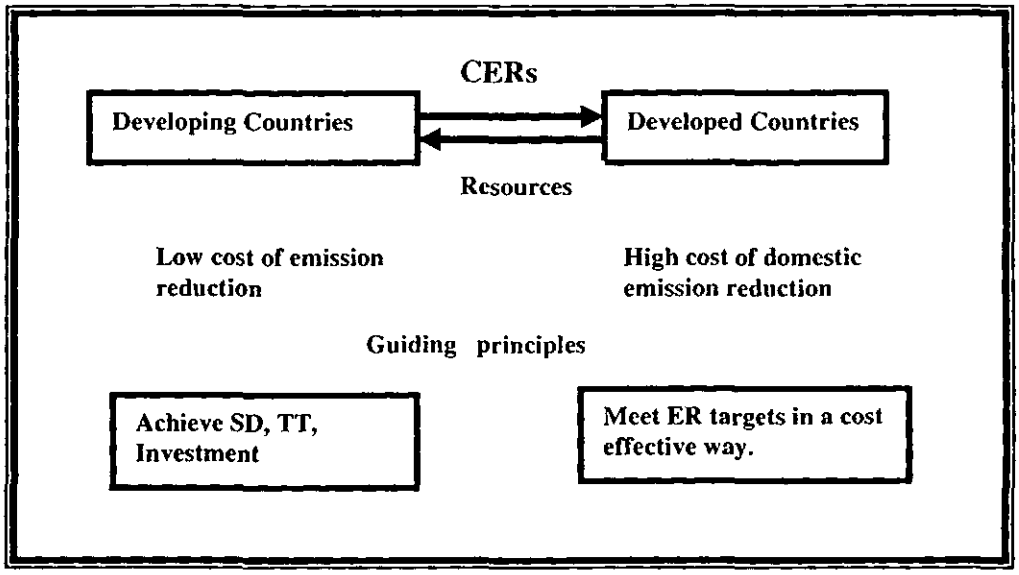
Other intentions, expectations or anticipated benefits of CDM are:

- Achieve real reductions of greenhouse gases in developing countries.
- Extend low cost abatement options (cost effectiveness); both for Parties needing to fulfill their Kyoto commitment and for the legal entities covered by the European Emission trading scheme.
- Create one of the pillars of the international emissions trading market; a considerable pillar in terms of volumes.
- Involve developing countries in climate change mitigation.
- Increase awareness of climate change and of opportunities for the use of clean technologies.
- Involve the private sector in the climate change regime.
- Make new investments (e.g. in the energy sector) more environmentally friendly.
- Stimulate the transfer of low and zero carbon technologies.
- Attract Foreign Direct Investment (FDI) to developing countries.

2.6. A Project based Development Mechanism

Market demand for GHG credits from CDM projects comes from Annex I countries emission commitments. Annex I countries can meet those commitments by domestic as well as international emission mitigation activities, including the CDM. The CDM is regarded as an attractive compliance option as it can help meet Annex I GHG commitments more cost effectively through project based activities that are consistent with host countries' sustainable development priorities. The extent of the demand for CDM credits depends on the stringency of emission commitments, the gap between countries' emission commitments and actual emissions, and the relative use of CDM and other means of meeting emission commitments.

Figure 2.1: The Project based mechanism, CDM.



The mechanism allows the interference of both the Annex I and non Annex I country (Fig: 2.1) that seeks to attain its objective that differs according to the interests of the countries involved. For example, sustainable development and technology transfer for the developing countries and Certified Emission Reduction for the developed countries.

But neither the Protocol, nor its rules define what a 'project' is. This absence of a definition may lead to CDM projects that are not even physical undertakings. Even some states have suggested that policies, plans and programmes can be eligible as CDM projects. Only projects with a nuclear element have been excluded from eligibility. The Protocol's revisions refer only to the reduction of emissions of GHG, without specific details relating to the method of removal (Wilkins; n 10). Several opinions arouse to limit the size of the potential hydro power projects (to 10 MW) because the associated social and environmental impacts of dam building were contrary to the goals of the CDM (http://www.CDM watch.org).

The key component of the CDM is the requirement of **additionality.** Certified Emission Reduction units generated under the CDM will only be recognized when the reductions of greenhouse gas emissions are additional to any that would have occurred in the absence of certified project activity. Thus, the successful functioning of the Clean Development Mechanism can essentially be achieved by a parallel running of both drawing up rules governing the CDM and Project Development procedure (www.teri.org).

Although both public and private entities are eligible to develop CDM projects, the CDM is mainly intended for the private sector. Participation in the CDM is voluntary and CDM investments must comply with market regulations, just like conventional projects.

The types of project which can be implemented under the CDM are:

- Energy efficiency
- Fuel switching
- Gas capture or destruction
- Large hydro
- Renewable energy
- Land Use, Land Use Change and Forestry (LULUCF): Afforestation and Reforestation.
- Transport
- Waste incineration

A more clear subdivision of the project sectors enables a further subdivision of the basic sectors (table 2.3 of the Appendix)

Annex I Parties must refrain from using CERs generated through nuclear energy to meet their targets. In addition, for the first commitment period (2008-2012), the only sink projects allowed are those involving afforestation or reforestation, and Annex I Parties can only add CERs generated from sink projects to their assigned amounts up to 1% of their baseline emissions for each year of the commitment period. Further, guidelines for carbon sink projects will be developed to ensure they are environmentally sound.

The CDM project pipeline began operation in December of 2003 when the first project was accepted for public comment and validation. It was not until November of 2004 that first projects were registered and not until September of 2005 that the first CERs were issued to a project participant's account. Beginning in the second half of 2005, the registration process picked up significant steam so that by the end of April, 2006, there were 181 projects registered and so able to produce CERs for sale in the carbon market. It was not until November of 2005 that the volume of CO2 reductions deliverable by registered CDM projects began to grow large enough to play a significant role in Kyoto Protocol compliance. In the last quarter of 2005 and the first quarter of 2006, the potential CDM supply grew at a breakneck pace that established this flexible mechanism as an important factor in Kyoto Compliance. By April 1, 2006, more than 380 million tons ("Mt") CO2 equivalent had been registered for delivery via the CDM by the end of the first compliance period.

The CDM has intended to be and has in fact become the largest ever market based atmospheric pollution regulatory regime. During the past year, it has exploded in size as nearly 300 projects have been registered by the CDM executive while over 396 Mt CO2e of CERs futures contracts with an estimated value of greater than 2 billion pound charged hands in 2005, representing a 600% increase over 2004. Significant bodies of research have examined the theoretical underpinnings of GHG trading mechanisms.

Table 2.1: Potential actors and reasons for participation in CDM projects.

ACTORS	REASONS FOR PARTICIPATION
Developing country	Promote sustainable development and contribute to climate change mitigation.
Annex I Parties	Cost-effectiveness in complying with emission Reduction targets.
Non-governmental organizations	Promote sustainable development and contribute to climate change mitigation.
Corporations	Offset emissions; investment opportunity; competition gains, institutional marketing, social responsibility.
Niche company	Commercial opportunity; diffuse technology.
Industry associations	New opportunities for members.
Brokers	Commercial opportunity
Development banks	Promote sustainable development and promote climate change mitigation; create new markets.
Institutional investors	Portfolio diversification; socially responsible investing.

Annex I Parties, Non Annex I Parties and public and private entities of those parties are eligible to participate in CDM project activities, provided they are duly authorized. CDM project activities can be implemented through partnership with the public and private sector (table 2.1).

Annex I Parties that have reduction targets will be the main participants in this market from the demand side, seeking CERs to offset their commitments.

In the particular case of the CDM, developing countries will play a significant role in this market, especially in the supply of GHG certified emission reductions and/ or removals of CO2. They can also use the CERs generated to assist in compliance with their existing or future GHG reduction commitments.

The private sector has a significant opportunity to participate in the CDM due to the potential for considerable emissions reduction in this sector. The private sector is also a major recipient of increasing investment flows that can be used for CDM projects.

The primary incentive for Annex B countries to engage is to allow a cost effective realization of its internationally agreed GHG target. The government can foster private sector engagement in CDM by formulating targets in the context of a national or supra-national GHG emissions trading scheme {The Annex B country could also set incentives for CERs acquisition via taxes or command and control measures (Michaelowa 1997, p.21)} for (groups of) GHG emitters that are allowed to use CERs for compliance. If nevertheless the internationally agreed target is not reached, the country can then, as a "last-minute measure", buy CERs via Direct Purchase Agreements.

2.7 Bases for choosing the participating countries in Clean Development Mechanism

The CDM projects can take place in non-Annex I countries that have or will ratify the Kyoto Protocol. There are many reasons as to why a particular Annex I country may choose between the non-Annex I countries. These are:

- The cost of technological upgrade or retrofit
- Potential return on investment
- Looking at the tax structure
- Openness to foreign investment
- Legal infrastructural facilities
- Availability of financing
- Labor availability and labor costs involved
- Stability of the economy
- Momentum or existing business relationships and partnerships
- Government cooperation

- Technological expertise
- Monitoring capabilities

Besides these, there are other basic paraphernalia that seem indispensable include:

- An established business environment involved between the countries
- Appropriate and well-linked administrative and institutional framework
- An adequate and well maintained infrastructure
- Efficient project developers and business managers ready to operate
- Strong relations between the private sector, government and NGOs
- Development of accessible project information databases.

However, the developing countries can pursue CDM projects by establishing a CDM-investment environment or starting unilateral projects which is a one party system and the country responsible can both sow the seed and get the fruit of the project. After the completion of the project, it can enter the CDM market to sell the gained certified emission reduction unit.

2.8. CDM rules and conditions

The procedures and rules governing the implementation of the CDM were established by the Kyoto Protocol and specified in the Marrakech Agreements. Since then, the CDM Executive Board has facilitated the preparation of CDM projects by validating a wide range of methodologies applying to the different economic sectors and by defining standard formats for project applications. Clean Development Mechanism projects need to seek approval by the Clean Development Mechanism's Executive Board. A number of rules and conditions will apply, some to all project types and others specifically to afforestation and reforestation projects. The rules and conditions necessary for the successful running of the CDM projects are (Baker and McKenzie; June 2004).

- Projects must result in real, measurable and long term emission reductions, as certified by a third party agency ("operational entity" in the language of the convention). The carbon stocks generated by the project need to be secure over the long term and any future emissions that might arise from these stocks need to be accounted for.

- CDM projects must be in line with sustainable development objectives, as defined by the government that is hosting them. Projects must contribute to biodiversity conservation and sustainable use of natural resources.
- Only projects beginning in the year 2000 forward are eligible.
- Two percent of the carbon credits awarded to a Clean Development Mechanism project will be allocated to a fund to help cover the costs of adaptation in countries severely affected by climate change (the "adaptation levy"). This adaptation fund may provide support for land use activities that are not presently eligible under the Clean Development Mechanism, for example conservation of existing forest resources.
- Some of the proceeds from carbon credit sales from all Clean Development Mechanism projects will be used to cover administrative expenses of the Clean Development Mechanism
- Projects need to select a crediting period for activities, either a maximum of seven years that can be renewed at most two times, or a maximum of ten years with no renewal option.
- The funding for Clean Development Mechanism projects must not come from a diversion of official development assistance (ODA) funds.
- Each Clean Development Mechanism project's management plan must address and account for potential leakage. Leakage is the unplanned, indirect emission of carbon dioxide, resulting from the project activities. For example, if the project involves the establishment of plantations on agricultural land, then leakage could occur if people who were farming on this land migrated to clear forest elsewhere.
- There must be monitoring and verification of projects throughout the project cycle. Also for Land Use, Land Use Change and Forestry (LULUCF), fuel switching or biomass energy projects, project preparation must consider the effects of the projects on all 5 carbon pools (for UNFCCC, these carbon pools are: above ground biomass, below ground biomass, litter, deadwood and soil carbon).

There are several players involved in CDM and their interactions make the mechanism carry out its activity (figure 2.3 of the appendix). In order to make small projects

competitive to larger ones, the Marrakech Accords establish a fast track for small- scale projects with simpler eligibility rules

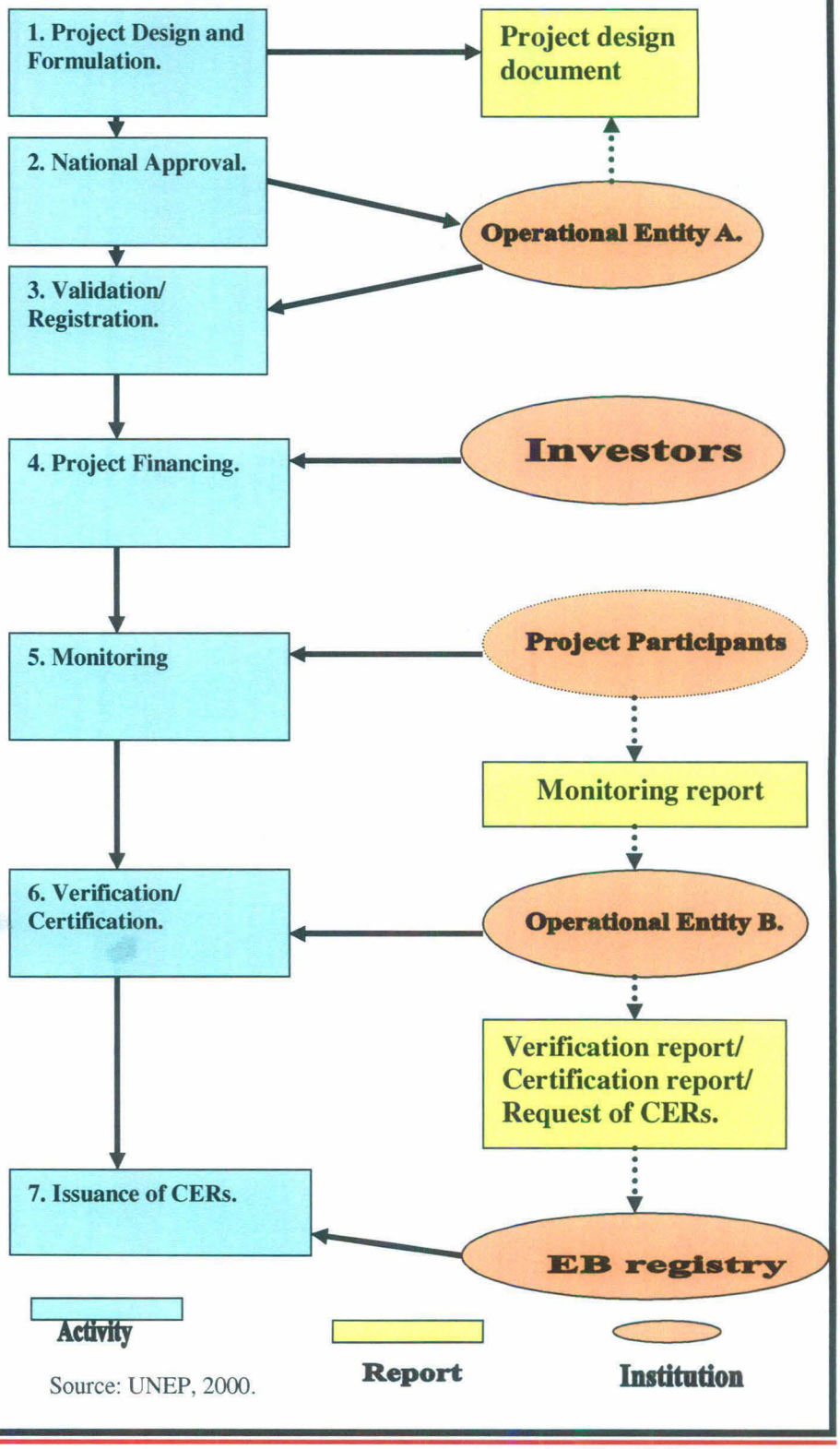
i. Renewable up to 15 MW, energy efficiency with a reduction of consumption either on the supply or the demand side of up to 15 gigawatthours/yr.
ii. Other projects that both reduce emissions and emit less than 15 kilotons of CO2 equivalent annually.

However, incase of small scale LULUCF projects, (decided at the 10th Conference Of Parties to the UNFCCC in Buenos Aires, Argentina, in 2004), the rules will be different. For these,

a) The CDM Executive Board (the supervisor of the CDM projects) would not require methodology for or estimation of the given baseline.
b) The condition of all five carbon pools being taken into consideration dropped.
c) There is no required estimation of leakage.
d) No requirement of monitoring of the baseline (UNEP report, 2004).

The below mentioned CDM project cycle (figure 2.2) gives a clear idea of the procedures that are followed to implement a project activity.

Figure 2.2: Project cycle under CDM



Source: UNEP, 2000.

The Clean Development Mechanism (CDM) project cycle as shown the figure has seven basic stages: project design and formulation, national approval, validation and registration, project finance, monitoring, verification/ certification and issuance of CERs. The first four are performed prior to the implementation of the project, while the latter three are performed during the lifetime of the project (Shannon Flint; 2002).

Each step of the CDM project activity involves particular functions from each part (Yuji Mizuno; March 2007).

- *Project Design and Formulation:* the project participants prepare a project design document for a CDM project activity that presents information on the essential technical and organizational aspects of the project activity and is the key input to the validation, registration and verification of the project.
- *National Approval:* the project participants shall work to get the approvals of voluntary participation from the Designated National Authority (DNA) of each party involved.

❖ *Validation /Registration:* validation involves the independent evaluation of a project activity against the requirements of the CDM.

Registration is the formal acceptance of a validated project as a CDM project activity.

❖ *Project financing:* 2% of the CERs from CDM projects will be deposited into a CDM account that will be administered by the Executive Board.

❖ *Monitoring:* the project participants collect and archive all relevant data necessary for calculating GHG emission reductions by a CDM project activity, in accordance with the monitoring plan.

❖ *Verification and Certification:* Verification is the periodic independent review and aftermath determination of the monitored GHG emission reduction. Certification is the written assurance that a project activity achieved about the reductions in the GHG emissions.

❖ *Issuance of CERs:* the Executive Board will issue certified emission reductions (CERs) equal to the verified amount of GHG emission reductions. Even among this issued CERs 2% will be deducted for the share of proceeds to assist developing Parties that are particularly vulnerable to the adverse effects of climate change to meet the costs of adaptation.

2.9 CDM fund administration

Article. 12 stipulates that, "*a share of proceeds from certified project activities (should be) 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*". Public funding for CDM projects must not result in the diversion of funds for official development assistance. In addition, the CERs generated by CDM projects will be subject to a levy- known as the "share of proceeds" of 2%, which will be paid into a newly created adaptation fund. Another levy on CERs will contribute to the CDM's administrative costs. To promote the equitable distribution of projects among developing countries, CDM projects in least developed countries are exempt from the levy for adaptation and administrative costs. Even, after validation, a administrative fee is charged which differs with the size of the project and confirms the registration of the project (table 2.2).

Table 2.2: Administration Fee for CDM projects.

Volume of CERs generated annually (TCO2)	Fee (US dollars)
<=15000	5000
>15000 and <=50,000	10,000
>50,000 and <=100,000	15,000
>100,000 and <=200,000	20,000
>200,000	30,000

Source: www.CD4CDM.org. last accessed on Nov, 2006.

Often, the funding mechanism is based on the proceeds of the project (either direct financial payment or diversion of a share of CERs to a central fund), then in negotiation, investors will reduce their willingness to provide benefits to the host country accordingly in order to ensure that the net return on the project remains commensurate with other rates of return throughout the global capital market. In that case, the CDM fund should

simply be redistributing proceeds among non-Annex I countries. The CDM involves approval of methodologies for its proper formulation (figure 2.4 of the appendix).

2.10. The advantages from CDM by the host countries and for the investors.

The Clean Development Mechanism get certain advantages by carrying out the projects. The benefits are well distributed among the host parties and the investor parties involved in the mechanism.

2.10.1. Participation in the sustainable development of the host country.

Taking into account the fact that the investments provided for in the CDM will be made in developing countries and that countries subject to the Protocol will generally finance them. This innovative mechanism can be considered as a new source of funding for projects.

The role of CDM is to favor projects that can:

- **Contribute positively to the local environment** (waste, urban pollution, etc.);
- **Contribute positively to the economy in parallel,** and generate positive social impacts (access to decentralized energy, forestry development, etc.);
- **Encourage Foreign Direct Investment (FDI)** in new low emission technologies and technology transfers: energy efficiency, industrial processes, sustainable forestry, land restoration, etc.;
- Provide an additional financial contribution to **render a project financially viable** by lowering the cost of its implementation and operation.

Accordingly, the appeal of this mechanism for host countries ia that it can set up structures, in an increasing number of developing countries, for the promotion, accompaniment and validation of these projects. This new dynamics will largely depend on trends in the price of carbon.

2.10.2. Economic benefits for the project developers.

For business, a CDM project offers two advantages:

- **An additional source of income for the project from the generation and sale of Certified Emission Reductions (CERs), or, Carbon Credits.**
- **An option to reduce and diversify risks is likely to interest companies with domestic GHG emission reduction objectives under the European Union Emission Trading Scheme.**
- **The positive impact of an anticipated Emission Reduction Purchase Agreement on the completion of a project's financing plan, due to the resulting additional revenues.**

2.10.3. Advantages of a longer term strategy.

In certain cases, the commercial benefits will be the main motivation for project developers. Using the CDM may, for example:

- **Enable projects of better quality to be proposed, involving more advanced environmentally friendly technologies** and/or less costly technologies if emission reductions can be recovered on the market, thereby generating a reduction in the price of goods and services and enhancing the competitive positioning of the operator;
- **Conversely, avoid marginalization of the supply side offer.** If the price of carbon was to increase substantially, and by not incorporating this revenue, could gradually become a factor for disqualification in certain sectors; e.g., in the waste treatment sector, the valuation of emission reductions may generate a significant difference in the rate of return on the project investment.
- **Facilitate penetration of new GHG emission reducing technologies.** As this is the only mechanism enabling the financial valuation of emission reductions in non-Annex I countries, the CDM may facilitate the expansion and development of markets for these new technologies. Accelerated amortization of the development

programs for these resulting new technologies will enhance their international competitiveness;

- **Image enhancement, at the local level, of the company developing the project,** with respect to the host country, its clients or the populations concerned. This aspect may strengthen and facilitate the communication process and therefore the acceptability of certain complex projects such as mass urban transport projects or urban heating projects.
- **Materialization of the company's environmental and social responsibility policies,** using CDM projects that contribute to both sustainable development of the host country and protection of the global environment.

2.11. The geopolitics behind Clean Development Mechanism.

The basic principle of the Clean Development Mechanism is simple: developed countries can invest in low-cost abatement opportunities in developing countries and receive credit for the resulting emissions reductions, thus reducing the cutbacks needed within their borders. While the CDM lowers the cost of compliance with the protocol for developed countries, developing countries will benefit as well, not just from the increased investment flows but also from the requirement that these investments advance sustainable goals. The CDM encourages developing countries to participate by promising that development priorities and initiatives will be addressed as part of the package. This recognizes that only through long-term development will all countries be able to play a role in protecting the climate.

CDM can be looked at as a subsidy, a market and a political mechanism (Wara, 2006). It is a subsidy in that it pays developing countries to pollute less than they otherwise would. It is a market, in that its subsidy is delivered through the creation of Certified Emissions Reductions (CERs) tradable credit also usable as compliance instruments for developed nations' Kyoto obligations. It is a political mechanism in that it includes developing world participation in the Kyoto Protocol. CDM has produced remarkable participation on the part of its parties. Indeed the participation of CDM has been most active in those

countries with relatively high rates of economic growth. In other words, exactly the developing countries whose efforts are most needed to help resolve the global warming problem. It is essential to evaluate the CDM's success or failure as a political mechanism from the perspective of the developing (non- Annex I countries) and developed (Annex I countries). The whole politics of Clean Development Mechanism spawned with the inclusion of the Kyoto Protocol as a device to combat the terrors of Climate Change.

The basic politics of the market mechanism of CDM is that, since it is less expensive for Northern countries to invest in reduction projects abroad than it is for them to reduce emissions domestically, it enables the industrialized countries and their corporations to buy the right to pollute and to escape even the most meager commitments laid down in the Kyoto Protocol. CDM is also thought to catalyze serious environmental and social damage on an unimaginable scale. These mechanisms effectively turn greenhouse gases into tradable commodities, lock in existing North- South inequalities in the use of the atmosphere and natural resources, and open up many new and harmful profit making opportunities for transnational corporations (TNCs).

Through these schemes, TNCs and their Northern governments will be entitled to buy countless cheap emission credits from the South, through projects of an often exploitative nature, thereby imposing on the South what the Centre for Science and Environment (CSE) refers to as "carbon colonialism" (Narain Sunita, 2006). Furthermore, the North will have harvested all of the cheap credits when it comes time for Southern countries to reduce their own emissions, saddling them with only the most expensive options for any future reduction commitments they might make.

2.11.1. The Kyoto Politics.

The Kyoto was ratified by a sufficient number of Annex I nations to enter into force (at least 55 parties to the protocol representing at least 55% of 1990 emissions of GHGs must ratify for the treaty to enter into force) and by numerous non- Annex I parties but was not ratified by either the United States or Australia. The US (headed by Bill Clinton) initially supported the Kyoto, but could not get it ratified by the Senate that had united against it by a vote of 95-0 in 1997. It was thus obvious that president George W Bush

will reject the proposal. It is argued that Bush did not take a whimsical and unpredictable decision by not ratifying the Protocol. Often to some delegates (particularly in US), it reflects a serious flaw in the design of the Protocol. The fatal flaw in the Kyoto Protocol, as was pointed by the US is that it left India and China out of emission reduction obligation, which, in turn argued that they were hardly responsible for the "stock" problem or past damage to the environment. The US Senate was not convinced with this exemption. First, the principle of "progressive taxation" that would leave the poorer countries with little obligation aroused confusion in US. Second, the image of these two giants long asleep and snoring shifted to that of giants astir and spewing out significant levels of CO into the atmosphere, undermining the credibility of those who would exempt them from burden- sharing. In order to induce a sufficient number of Annex I parties to ratify the treaty to enter into force, it was necessary that some concessions were made to particular parties. Notably, the Russian federation and Ukraine were allowed to join the protocol with commitments of a 0% reduction below 1990 levels even though by the time of the negotiations, their actual emissions were far below the 1990 baseline because of the post-Soviet economic contraction (Victor, David G., Nakicenovic, Nebojsa, and Victor. Nadejda, 2001, p263- 277). These nations were able to join the Kyoto Protocol without fear of facing emissions reductions. Before and after its entry into force, the Kyoto Protocol has been severely criticized. It has been criticized for doing little to combat global warming (William Nordhaus; 2001, p294 and 1293). It has been criticized for being too slow to mitigate the global warming. Moreover, the utilization of absolute emission caps rather than emissions intensity targets or a carbon tax which "limit a country's CO2 emissions per dollar of Gross Domestic Product (GDP) are also questioned. It is a consequence of Weitzman's insight (M.L. Weitzman, p477-491) that when uncertainty exists as to costs of abatement and the slope of the marginal benefit of abatement curve for an environmental good is relatively flat, a tax rather than a quantity control leads to a superior welfare outcome (William Pizer; 2005). Kyoto has also been criticized for not committing the largest developing nations, most notably China and India, to binding emissions reductions (http://www.whitehouse.gov/news/releases/2001/03/20010314.html).

2.11.2. The CDM politics: from the perspective of developing country.

Among developing countries, there is a spectrum of opinion regarding CDM, as there are different interests among the developing countries. While all developing countries hold a common position that its function is first and foremost to foster sustainable development, the African countries are particularly concerned about how this function remains very ill defined (Dakkar, Senegal; 1998). Some Latin American countries would like to promote the use of forestry projects- forest protection, reforestation, afforestation, and plantation- within CDM. Thus the developing countries come up with its own interests which make the sustainability platform differ from each other.

The CDM encourages developing countries to participate by promising that development priorities and initiatives will eventually take place with time. This recognizes that only in long-term developments, the countries will be able to play a role in protecting the climate.

From the developing country perspective, the CDM can:

- Attract capital for projects that assist in the shift to a more prosperous but less carbon-intensive economy;
- Encourage and permit the active participation of both private and public sectors;
- Provide a tool of technology transfer, if investment is channeled into projects that replace old and inefficient fossil fuel technology, or create new industries in environmentally sustainable technologies; and,
- Help define investment priorities in projects that meet sustainable development goals.

The drive for economic growth presents both threats and opportunities for sustainable development. Many options under CDM could create significant co-benefits in developing countries, thereby aiming at solving the local and regional environmental problems and advancing towards social goals. This serves as a motive to take part in CDM activities. Especially China, India and Brazil is playing important role in the clean Development Mechanism procedure (figure 2.4 of the appendix).

China and Clean Development Mechanism

China is presently the country with a top prospect incase of the Clean Development Mechanism project. China holds 36% of the CDM as a host country (CDM4CDM). The Chinese CDM study project aims at capacity building at a micro level. China shares 36% of the CDM projects in Asia (as in May 2007), and the volume of Certified Emission Reductions achieved by the country is estimated to be 64% by 2012(www.CD4CDM.org.). China's CDM scenario is dominated by newer technological input. China is fast accelerating in improving its technology to earn lump some of CERs and attain its goal of sustainability. China's CDM potential is 21.6 MtC (79.2 Mt-CO2) for 2010 (UNEP Riso center, 2007). The power sector along with the renewable power project serves as the main base for Chinese CDM market. The priority technologies for the renewable power in China are:

- Fuels switching to combined cycle gas power plants
- Wind power
- Landfill methane gas conversion to power
- Hydropower

Beside the power sector, the steel, cement and chemical industries show the second largest abatement potential.

The priority technologies for these sectors are:

- Equipment for coke dry quenching
- DC-electric arc furnace
- Waste heat recovery system (chemical industry)
- CFBC-boilers for process heat
- Dry process rotary kiln with pre-calciner (cement industry)
- Biofuels for transport sector
- Demand-side management, for example using advanced electrical motors

Thus, it is seen that behind the large share of CDM potential in China, technology plays a major role. However, the Clean Development Mechanism will not have a significant impact on overall economic growth in China in the timeframe considered (up to 2010-2020) (THE WORLD BANK report, 2004). However, the CDM implementation will be beneficial for energy project proponents and relevant stakeholders in China.

India and Clean Development Mechanism

India has the World's second largest population and the country emits 4% of the world's total carbon dioxide. The growth rate of GHG emissions in India is 4.6% annually, compared to a two percent world average. The vastness of the country along with varied sectoral growth rate, consumption patterns and resource endowments result in such a high GHG emission (Garg, A. Shukla, P.R. 2002). The industrial and transport sector along with the coal and oil product dominates the emission scenario in India.

India tops the list of the number of CDM projects in Asia covering 48% of the total, but the volume of CERs until 2012 in India is estimated to be 22% as compared to the 64% of China (*www.CD4CDM.org).* The CDM market in India could consist of large opportunities in the power sector, including renewable energy, energy efficiency, waste processing and urban transport. The GHG mitigation potential in power sector in India lies in the adoption of CDM projects that move toward high technology such as super critical power plant, integrated gasification combined cycle and through renovation and modernization of existing plants. In the renewable energy sector, the scene is dominated by grid connected power generation option such as biomass based power generation, wind energy and small hydro plants. The energy sector includes projects encouraging energy efficiency and fuel switching in fertilizer, cement, iron and steel and aluminum industries.

In developing countries like India, CDM related activates would necessary have to include intensive capacity building exercises. This is needed at various levels - policy makers and technical staff of concerned government departments and institutions, private sector entities, financial institutions, and the project developers. In terms of preferred technologies and applications, procedures and guidelines for proposing CDM projects, and sustainability criteria, India is growing towards achieving a powerful place in the Clean Development Mechanism potential.

Brazil and Clean Development Mechanism

Global climate change and greenhouse gas emissions are perceived as being very important issues in Brazil, and the country is conducting a variety of efforts in the area of

climate change and particularly CDM development. A large potential for CDM projects does exist in the country particularly in areas of fuel substitution and energy efficiency. The CDM project activities in energy sector include the switching on to the renewable energy resources in the form of sugarcane products, wood, urban solid and agricultural wastes, hydroelectricity, solar and wind resources etc. the energy efficiency projects are largely available in the transport sector of Brazil. Presently, (as in May, 2007), Brazil occupies the second position in the world in CDM projects next only to China. The number of projects in Brazil is 41% of the total Latin American CDM projects. The estimated CERs in Brazil till 2012 were estimated as 48% of the Latin American total (UNEP, RISO Centre, 2007).

Though CDM projects are in fast growth in Brazil, still the country is loosing momentum. Efforts should be made, both domestically and internationally for further capacity building for CDM in Brazil.

2.11.3. Industrialized country perspectives.

Among the industrialized countries, the positions are also diversified. Most of them, however, highlight its function as a producer of CERs. European countries suggest limiting the portion of the Quantified Emission Limitation and Reduction Objective (QELRO) that can be bought from abroad, either through the purchase of Emissions Reduction Units (ERUs) from Emission Trading and Joint Implementation, or CER from Clean Development Mechanism. However, the United States, Japan and some other industrialized countries argue against any limitation. The EU argues that the limitation is necessary to ensure that Annex I countries still achieve significant reduction in their emissions domestically (UNFCCC 1998, Document No. FCCC/CP/1998/MISC.7). The US position in promoting unlimited use of flexible mechanisms is based on the argument that these mechanisms will speed up the emissions reduction efforts while pushing the costs down: Unnecessarily arbitrary limitation will hinder such benefits (by Mr. Stuart E. Eizenstat, November 12, 1998). All industrialized countries agree, however, that clear rules, procedures, and strong compliance mechanism are instrumental in the development of CDM.A concern arises with a plan to tax CDM transactions to raise money for a fund

to redistribute project investments, as well as to cover CDM administration costs. This may lead to some perverse outcomes distributional; in that Annex I investors will seek to protect their project returns by shifting part of the tax to their host country partners.

The United States' stand.

US entities face a potentially deal-breaking obstacle because their current government (George W. Bush) refuses to ratify the Kyoto Protocol. This could result in a virtual shutting out of US entities from worldwide CDM projects, in protest of or retribution for US intransigence on the treaty, or for the simple practical reason that project partners and hosts want as much certainty as possible with regard to earning additional. The "Hallucinations" of the climate change scientific findings, as was stated by the government however, now adds up ammunitions for lobbies within the US and forces outside it for pushing the World's only super power towards signing the 1997 Kyoto Protocol on global warming (Sunita Dubey, 2006).

The European Union's stand.

As regard the European Union, it is playing a game of politically non-action (DOWN TO EARTH; December 15, 2006; Unknown Future). The states in EU had issued too many carbon-polluting permits to companies under EU's Emissions Trading Scheme (ETS)- a mechanism to reduce carbon di oxide emissions to meet Kyoto Protocol targets (In 2005, alone EU industrial units pumped out 1.785 billion tones of CO2, while national authorities had given them allowances for 1.829 billion tones – about 2.5% surplus) (DOWN TO EARTH; June 30, 2006 issue). Thus the permits effective make the "right to pollute" a trade commodity, giving companies the ability to buy and sell permission to emit extra carbon dioxide. Another issue related to CDM is of much great concern. The EU governments are currently discussing whether to limit the proportion of emissions their industries can offset through the CDM. It means that if a country emits 100 million tons of greenhouse gases, it can offset only 5million of them by investing in emission reducing CDM projects (Catherine Brahic, 2006).

Japan's stand

Measures to suppress the emission of greenhouse gases within Japan will be strengthened during the 2005–'08 period, prior to the reductions to be introduced under the Kyoto Protocol in 2008–'12. No doubt, certified emission reductions, CERs—the official term for CDM credits, will come into play at that point.

Japan ratified the Kyoto Protocol on June 4th, 2002 and pledged to cut its average emissions of greenhouse gases by 6% per year, compared to the base year of 1990. One percent of Japan's base-year emissions, measured in terms of a carbon dioxide equivalent, come to about 12 million tons per year (Teri, 2004). The scale of credits that could be expected from CDM projects studied so far is still relatively small falling somewhere between tens of thousands of tons and a million or so tons per year.

Thus, it is been observed that the Clean Development Mechanism with its project formulation, designing and other technical formalities are affecting the global politics to a large extent. Both the developing and the developed countries are affected by the objectives and consequences of the mechanism. The inclusion of market and development goes side by side in this mechanism along with the involvement of the North-South parties ("North" is referred to the industrialized countries and "South" to the developing countries). Thus, the Clean Development Mechanism stands as a point of "convergence of opposites"

Chapter 3

The Clean Development Mechanism: Brazil and India

Chapter 3: The Clean Development Mechanism: Brazil and India

Clean Development Mechanism (CDM) is the only flexibility mechanism under the Kyoto Protocol that allows the inclusion of both the developed and the developing country in its workability. The mechanism is simple thereby dividing the functions of both the countries; as checking of the harmful greenhouse gas emissions in the industrialized countries and performing sustainable developmental work in developing country's side. Other small works as the technology transfer from the industrialized (Annex I) countries to the developing (Non Annex I) countries accompanies this two prime function. However, this dual objective is tough to manage both at the same time, since; the mitigation greenhouse gas emitted projects require markets whose presence, in turn are refused by the sustainable development objective. The CDM promised potential to reduce greenhouse gas emissions and to provide other environmental benefits to the developing countries. Here, the case study of Brazil and India are been taken. A closer look at the geographical and economical profile of these two countries can help understand the relevance of the project status and implementation of the CDM of the countries as a host to the CDM activities.

3.1. The Clean Development Mechanism and Brazil

Brazil was the first country to sign the United Nations Framework Convention on Climate Change (UNFCCC), on 4 June 1992, and the Brazilian National Congress

ratified it on 28th February 1994. The Convention entered into force for Brazil on 29th May 1994, 90 days after its ratification by the National Congress.

The country plays a seminal role in the development of the Clean Development Mechanism (CDM). In party discussions before the Third Conference of the Parties (COP3), held in Kyoto, Japan, in 1997, the Brazilian government proposed that, if a developed country exceeded its greenhouse gas (GHG) emissions requirements, an economic penalty would be assessed, and this would be collected in a Clean Development Fund (Brazilian Implementation Guide, 2003). Money from this fund would be directed to developing countries, which, then, would use these funds for mitigation projects designed to prevent or mitigate global climate change. During the COP3 discussions the proposal evolved into the CDM, a full- fledged flexibility mechanism of the Kyoto Protocol.

3.1.1. Role of Brazil in the origin of CDM: The Clean Development Fund.

The Clean Development Mechanism was not discussed until the last day of CoP-3 at Kyoto, and came as a surprise following the negotiation process. Brazil was the first to put forward an idea close to CDM.

Brazil had proposed the development of a non Annex I compliance mechanism that it named as the Clean Development Fund. The country proposed periodic evolution for the periods of 2001-05, 2006-10, 2011-15, and 2016-20 of the compliance by each Annex I Party with commitments to maintain its effective emissions below the respective emissions ceiling, including the calculation of the difference between the effective emissions based on reported net anthropogenic emissions, and the corresponding effective emissions ceiling. Subsequently, the concerned Annex I Party, in non compliance were to make a contribution to the financial mechanism of the Convention, on the basis of US $$3.3 for each effective emissions' ceiling (expressed in tons of carbon per year equivalent). A fund was proposed to be established by the financial mechanism to receive these contributions. The financial resources of the fund were to be made available to the non Annex I Parties for rendering proper service to the climate change mitigation and adaptation of projects, whose guidelines were to be

established by CoP-4. The resources of the fund allotted to the climate change adaptation projects were proposed not to exceed 10% of the total amount of the fund in that particular year. The financial resources are then made to be available to the non Annex I Parties that wished to carry on climate change mitigation projects. However, the Clean Development Mechanism introduced in the Kyoto is nowhere similar to the Brazilian proposal.

3.1.2. The geographical overview of Brazil

Brazil is located in South America between parallels of latitude 5degree 16'20" North and 33degrees 45'03" South and meridians 34 degrees 47'30" and 73degrees 59'32" West of Greenwich (England). Bounded on the East by the Atlantic Ocean, the country borders on the North, West, and South on every South America country, except for Chile and Ecuador. The country has a total area of 8511965 sq km. the forest area of Brazil is 56.5% of the land area. The land is located at the lowest latitudes of the planet with the Equator and the Tropic of Capricorn crossing it and thus it is regarded as a tropical country. Brazil is a country of continental dimensions and of great complexity, divided into 26 states, 5,507 municipalities (2000 census) and the Federal District, where the Capital of the Republic, Brasilia, is located.

In the year 2005, with a population of 180 million, the illiteracy rate has been 13.6% which means a literacy rate of 86.4 percent, life expectancy rate is 71.97 years; infant mortality stands at 27.6 children per thousand and per capita income has become over Rs $8,600 (according to 2006 data) (World bank, 2006). Most of the populations in Brazil live in urban centers (137953959people) while 31845211 live in the rural areas (figure 3.1 of the appendix). Especially in the South-East of Brazil, about 90.5% of people are urbanized. One of the reasons for the high urban population development was the rapid economic growth observed during the thirty year period after the Second World War. During those three decades, the Brazilian government adopted an import substitution economic model that, of course, triggered the industrialization process.

The economic stabilization plan, launched by the Brazilian government in the year 1994 was held responsible for the rise of the Brazilian economic and social scenario. The plan had positive results in many areas, such as the control of inflation, better income distribution, and the slow but continuous progress of the main structural variables of the Brazilian social conditions.

Between 1950 and 1980, the country's average economic growth was 7.4% per year. In 1950, the agricultural sector contributed with 24% of the Brazilian GDP, in 2006, its contribution increased to 9% with a sharp increase in exports of agricultural products (table 3.2 of the appendix). The percentage change in annual deforestation in Brazil is 0.5% (within 1990-2005) as against a global percentage of 0.1%. The contribution of industry and services to GDP is 32% and 59% respectively. The percentage of GDP growth rate in Brazil was -4.3% in 1990 which grew considerably to 4.9% in 2004 marking the outstanding development in Brazilian economy. The below given table 3.1 gives a clear picture of the various social and demographic elements in Brazil.

Table 3.1: The change of various social and demographic elements in Brazil (1900-2005)

Year	Population in million	Illiteracy level in %	Infant mortality in child/ thousand	Life expectancy in years	Per capita income in Rs$
1900	17.4	65.10	162.4	33.6	516
2005	180	11.8	27.5	71.3	8000

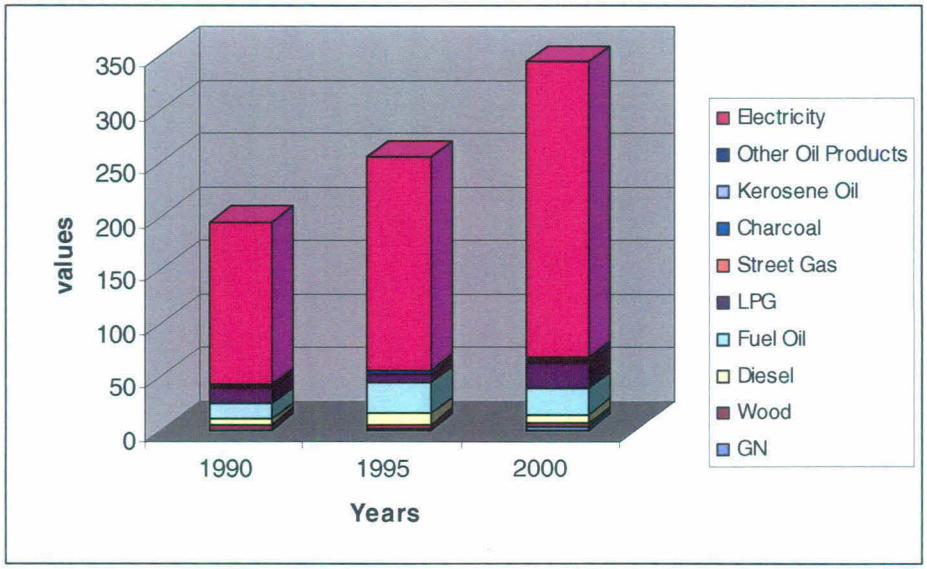
Source: the ministry of Science and Technology of Brazil; 2006.

The education level has increased at a considerable rate in Brazil. In 2003, around 98% of children in the 7 to 14 age range were in classroom, which represent a virtually universal access at the basic level. There has been also an improvement in the access to food, electricity and piped water, consumption of durable goods, and access of women to the labor market. However, despite these improved social indicators, the country is characterized as having high-income inequality, regional concentration of development, etc. Moreover, the job opportunity is also low in the country. The country has a National Poverty Rate of 22% (World bank, 2006)

3.1.3. The energy sector in Brazil

The per capita energy uses in Brazil 1065 Kg oil eqv. Brazil shows a huge market for natural gas and oil products. The crude oil production has increased considerably from 1970 (37.2%) to 2000 (46.4%). However, in the context, where fossil fuel prices are low and the economic subsidies for renewables are diminishing, the market share of natural gas and oil products have increased. By 2010, as per the estimates of Petrobras, natural gas will contribute 12% of the total primary energy supply (table 3.3 of the appendix).

Figure 3.2: Annual Energy Consumption by source, Brazil, 1990-2000.



Source: MME (2004) & IPCC (1996)

As for renewables, hydroelectricity production has not increased as in the past because natural gas is now competing, in part with it. The energy from combustible renewable and wastes in Brazil is 25.9% of the total. The private sector is more willing to invest in natural gas fired power plants rather than in hydroelectric power plants due to the higher up front costs of the latter, mainly in the context of economic uncertainties, lack of

financing for this kind of investment and environmental concerns. Prior to beginning of the privatization process, hydropower plants contributed with 93.3% of the total power generation. In 1999, hydropower's share of electricity was reduced to 88.1% (figure 3.2)

The biomass production is almost stabilized in absolute terms, but it decreased in relative terms. Sugarcane products market share decreases from 13.2% in 1990 to 10.3% in 2000. However, the total amount of sugarcane products remains almost constant in the said period. The per capita electric power consumption in Brazil amounts to 1883 kilo Watt Hour (World bank, 2006).

In the residential sector, traditional biomass consumption has decreased naturally over time and in industry, notably in the steel industry, charcoal has been replaced by coke or by coal. The energy substitution process gained pace with the privatization of most steel companies. Charcoal technology became less competitive when market barriers to import coke were eliminated. Again, the price of charcoal increased due to its due to its entrance in the steel mills made obligatory. Due to low relative fossil fuel prices, coke and coal market shares have increased.

3.1.4. Brazil's Greenhouse gas emissions

According to the estimates and data available from the Ministry of Science and Technology of Brazil (MCT), the country's total GHG emissions in 2000 was 2200 $MtCO_2e$, accounting for 6% of the global GHG emissions and 10% of the non- Annex I country emissions (MCT, Brazil, 2006.). However, from the World Bank estimates (World Bank, 2006), it is seen that Brazil had a considerable check on the Carbon dioxide emission and as against the global total of 3.9 metric tons of CO2 per capita emission, Brazil has a share of 1.8 metric tons. Although the GHG emissions indicators in Brazil are lower than the global average or those for the OECD countries and even the non- OECD nations, the fact that the energy demand income elasticity is higher than one in the country which will, in long term result in a probable increase in Brazil's per capita income and rapid penetration of fossil fuels in the energy matrix. So, these indicators will have a probable increase in near future. Unlike most developing countries, Brazil's electricity sector accounts for only 1% national emissions because

hydroelectric power accounts for approximately 87% of the total national electricity production (table 3.4 of the appendix). On the other hand, major industrial sectors in Brazil accounted for relatively large share of the sectoral emissions from developing countries and the world. The aluminum sector accounted for 16.1% and 5.0% of the sector's emission in developing countries and the world, respectively. The transport sector GHG emission estimates are been provided in the table 3.5 of the appendix) Paper & pulp sector accounted for 10.3% and 2.6% of the sector's emissions in developing countries and the world, respectively. The land use change and forestry (LUCF) sector however is regarded as the largest contributor for GHG emissions particularly CO_2.

Brazil's participation in environmental negotiations.

Brazil has always been a major supporter in all the treaties related to the global environment signed during 1990s, be it the Basel Treaty for controlling and discouraging the international trade in hazardous waste in 1989, or, the London Amendment to the Montreal Protocol establishing technology transfer mechanism for substituting CFCs in 1990, the Madrid Amendment (1991) to the Antarctic treaty extending for more fifty years the suspension of economic activities in that continent, the Convention on Biodiversity (1992), the creation (1991) and expansion (1993) of the Global Environment Facility, and the Protocol on Biosafety (2000). Though maintaining a low profile in all these treaties, Brazil made it a point to ratify it all. In the Convention on Biodiversity (1990-92), Brazil played a major role, being the largest country in the world in biodiversity. Here, Brazil underwent a conflict with US, who defended the principle of Intellectual Property Rights according to the conventional definitions. Brazil, here, as a head of the coalition of countries rich in biodiversity, defended the right to royalties for countries where biodiversity is located. The convention was approved in May 1992, providing rights to the indigenous people and rejecting the full principle of Intellectual Property Rights.

Brazil directly witnessed the response of the international community to this mankind-influenced situation during the ECO-92 conference, which took place in Rio de Janeiro.

These initial discussions eventually lead to Japanese shores, which witnessed the drawing up of the Kyoto Protocol in 1997.

3.1.5. Brazil in global politics of carbon emission

Brazil is the fourth largest carbon emitter on the planet. A Brazilian policy in the emerging arena of the global environment is a consistent one. The Brazilian stance was based on the principle that the main cause of pollution was poverty, and that environmental protection should come only after economic development has dramatically increased per capita income to the level of the developed country.

For a better understanding of Brazilian participation in the negotiations of the Kyoto Protocol, it is necessary to point out that in referring to carbon emissions the country has three great advantages and one major disadvantage. The three advantages are:

- To be an intermediate country (being out of the obligatory commitments for reduction of carbon emissions corresponding to the developed countries).
- To have an energy matrix with strong weight of hydroelectricity (more than 90% of the electricity generated starts from hydro sources).
- To posses in its territory 16% of the world forests (having great importance in global carbon cycle).

The disadvantage is to have large carbon emissions from the use of burning in traditional agriculture and from deforestation in Amazon (2.5% of the world's emissions, among this, about 25% by modern economy, and 75% by traditional agriculture, from land use conversion in the agricultural frontier and from inefficient timber industry)(Eduardo Viola, 1989-2003). About 80 percent of the Brazilian population is related to productive activities that has high per capita emissions and per unit GDP emissions. These are quite insignificant to the developed countries. However, the rest 20% of the population who are directly or indirectly attached to the traditional agricultural pattern, land use conversion in the agricultural frontier and to inefficient timber industry, is responsible for high per capita carbon emission and higher GDP emissions.

Brazil's GH gas emissions whether through the burning of fossil fuels, transport or the methane created by landfill, are modest. Methane may be a more potent GH gas, but in

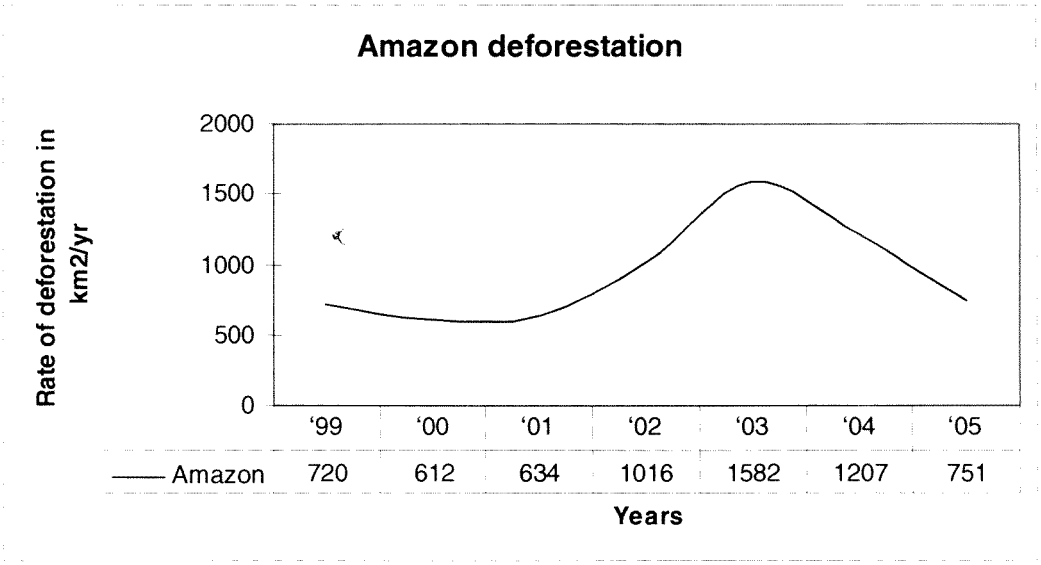
the end the biggest culprit leading to a warmer world is CO_2. Though 50% of Brazil's energy demands fulfilled through hydro, 75% of Brazil's total carbon emissions stem from deforestation. Brazil could quite successfully and drastically reduce their anthropogenic GH gas emissions if they were to seriously tackle illegal and predatory deforestation in the Amazon as well as throughout the rest of the country (Tim Cowman, September 2006).

Amazon: the worst fear in Brazilian emission check.

The total CO2 emissions in Brazil, according to the First National Communication of Brazil submitted to the UNFCCC in December 2004 (MCT, 2004), was 978583 Gg C in 1990 and 1029706 Gg in 1994, representing an increase in 1990 and 1029706 Gg in 1994, representing an increase in CO2 emissions in this period of little more than 5%. The sect oral distribution of this emission shows a dominance of land use change and forestry- LUCF, i.e. 75.4% accompanied by energy sector at 23% and industrial processes 1.6% (figure 3.3). Thus, it is clear that the LUCF sector holds an important position in the total CO2 emission. Amazon forest in Brazil is hugely responsible for Carbon emission due its heavy deforestation activities performed in recent years with increase in urbanization in the country. In this regard, the Cardoso administration has put forth several policies to curb the under going deforestation activity. The most important features of policies from 1995 to 2005 were:

- Incentives for large investments in mining, energy, timber, soybean cropping and transportation;
- Low capacity to punish illegal deforestation for timber industry of the landowners, of the settlers, of the landless rural workers and of the tribal populations;
- Low capacity to promote national and international tourism;
- Incapacity to control the expansion of organized crime flowing mainly from traffic of drugs, weapons, gold and wild animals that constitutes the main problem of poor functioning of the public policies for the Amazon.
- Priority for the establishment of SHIVAM radar system that put a check to the illegal activities in the forest.

Figure 3.3: Annual rate of deforestation (in km2/yr) in Brazil (Amazon)



Source: INPE (2005).

The Amazonian deforestation has been in full force due to several researched causes:

- The high rising demand of Timber from the rest of the country;
- The existence of vast contingents of population in poor conditions that has a tendency to settle and deforest public lands;
- The weakness in the field branches of IBAMA (the federal environmental protection agency);
- The short-term approach to development by social elites by curbing the forested arena.

The deforestation rate in Brazil has been above 15000 Km^2 in 1985-1989, which came down to about 5000 Km^2 a year during 2000. Reducing the pace of Amazon deforestation remains a major objective of Brazilian society. Preservation of this natural resource can also maintain the possibility of long-term sustainable development in the region. Huge difficulties from technical, economic, financial, social, political and cultural concerns help rise in the struggle for the Amazon jungle-cleaning. The expansion in agricultural frontier in the Amazon Basin has been traditionally a complex issue in Brazil. In the past, ill-conceived policies to favor the occupation of the region

have granted fiscal exemptions to big national and multi national industries, installing huge farms and cattle rising activities, leading to extensive deforestation. After the removal of these subsidies, the contribution to forest clearing from small farmer's migration has increased its relevance, and is currently still fed by the lack of access to land by small farmers in the rest of the country due to insufficient agrarian reforms.

3.1.6.CDM projects in Brazil

The Clean Development Mechanism has the potential to reduce greenhouse gas emissions and provide other environmental benefits to the developing countries including Brazil. By providing a number of projects in the country, the mechanism promises the sustainability of the developing country among which Brazil is one. So, the project-based mechanism is essentially a tool to combat the ongoing trend of environmental degradation. The projects that are financially not viable in the absence of the CDM may become cost-effective provided that the transaction costs associated with the CDM are relatively low as compared to the value of carbon emission reductions credited. Keeping in consideration, the potential of CDM, Brazil prioritized in the projects, that involves:

- Renewable energy sources;
- Energy efficiency/conservation;
- Reforestation and establishment of new forests;
- Other emission reduction projects: landfill projects and agriculture projects.

According to the point of view of the Brazilian government, which is based on the perspective of the atmosphere, such projects are the ones that can effectively contribute to the mitigation of climate change. Brazil can take up initiatives to control the emission of GHG since it has "clean" energy matrix with more dependence on hydro energy supply[1] among the primary energy sources used in the generation of electricity. Another important programme is related to the use of ethanol from sugarcane replacing gasoline in the road transport. These initiatives have been taken because of the increasing

[1] 93% share in energy supply by the hydro energy in 1999.

dependency on foreign exchange resulting from the oil price shocks or in order to postpone investments in new electrical generation facilities or oil refineries. Brazil's efforts related to GHG emission reductions include further research and development in the area of ethanol fuel from sugarcane; the development of hydro, wind, solar and thermal power plants; the use of charcoal from planted forests in the iron and steel industry; energy conservation and suppression of forest fires. It is fundamental to highlight that the Brazilian position is against the consideration of forest conservation (or managed forests in the language used under the Convention) as a possible activity to be submitted for certification under the CDM, as it does not contribute to the mitigation of climate change. The argument in favor of forest conservation can be seen from several different angles: as avoiding future deforestation; contributing to the preservation of water resources; contributing to the preservation and development of biodiversity and enabling the creation of activities and, consequently, jobs and income for isolated communities, especially indigenous peoples. All these arguments have merits of their own. However, from the strict perspective of the atmosphere, or even under the Climate Convention, the fact of conserving an existing forest does not contribute to mitigating the greenhouse effect, or in other words, to attenuate climate change. There is no variation in the concentration of any greenhouse gas in the atmosphere as a result of the mere fact of fencing a forest and, supposedly avoiding its deforestation. Deforestation is not taken in Brazil as a primary concern initially since, the country strongly believed in the objective of sustainable development provided to it rather than concerning on global GHG mitigation which is the responsibility of the industrialized countries as put forward by Kyoto. Still with regard to the conservation of forests, there are four important aspects to be considered:

1. According to Article 4, paragraph 1, of the Convention on Climate Change, all signatory countries have accepted the commitment to "promote sustainable management, and promote and cooperate in the conservation and enhancement, as appropriate, of sinks and reservoirs of all greenhouse gases not controlled by the Montreal Protocol, including biomass, forests and oceans as well as other terrestrial,

coastal and marine ecosystems". According to the Convention, forest conservation or protection is already an obligation of the countries.

2. Since there is no carbon uptake by fencing a forest, from the perspective of the atmosphere, the eventual eligibility of a project of this kind to the Clean Development Mechanism would require the certification of hypothetical emission reductions (eventual future deforestation), that is, certification would refer to a hypothetical baseline of future deforestation. Therefore, no real carbon sequestration would be certified, but future hypothetical sequestration. Moreover, how can we state that this is an anthropogenic activity for mitigation when the costs for maintaining this possible sink are restricted to fencing an area?

3. The reference of the Kyoto Protocol for the establishment of agreed reduction targets are the net anthropogenic emissions of greenhouse gases in 1990. The consideration of "forest conservation" as candidate for emission reduction projects implies the consideration, in addition to the anthropogenic activities, hypothetical emission reductions in case of conserving native tropical forests, or natural sinks in the case of boreal forests. The target established in Kyoto for Annex I countries of reducing 5% below 1990 levels of anthropogenic emissions of greenhouse gases not controlled under the Montreal Protocol, considering that the emission level for Annex I countries projected for 2010 is around 15% above 1990 levels, will be equivalent to an effort of reducing net emissions by around 900 million tC/year. In view of such figures, the consideration of natural sinks or hypothetical reductions as part of flexibility mechanisms of the Protocol means to practically nullify the Kyoto Protocol, as the magnitude of possible sink activities, if native forests are considered, will be at least twice greater than the reduction targets agreed in Kyoto.

4. There is no way to guarantee that a forest preservation project will avoid deforestation. First, a strict inspection of the area would be necessary and even it that is done efficiently, it is practically impossible to avoid fires, either caused by man or with natural causes. Moreover, even if one manages to preserve a certain area, no one can ensure that the areas surrounding it will not be deforested, and those may even involve bordering countries.

Therefore, the Brazilian government is not against forests being considered as activities that contribute to attenuating climate change. There are several different situations to consider. As explained above, the anthropogenic activities that require expensive investments and that effectively reduce the atmospheric concentration of carbon dioxide (reforestation and establishment of new forests) can and should be considered as eligible projects for the clean development mechanism and for the emission limitation and reduction targets of countries in Annex B to the Kyoto Protocol. However, projects that imply the consideration of native forests (either with the purpose of management or conservation), but that do not contribute to the reduction in the atmospheric CO_2 concentration should not be allowed or eligible for mechanisms under the Protocol, even if such projects have merits from several points of view. Such merits, as appropriate, should be assessed and acknowledged in pertinent fora but not under the United Nations Framework Convention on Climate Change.

Thus, for the establishment of eligibility criteria for certifiable projects under the CDM, it is necessary that national development priorities are compatible with the view of real climate change mitigation.

The present state of CDM projects in Brazil

Brazil guarantees a very strong position in the Clean Development Mechanism scenario. The country started well with the highest number of projects in hand having an estimation of 51.6% of projects validated or under validation among which, the estimated CERs during the 1st commitment period has a share of 43.4% of the total during the beginning of 2005 (Kazuhito Yamada, 2005). Even in small scale CDM projects, Brazil had a total share of 21.4% out of the total 57. The major sectors of this growth in the projects come from Liquid Fuel Gas (LFG), Bagasse, Biofuel, Animal Wastes etc. However, the Brazilian share gradually decreased with the inclusion of other players in the markets as project hosts (china, India). Presently, Brazil ranks third in the world as a CDM host country. Brazil dominates Latin America with 41% of its CDM projects. The total number of CERs claimed by Brazil till 2012 is also much high in its own continent, i.e. 1,54,990.72 tonnes of carbon eqv. Brazil occupies 13% of the

world total in the CDM projects. Out of the reduced emission on the first crediting period, Brazil's share presently reaches 8% of the total in the world (Jose Miguez, Feb 2007). Among the CDM projects in Brazil, under validation, the cogeneration with biomass projects has a maximum share of 67, but the Annual emission reduction share goes to the Landfill projects with a value of 9,548,888 CO2eqv. The electric generation holds the second position with 22% of the projects in hand, but again the second position in case of CER emission goes to N2O reduction with 24% out of the total reduces. Though Brazil started as a host to CDM countries initially attracting a large number of country parties, but the tendency decreased to a considerable rate with Brazil now, being hugely carrying on with unilateral projects having a share of almost 65% and among the rest, UK, Nether land and Japan stands prominent. Out of the total of 210 Brazilian CDM projects, 88 were registered, 1 requests registration, 90 are still under validation. The estimated CERs during the first commitment period is expected to be 57MtCO_2 for Brazil.

3.2.Geographical overview of India

India is located in the continent of Asia between latitude 8°4' and 37°6' north and longitude 68°7' to 97°25' east, covering total surface area of 3287000 sq km. the country is bounded by Indian ocean on the South, Arabian Sea in the West and Bay of Bengal in the East, forming a peninsula. The country has a forest area of 22.8% of the total land area.

India has a vast dimension and is divided into 28 states and 7 union territories. The capital city of India is New Delhi, which is itself a state. India is the second most populous country of the world with a population figure of 1,095,351,995 with a population growth rate of 1.4% (World Bank, 2006). According to 2001 census, India sustains 16.7% of the World population. The population density as per the same census shows a figure of 324 persons per square kilometer. The sex ratio has always been unfavorable for females with 933 females per 1000 males.For the purpose of census 2001, a person aged seven and above, who can both read and write with understanding in any language, is treated as literate. According to this, the literacy rate in India is

64.84%. The GDP amounts to $691.2 billions with a growth rate of 6.9% p.a in 2004 as against 5.8% in 1990. India has 22.8% of the forested area and the annual deforestation rate (1990-2005) is -0.4%. India has an energy consumption of 520 kg oil eqv with a net energy import rate of 18% of the total energy use in the country. The energy from combustible renewable and waste in India 38.2% of the total as against a global share of 10.4%. The electric power consumption per capita in the country is 435 kWh.

3.2.1. Indian Energy Sector

In recent years, India's energy consumption has been increasing at a fast rate due to the population growth accompanied by the economic development. India ranks fifth in the world, in terms of primary energy consumption, with 3.5% of the world commercial energy demand in 2003 (TEDDY, 2004-05). The primary commercial energy demand had a rise of 6% between 1981 and 2001 (Planning Commission; 2002). Coal, oil and natural gas are the three primary commercial energy sources in India. In it, the country ranks third in the world. Other sectors like power, steel and cement are dependent on the coal. 75% of the coal is generated in the power sector (MoC; 2005) with electricity generated by coal amounting to 68.3% as compared to the 40.01% global generation. In the power sector, the electric consumption had a leap though; the rise was slower than the GDP rate. The installed capacity rose from 1713 MW in December, 1950 to 118419 MW in March, 2005. The growth of service sector and the prudent use of electricity were perhaps responsible for this high increase. As regards the crude oil reserves, India has 0.4% of the world total with a considerable increase during the years; 6.82Mt in 1970-71 to 33.38 Mt in 2003-04 (MPNG; 2004b). Even, the natural gas also shows a huge increase with an increase in demand of 6.5% over ten years. To stop the excessive dependence on coal as the prime source of energy, industries in India, such as, power generation, petro chemical, and fertilizer are shifting towards natural gas.

India has one of the highest potentials for the effective use of renewable energy. The energy derived from the combustible renewables and wastes comprise of 38.2% of the total. The country is the world's fifth largest producer of wind power. The small hydro power potential is estimated as about 15000 MW. The electricity generation capacity

from both wind and hydropower showed a growth rate of 4.35% during 1991-92 to 2003-04 (TEDDY; 2006). With the increase in Bagasse and Biomass resources, the country offers enormous potential to the economic, social and environmental benefits.

3.2.2. Historical emission of GHG in India.

In 1994, 1228 million tones of CO_2 equivalent emissions took place from all anthropogenic activities in India, accounting for 3% of the total global emissions. The percapita carbon dioxide emission equivalent in 2000 in India amounts to 1.5tonnes CO_2 per capita as compared to the global average of 3.9. About 63% of the CO2 eqv emission was from the gas CO2, 33% was from methane and the rest from nitrogen dioxide. The CO2 emissions were dominated by the fuel combustion in energy and transportation activities, road transport, cement and steel production. The methane emissions were dominated by emissions from enteric fermentation in ruminant livestock and rice cultivation. Among the nitrogen dioxide emission, the agricultural soil due to fertilizer application is dominant. The recent data however accounts for 1484 million tonnes leading to 4.2% of the global emissions in the country. The high degree of energy consumption by India in the past 10 years (1990-2000), marks high emission intensity. The sectoral difference also matters here (table 3.8 of the appendix). The total annual final energy consumption in India increased from less than 5230 PJ in 1990-91 to more than 8480 PJ in 2000-2001 with mostly the industrial sector dominating (4091 PJ) followed by the transport (1400 PJ). The energy sector is the largest emitter of CO_2, contributing -% of national emissions as compared to the historical emission of 56% (565MtCO_2 of total GHG in 1990 (ADB et al. 1998,p.5). These include emissions from transport, coal mining, oil and natural gas emission. The power generation produces roughly half of India's CO_2 emissions, i.e., 45% in 1999. The conventional energy sources, like coal driven industries are the major sources of such emissions. The electricity sector use per capita increased to a considerable extent, though it is stills less as compared to the world total ($1/6^{th}$ of the total). According to Garg and Shukla (Garg, A.P., Bhattacharya, S., Shukla, P.R. and Dadhwal, V.K., 2001), the 50 large industrial sources are responsible for the major emission, which is 29.6% of the total CO_2 emission. Thus, there is high concentration of the industrial emission scenario in India.

The transport, accounting for 10% of India's GDP, has an increasing trend of GHG emissions (TERI, 2004).

In India, agriculture stands prominent as a large nitrogen emitter sector. With about 70% of population engaged to the sector, the agricultural sector is responsible for GHG emissions with its enteric fermentation in domestic animals, manure management, rice cultivation and burning of agricultural residues. The sectoral composition of India's GHG emissions highlights the power area holding the greatest potential for emission reductions. A comparison of the Indian emissions with some of the global emitters indicates that the absolute value of Indian emissions is 24% of the US emissions, 31% of Chinese emissions and 80% of the USSR in 2000. The Indian per capita emissions are however, only 7% of the US (NIR 2004), 13% of Germany (German National Inventory Report 2004), 14% of UK, 15% of Japan, 45% of China and 38% of the global average in 2000. The CO2 emission per unit of GDP in India in 2002 has been 0.41 kg CO2, almost 9% lower than its 1990 level. The emission is further estimated to rise three times with respect to 1990 emissions in 2020. These are driven by the developmental needs of the country. The emission also varies according to the gas types with CO_2 emission topping the list (table 3.6)

Table 3.6: India's GHG emission by greenhouse gas types, 1994.

Greenhouse Gas Type	Emissions (in million tons)	Emissions %
Carbon dioxide emission	**793.49**	**64.59**
Methane emission	**18.08**	**30.91**
Nitrogen dioxide emission	**0.18**	**4.50**
Total	**811.75**	**100.00**

Source: India's Initial National Communication to the UNFCCC, MoEF, 2004.

The major increase in GHG emissions in the past 20 years is attributed to the energy efficiency and increasing use of renewable energy (or a move toward low carbon reduction options). The coal based power generation is highly perceived as a major reason for high GHG emissions. However, the present clean coal technologies use of renewable energy sources such as hydro, wind and biomass based power options and alternative low carbon options are slowly reducing the emission rate in India in recent years.

The Indian forestry sector reported that in spite of having considerable carbon sink in the forests in India, the Indian forests are posing threat to global mitigation by deforestation. The deforestation rate in India progressed from 1.5 Mt in 1990 to 77.3 Mt in 2020 (assessed). The high rate of deforestation is due to several factors like urbanization, abandonment of managed lands, on-site and off-site burning of forests, non- sustainable extraction of biomass, etc. The LUCF mitigation lies between 60 to 87 GT of carbon between the period of 1995 and 2050 globally (Brown, 1997).

In India, there is a major source of Methane, especially in the rice fields (23%), the enteric fermentation in animals (42%), the manure management, and burning of agricultural crop residues (16%). The hotspot for methane emission is also from waste disposal in metro cities like Delhi, Greater Mumbai, Chennai, Calcutta, Ahmedabad and Bangalore (Garg and Shukla, p. 83).

3.2.3. GHG mitigation and India

India is highly vulnerable to climate change as its economy is heavily reliant on climate sensitive sectors like agriculture and forestry and low lying densely populated coastline that is forever threatened by the potential rise in sea level (Anil Kewalramani, 2004). In India, therefore, the government has taken significant steps towards the mitigation of GHGs at national level. Detailed studies of energy efficiency programs are been taken up in industries and power sectors. The past few years have also witnessed introduction of landmark environmental measures that have targeted cleansing of rivers, enhanced forestation, and installed significant capacity of hydro and renewable energy technologies and also CNG vehicles in the transport sector. The Indian government has

also introduced clean coal technologies like coal washing and introduced the use of cleaner and lesser carbon intensive fuel. In order to combat the global warming, India became a strong and consistent supporter of the various conventions taken up by the United Nations. The government of India has submitted a comprehensive national GHG inventory as part of its first National Communication to the UNFCCC, in April, 2004. It is a party to the United Nation Framework Convention on Climate Change (UNFCCC) and therefore is targeted to achieve stabilization of Greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. India also acceded to the Kyoto Protocol in August 2002 and one of the objectives of acceding was to fulfill prerequisites for implementation of Clean Development Mechanism projects, in accordance with the national sustainable priorities.

3.2.4. India and CDM

CDM process development in India picked up in early 2002. It started with the Netherlands government tender CERUPT was announced. India's active participation in CDM has largely been driven by consultants who are playing a crucial role in convincing the promoters of the project for CDM opportunities. Projects are been developed in unconventional sectors, i.e., fluro-chemicals, renewable energy sector, power and industrial energy efficiency sectors, etc. India faces the potential CDM market that has become but a fraction of its originally envisaged size, primarily due to the rejection of the Kyoto Protocol by the US (CDM Implementation in India: the National Strategy Study; TERI; 2005; page:12).India's sale of CDM credits could range from 3.7-26.4 MTCO2eq per year during the first commitment period. The investment of India in transaction and formulation procedure in CDM projects, around 58 lakhs is too high for a capital restrained country perspective. Even if there are some observations in favour of utilizing the money in social and economic development (IDFC data, 2004), the following factors address the relevance of inclination of India towards CDM.

- A small revenue team can trigger the adoption of cleaner and more efficient energy production systems.

- Over the first commitment period, there are many avenues for certain types of projects to command a price premium (those demonstrating high sustainable development contributions). Such projects would have to compete with potentially low priced CER resulting from the HFC sector.
- If US allows participation in the second commitment period, then this CDM could play a more significant role in terms of volumes and revenues.
- The compilation of CDM projects to GHG emission reductions and to the protection of the global climate system will assist India in meeting its environmental foreign policy commitments under the UNFCCC.
- India can get a scope to leverage the CDM revenues for projects that are in consonance with sustainable development and its development priorities.

Moreover, the high transaction cost can be well managed by:

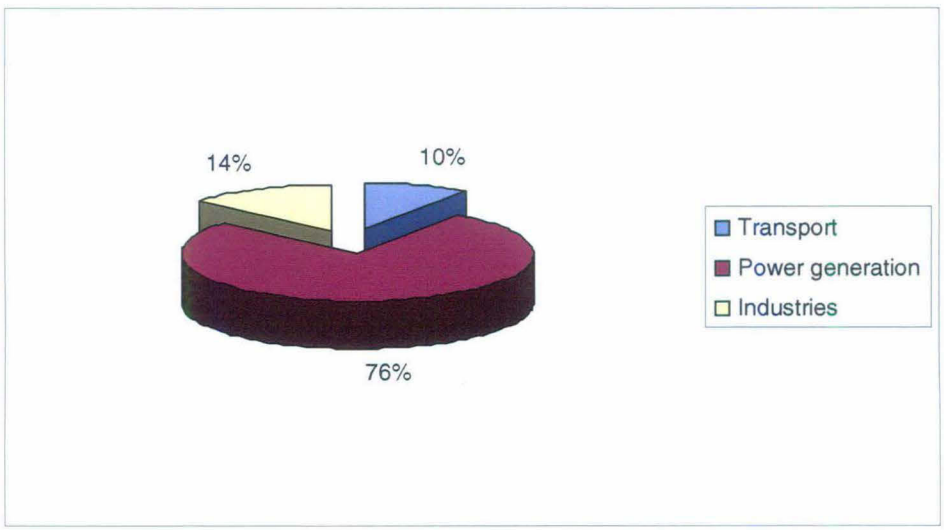
- Choosing the conventional local financing and carbon financing may bring down the transaction cost by 40%-60%.
- Local expertise in the in areas of validation in particular can also bring down the fees by about 30%.
- Compiling several small-scale projects can also help reducing the transaction costs.

The present status of Clean Development Mechanism projects in India

India has a high potential for the CDM activities and is carrying it off very smoothly. The Project Information Notes received from all regions of the country re ported that the northern and western India is dominating the scenario, followed by the southern part. The renewable energy sector dominates Indian CDM projects, representing wind, small hydro, biomass power, biomass gasification, bagasse cogeneration and solar thermal. In the energy efficiency, fuel switching and substitution of clinker with mineral components, industries like steel, cement, foundry, brick, glass, petroleum refinery, paper mill, and fertilizer were represented. Municipal solid waste and poultry litter projects are received in waste-to-energy category. Most of the projects aim at reducing CO2. CDM in India is mostly relying on the domestic technologies and a handful of

projects only proposed technology transfer namely steel industry, energy efficiency, fertilizer and waste-to-energy. The sectoral potential of GHG mitigation in India shows the prevalence of the power generation (table: 3.4).

Fig 3.4: Sectoral Potential of Greenhouse Gas mitigation in India, 2004.



Source: TERI & IGES ,2005.

76% of the sectoral mitigation in india comes from power generation with the renewable energy dominating. The participating promoters in India, belong to various sectors such as joint and public sector, state nodal agencies, private companies, consultants, financing institutions, and NGOs. Most of the CDM projects in India are Unilateral in nature percentage, i.e., developed, financed and implemented by the host country; no foreign investment takes place. The initial cost of formulation and approaching the international community is though cut off, but later on the CER needs a marketisation in India. India occupies a leading role in the global carbon market which had been possible only due to the increase in awareness among the stakeholders, private sector involvement supported by efficient CDM activities. India's share of the CDM market, as estimated by the National Strategy Study for CDM Implementation in India could be at least 10% of the total, earning revenues of up to 100 million dollars per year (TERI, 2005).

In India, the renewable energy sector from the small scale projects dominate which is much contradictory as compared to the global CDM project scenario where the HFC decomposition and Landfill gas to energy projects accounted for 49% (Lecocq, 2004). The projects related to renewable energy, energy efficiency, fuel switching, particularly in rural areas and small industries which are of interest to india are mainly concentrated towards earning sustainable development for the country rather than earning cheap carbon emission revenues.

Table 3.7: Project size and transaction cost in India.

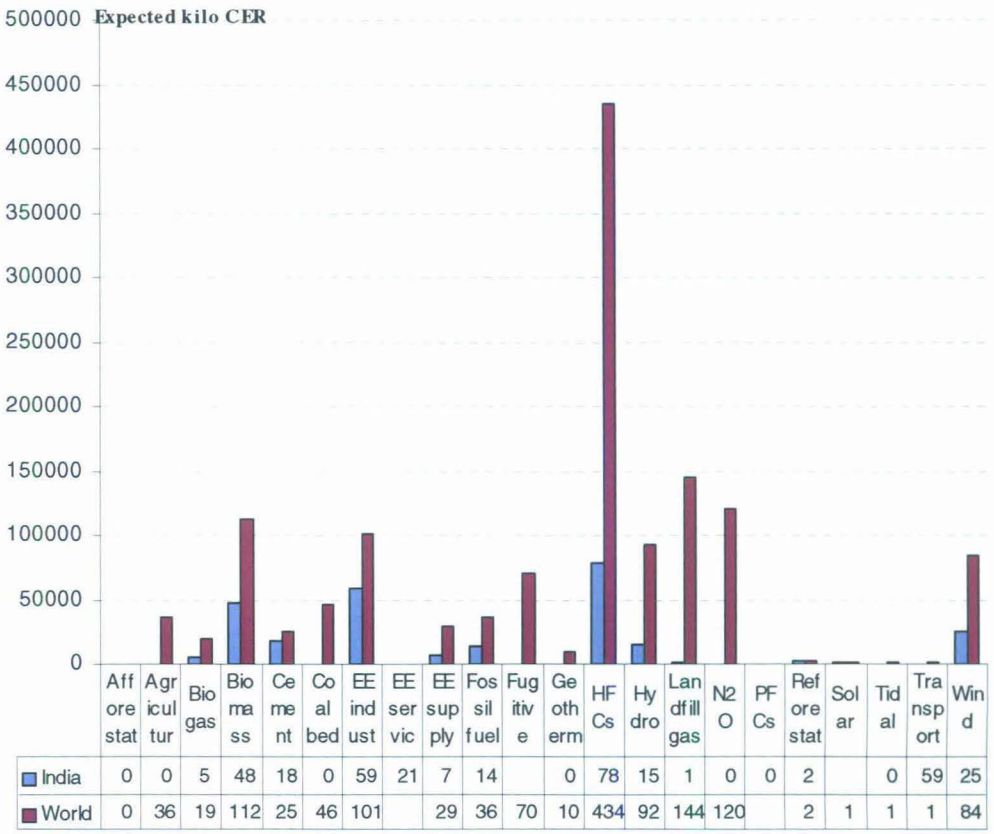
Project size	Reduction (TCO2eq/year)	Transaction cost (USD/TCO2eq)
Very large	>200,000	0.1
Large	20,000-200,000	0.4-1.3
Small	2000-20,000	13
Mini	200-2,000	130
Micro	<200	1300

Source: Michaelowa and Jotzo, 2003.

Among the new methodologies submitted to the CDM Executive Board for approval, India has the highest number of methodologies (about 43 methodologies submitted from India, among which, 10 have been approved (Dr. Y.P Abbi, 2006.). India's leading role in global carbon market[2] is largely attributed to enhanced awareness among stakeholders, increased private sector engagement, streamlined national approval procedures and the presence of several international donor supported CDM activities. Also, a strong human resource base and service sector made the country an ideal host for CDM projects. In India, the project size and the heavy transaction cost often hampers project activities since carrying out project with foreign transaction cost currencies is very difficult in capital constrained countries like India (table 3.7).

[2] India was the number one country from the CDM investors perspective till December 2004 according to the Point Carbon survey.

Figure 3.5: India's CDM projects (total expected kilo CER) by 2012, by sector.



	Afforestat	Agriculture	Biogas	Biomass	Cement	Coal bed	EE industry	EE service	EE supply	Fossil fuel	Fugitive	Geotherm	HFCs	Hydro	Landfill gas	N2O	PFCs	Reforestat	Solar	Tidal	Transport	Wind
India	0	0	5	48	18	0	59	21	7	14		0	78	15	1	0	0	2		0	59	25
World	0	36	19	112	25	46	101		29	36	70	10	434	92	144	120		2	1	1	1	84

Source: http://cdm.unfccc.int. (last accessed on November 3, 2006)

Currently, as on November 2006, India is hosting 123 projects from which a total annual CER of 11,904,118 is expected CO2eqv is expected. The major areas of the CDM activities in India are essentially the small scale projects like small hydro, Fuel switch, Wind, Landfill gas, Biomass to energy, HFC decomposition and Energy efficiency. India holds the second position in its continent with 48% of projects in its hand. However, the number of CER achieved by the country is much less with only 22% (China ranks first in it holding 64% of CER's until 2012 in Asia). The reason for such a disproportionate performance may be attributed to the domination of renewable energy sector in Indian CDM scenario particularly in rural areas and small industries

which earn comparatively cheap and high volume non-carbon dioxide projects. This is in contrast to the international scenario where hydroflurocarbon (HFC) decomposition and landfill gas to energy projects accounted for 49% of the total emission reduction volume contracted (Lecocq, 2004).

The current CDM project pipeline has gaps in sectors that are very relevant for India, such as the transport and residential sector are hardly represented and needs special focus.

India is likely to capture 10% of the global carbon market during the first commitment period. The countries volume of CER exports are expected to range between 3.7 and 26.4MTCO2eq (TERI,2005), bringing in revenue in the range of 5-100 million USD per year. Thus, India stands in a high tide zone as related to the CDM projects globally. The country is largely motivated towards a bright Clean Development Mechanism Potential.

3.3. Comparative analysis between the CDM position of India and Brazil

Standing on almost the same base of development since India and Brazil both are developing country with a GDP of India being 691.2$billion and Brazil being, 604 $billion (World bank, 2006), both India and Brazil started off very well in the Kyoto compliance mechanism of CDM. Brazil had a quick start and by May 2005, Brazil topped the global list of the CDM host countries with 51.6% of the projects validated or under validation for each country whereas, India, in the same category had a share of only 4.7% (Kajuhito Yamada; June 2005) . Even in the case of estimated CERs during the first commitment period by projects validated or under validation for each country, Brazil had a share of 43.4% and India having 24.1%. Among these projects, the Liquid Fuel Gas (LFG) management had a share of 32.3% and 46.3%. Thus, by mid 2005, both India and Brazil reached to a secure position as regards the hosting of CDM projects. Brazil emerged as a top runner of CDM host countries with strong LFG, Bagasse, Biofuel and Animal Waste projects. India was the second in the list with the domination of small scale hydro, Bagasse, Biofuel, Steel works and Wind power dominating. India was lagging due to its preponderance on coal that earned it high Carbon Emission

Factor (CEF). This was an advantage for Brazil since it dominated in hydropower and so, had a low CEF. Brazil also was a top runner due to the CDM opportunities in the transport sector, where it presents a great option in the biodiesel use with enormous dividend benefits and also regarding vehicle fuel efficiency due to its huge fleet with an increasing growth rate (Suzana Kahn Ribeiro, 2004.). However, by the end of 2005, the tables started turning and by 2006, China emerged as the top runner of CDM host countries and Brazil and India slowly taking up the second and the third position. By September, 2006, Brazil had only 8% of the volumes sold while India had a close follow on with 7% in which China had a massive share of 61% (Capoor et Ambrosi, 2006a, b). This was due to the fact that both India and Brazil were more concerned with the hydro, biomass, wind and CO2 gases which earned them less CERs as compared to China that concentrated largely on high CER generating non CO2 gases like HFC. Actually, the payments for carbon usually come from highly credit rated sources, and in strong currencies (EUR, USD, and YEN). In capital constrained countries, like India and Brazil, project developers can use carbon finance to leverage additional financing or in getting better terms to close financial structuring of deal. This requires, however, that financial institutions recognize emission reduction potential as collaterals, which remains the exception rather than the rule. By May 2007, again, the renewable (with 25% of share) and the energy efficiency projects (with 8% share) slowly started gaining momentum.

Chapter 4

Clean Development mechanism, Sustainable Development and the role of Private Sector

Chapter 4: Clean Development Mechanism, Sustainable Development and the role of Private Sector.

In the previous chapter, the Clean Development Mechanism and its implication on the developing countries like India and Brazil are discussed. Looking after the various CDM activities and present status, it naturally comes to mind that how far the main objective of the mechanism as was promised in the Kyoto Protocol in 1997 (sustainability of the developing countries) was taken care of. In this regard, the role played by private sector is also in question. A critical issue is whether "achieving sustainable development" is synonymous with reducing GHG emissions or whether this vague wording allows for other considerations to guide certification, such as addressing serious local environmental problems. Another theme in the ongoing negotiations about the CDM is the demand that projects should be allocated according to regional considerations instead of economic merit. All these form the basic outline of this chapter, where, the sustainable development of the CDM in developing countries, especially in the study area, i.e., India and Brazil are discussed broadly. Also the private sector participation and in this, the role of market (CDM being called as a "market mechanism") is also put to question.

4.1. Sustainable Development as an objective of CDM

The Clean Development Mechanism is the compliance mechanism which aims at reducing greenhouse gas emissions in industrialized countries and contributes to sustainable development. In the Article 12 of the Kyoto Protocol, the aim of the CDM reads:

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.

These objectives of CDM are operationally dealt with through various projects that are taking place in various developing countries financed by the industrialized countries and often taking place unilaterally. The GHG emissions that are reduced by these projects are credited to the industrialized country's balance of payments. However, the projects aim at per suing sustainable development for the developing countries in return. This is the benefit of this mechanism for the developing country. How far this criterion is being taken care of is still into question.

Sustainable Development

The concept of sustainable development was though an age old phenomena, still it gained momentum only lately with the Brundtland commission report (also known as 'our common future' by the World Commission on Environment and Development) which stated that a development is sustainable only when it "meets the needs of the present generation without compromising the ability of future generations to meet their own needs" (WCED, 1987). Thus, it is been observed that the sustainable development essentially aims at wise use of resources, i.e., maximum yield with minimum effort so as to keep something for future use. In this respect, three indicators of sustainable development (UNCED, Rio de Janeiro, Brazil, 1992.) have been categorized:

i. **Economic:** it includes GDP, GDP/capita, balance of payments, investment in priority sector, transfer of clean and effective technologies, generation of local employment, and improvement of local economy.

ii. **Environmental:** it includes reduced air and water pollution, conservation of bio diversity, reduced soil erosion from deforestation and improving the sustainability of natural resources.

iii. **Social:** it consists of the local employment, greater community participation, improved health, reduction of wealth disparities, poverty reduction, capacity building, improved access to power, helping backward communities and security of energy supply.

These indicators are been examined in different perspectives, essentially, along the (i) Global level, (ii) National level and (iii) Project or Local level. The indicators of

sustainable development look after several aspects of development. The environmental aspect is however, most common among them.

The Sustainable Development and the Climate Change have remained as a separate branch of study for quite a long despite of both being intrinsically attached to human impacts. The climate change debate has been natural science driven, the sustainable development debate has been framed in a more social and human science oriented approach. The two debates continued separately until around 2001-2002, when the Intergovernmental Panel on Climate Change (IPCC) Third Assessment Report and the World Summit on Sustainable Development created platforms to direct the focus towards integration and linkages between Climate Change and Sustainable Development. The term Sustainable Development is not defined either in the Kyoto Protocol or the Climate Convention, which could well be a reflection of the general assumption that both the Greenhouse Gas mitigations generally promote sustainable development.

4.2. CDM and Sustainable development

The Clean Development Mechanism is a commercial mechanism that not only sets up to help industrialized countries to reduce the greenhouse gas emissions, but as described in article 12.2 of the Kyoto Protocol, also has an objective to help the developing countries to achieve sustainable development. Pursuing the sustainable development objective in CDM is basically confined to areas such as:

- Short and long term economic effects
- Social and employment benefits
- Local and global environmental benefits
- Technological innovations

However, there is a debate about meeting the duel objective of CDM. It is been argued that the credits for CDM is primarily directed towards large projects with easily accessible credits and the Sustainable Development criteria is given minor importance. The host countries often reduce least cost CDM projects in order to be competitive. Since project owner's influence on emission reductions certification costs and carbon prices are

limited and influence on costs for attaining sustainable development benefits is high, the latter is often targeted for cost efficiency. This situation repulses the project participants and additional activities that enable in achieving sound sustainable development benefits are not entertained.

There is a well known conflict between the Climate Change and Sustainable Development issue. CDM initially was taken as a project mechanism for Climate Change and later on has been linked with the issue of Sustainable Development. The Northern countries dealt with the concept of climate change as global environmental problems while the South has been dealing it as a development problem

As of yet, developing countries have identified specific sustainable development objectives related to the CDM. Nonetheless, it seems likely that most countries will insist that CDM projects must meet the following criteria to be consistent with sustainable development.

- Projects must be free of local opposition and must not impose burdens on local communities that cause those communities to oppose the project.
- Projects must be free of environmental burden shifting. They must not result reduce greenhouse gas emissions at the expense of increased environmental impacts in other areas (e.g., air quality emissions, toxic wastes, land use degradation, etc.).
- Projects must provide multiple social and economic benefits such as enhanced local economic development, job creation, the alleviation of poverty and the introduction of new eco-efficient products and services into the economy.
- Projects that provide multiple environmental benefits (e.g., improved local air quality, maintenance or expansion of green space or forested areas, improved water quality) will also be preferred.

The application of these sustainable development criteria will clearly vary from country to country. For example, some countries are likely to conclude that projects related to coal-fired electricity are incompatible with sustainable development because of the multiple environmental impacts associated with use of the most carbon-intensive fossil fuel. In other countries, however, where no clear alternative to coal (e.g., hydro or natural gas) exists in the short-term; a project that introduced the best available technology and

also took additional steps to mitigate local air quality and resource mining impacts might be considered.

Poverty reduction and use of renewable energy takes a lead in the sustainable projects. In order to ensure the sustainability of the CDM projects, there is a strong need for capacity development consisting of strong institutions capable of monitoring the progress and commitment of the projects. Even, the success and sustainability of technology transfer is also ensured by sustainable development.

4.2.1.CDM projects and sustainable development

Though the sustainable development has several indicators, but when it comes to practical and concrete assessments of sustainability impacts of CDM projects there is no single authoritative or universally accepted approach or methodology applicable to any CDM project regardless of project type and location.

According to Pembina and TERI, the following principles should be followed in defining sustainable development criteria in Clean Development Mechanism projects:

- The projects must be free from local opposition.
- The projects must not result in the emission of GHG thereby obstructing other areas.
- There must be multiple social and economic benefits obtained from the projects such as, local economic development, job creation, the alleviation of poverty, services into the economy, etc.
- The projects should aim at multiple environmental benefits also, (improved local air quality, maintenance or expansion of forest belts, improved water quality, etc.).

The benefits of the CDM projects to developing countries include the selling of CDM credits, improved foreign investment, technologies and knowledge transfers from Annex I countries. CDM is considered as a catalyst for more transformational shifts to greater sustainable sources of value creation.

The Clean Development Mechanism is a project mechanism and the success of its objective essentially depends on the variety and efficiency of its projects. The sustainable development criteria as was ensured by the mechanism also depend on the projects taken up. Poverty reduction is an integral component in the selection, implementation and transaction of CDM projects. The more the number of projects, the more possibility of technology transfer is there that enables a sustainable development for the host country since the technology embraced can be put to maximum gain. Besides this, the types of projects also play a role in the sustainability factor. More CERs are seen to be concentrated on a limited number of projects. High CERs are generated by HFC or N2O projects. The poverty alleviation or sustainability content of these projects is a highly debatable issue. The small scale CDM projects show a linkage between (i) project complexity and (ii) requirements that do not allow a full participation of the target groups of poverty reduction. The carbon reduction projects can also help alleviating poverty only if strong community organizations and involvement for the systems is undertaken. The proper concept of sustainable development varies according to what different host countries consider as their development priorities. However, it is been argued that the Clean Development Mechanism failed to attain its objective of Sustainable Development (Holm Olsen Karen, 2004).

The UNFCCC also haven't made any strict criteria of project selection under the sustainable development criteria in Kyoto Protocol's Article 12. There is also a lack of regulation by the Executive Board regarding sustainable development. This is often regarded advantageous as the parties involved can take up projects they think is proper for attaining the goal of sustainability under the compliance mechanism.

The sustainable development criteria are essentially qualitative and its **measurement** is quite unique from the other assessment. Seroa de Motta and colleagues (2000) have laid down an assessment to measure the sustainability impact of various CDM projects thereby evaluating it subjectively. The impacts are ranked as negative (-), neutral, positive (+) and very positive (++).

Sustainable development plays an important part when climate measures along with environment, development and equity considerations are combined. The concept is purely

qualitative and chooses between various combinations of environment and development policies. However, there is a conflict between a Clean Development Mechanism's project cost effectiveness (emission reduction at the lowest possible cost) and its impact on sustainable development. The projects that require high carbon price to be profitable generally rank higher in terms of sustainability criteria than do projects that require a low carbon price. This kind of inherent conflict in CDM may increase the price of CDM credits and thus result in a more limited market. If sustainable development objective is not given due priority, the intention of CDM may well be undermined and post 2012 CDM will call for a second thought to the developing countries.

4.3. Sustainable development in developing countries

One of the primary objectives of the CDM is to encourage the sustainable development of non-Annex I Parties through the improvement of capacity building and technology transfers (UNFCCC). The assurance of the continuing acceptance of the CDM among developing countries is essential. The mechanism explicitly states the criterion of sustainable development is important especially from the developing country perspective. Most of the developing countries are poverty stricken and are of the view that their condition have been due to the colonial exploitation and suppression for a long time. Alleviation of poverty and ensuring the availability of basic needs to their population are currently the main focus of their development process.

CDM can contribute to a developing country's sustainable development objectives through:

- Transfer of technology and financial resources;
- Sustainable ways of energy production;
- Increasing energy efficiency and conservation
- Poverty alleviation through income and employment generation;
- Local environmental side benefits.

Though there is no mention anywhere in Article 12 as to how CDM should foster sustainable development, but most developing countries envision that more and more

flow of resources and technologies in to the developing countries from the Annex I countries should be promoted. CDM, too many countries are expected to deliver private investment and thus sustain economic growth as the main key to sustainable development.

Even among the developing countries, there is a wide difference of opinion regarding the sustainability as an objective to CDM. While all developing countries hold a common position that its function is first and foremost to promote the Sustainable Development, there are some developing countries (particularly the African countries) that are more concerned to protect their interests and concentrate on projects that rehabilitate them. (Dakkar, 1998.).

Several developing countries are presently taking up CDM projects to foster sustainable development in its own area. There are some to mention:

The International Small Group and Tree Planting Program (TIST) empowers groups of subsistence farmers in Tanzania to restore local deforested area and to adopt sustainable agricultural practices such that it responds to the elimination of famine, reducing poverty and develop stronger local economies.

The **Forestry Development Projects** in Ecuador also aims at reduction of poverty and fostering of sustainable development thereby enhancing the growth of forested land. Also, the carbon sequestration project of the Jatun Sacha Foundation at Bilsa Biological Station, Ecuador is regarded as the first climate-forest project ever designed.

Installation of pico-hydro systems in far flung rural areas in Philippines aim at providing lighting to the village centers and to provide simple tools for livelihood activities. Also, **installation of solar powered systems** in remote rural areas in Philippines, promote poverty alleviation thereby providing lighting to the village centre, power for the village school, the village health centre and agricultural machinery.

The combined heat and power plant at Cape Timber Resources (CTR) in South Africa enables the utilization of biomass for electricity and heat generation which in turn aims sustainability to the community.

China, being the number one project holder in Clean Development Mechanism, adopted a sustainable strategy according to the 10^{th} Five-Year-Plan (2001-2005). These enable:

- Adherence to the basic state policy of family planning.
- Protecting natural resources and using them properly
- Improving ecological conservation and strengthening environmental protection.

The present CDM projects though have the aim of collecting high carbon revenue in China, but the projects also earn social benefits of creation of new jobs, awareness raising for environmental challenges at local level and improving household living standards. In china, the CDM assists in achieving sustainable development by absorbing additional financial resources and promoting technology transfer. It aims at an increase in foreign investment (via CDM deal inflows to China) up to $475 million annually in 2010, an higher rate of efficiency improvement in the energy end-use and electricity generation sectors resulting in greater resource productivity is also estimated. Besides, the objective of local economic development by promoting technology localization, increasing local tax revenue, creating new (skilled) jobs, building local capacity and resource efficiency are all set to hit the sustainable development scenario in China as a CDM benefit to the country (Ministry of Science and Technology, P.R. China, 2005).

Actually, the inclusion of a provision to foster sustainable development in Clean Development Mechanism was a clever political move (Agus P. Sari & Stephen Meyers; LBNL-43418; p-11). It was argued that the inclusion of sustainability factor is basically made to make the mechanism differ from Joint Implementation which is its greatest competitor. Since, it is still considered that development and sustainability cannot go side by side; CDM is the only mechanism that assures the full play of both of them.

Sustainability is the overall objective of all the development whether in the least developed, middle income or developed countries (Knud Vilby, 2005). However, despite of good prospects for investments and technology transfers to the least developed countries, it often cant materialize since it happens at the cost of contributions to sustainable development.

4.3.1. Brazil and sustainable development as an objective in CDM

Brazil, a Latin American country is regarded as a non-Annex I country to the Kyoto Protocol. Hence, the country is not included under the GHG mitigation and is not entitled

to meet up the Kyoto Target fixed up by the Clean Development Mechanism. The country is left out to look after its social problems and to carry out CDM projects as host countries and to attain the objective of sustainable development as was laid down in CDM. Brazil assess the type and magnitude of non GHG benefits associated with the CDM projects that include environmental such as cleaner air and water, reduced deforestation, soil conservation, biodiversity protection and social benefits such as rural development, employment and creation and poverty alleviation.

In Brazil, a large fraction of existing power is provided by hydroelectricity. However, the future energy use will increasingly rely on fossil fuels, particularly fuel oil and natural gas, as potential hydroelectric sites are fully utilized, especially in Center- West, Southeast and South regions, close to large urban centers, and the oil prices remain low. These can give rise to increased GHG emissions. The persistent deforestation is regarded as a major environmental issue, leading locally to soil degradation, deterioration in water quality and availability, enhanced risk of natural disasters such as floods and landslides, biodiversity loss and conflict with traditional forest-dependent communities. In Brazil, the silviculture plantations and sustainable logging practices are taken up that provides low cost carbon abatement. Moreover, the scale of Brazil's forest reserves reflects in an estimate that up to 1 billion tons of carbon could be abated by enabling reduced impact logging in Amazon to displace the illegal frontier logging. To meet up these typical developing country problems, Brazil is taking up actions. In Brazil, "Brasil em Acao" ('Brazil in Action') – one of many development programs – directs investments towards social, regional and development aims including improvements to health, sanitation, irrigation, transport links and energy distribution. Here, the projects aim to improve health care, irrigation, sanitation, and transport and energy distribution. The construction of pipelines across the Amazon, building up of hydro ways and undertaking irrigation programs for semi arid areas of Northeast Brazil are some of the projects. In some cases this has had to confront and be sensitive to potential environmental problems. A waterway project (the Parana Waterway) that had been intended to cross 3 million hectares of wetlands in Central Brazil was cancelled for ecological reasons.

The sustainable development benefits in Brazil include reductions in air and water pollution through reduced fossil fuel use, especially coal, improving water availability,

reducing soil erosion and protecting bio diversity. Regarding social benefits, many projects, if properly taken up, would create employment opportunities in target regions or income groups, and promote local energy self sufficiency.

Brazil has some of the most advanced environmental legislation that forbids mahogany exploitation, animal trafficking; bio-pirating etc. to combat the growing problem of deforestation in Brazil, the government has taken up the project for **Gross Deforestation Assessment in the Brazilian Legal Amazon Region (PRODES)** - the largest forest monitoring project in the world providing updated estimates of deforestation.

In the energy sector, Brazil has also the concern to keep its pattern of sustainable production of energy. **The National Ethanol Program (PROALCOOL)** is intended to provide an alternative clean fuel for vehicle use is taken up to foster renewable sources of energy is a good example of sustainability. The cogeneration within the industrial sector also aims at fostering sustainable development. Moreover, the use of biomass for thermoelectricity is been set up by the government aiming sustainable development in the energy sector of Brazil.

The reorganization of the energy sector of Brazil completed in 2004. According to the legislation passed, new generation of projects can only be bid in the country, which has environmental licenses. Moreover, electric energy generation is being considered essential to social inclusion and economic development, as well as for the improvement of the quality of life. The **Program of Incentive to Alternative Sources of Electric Energy (Programa de Incentivo as Fontes Alternativas de Energia Electra- Proinfa)** established 63 small hydroelectric power plants, 54 wind parks and 20 thermal units for energy generation through biomass. **The National Program for Production and Use of Bio diesel (Programa Nacional de Producao e Uso do Bio diesel)** has been undertaken which enables the use of palm and castor bean, as well as soybean to use as raw materials for the production of Bio diesel.

To accelerate the growth of the existing hydro electric stations, **Eletrobras' "Decennial Plan for Power Generation, 1997-2006"** envisages a continued focus on hydroelectricity, proposing a further 26GW of hydropower capacity over the next decade compared with 7.6GW of fossil fuel plants (La Rovere, 1998).

The projects in Brazil can thus be analyzed both in terms of climate abatement and also sustainable development. Following the study of Seroa de Motta and colleagues, the benefits other than GHG mitigation (i.e., developmental benefits) can well be assessed.

Table 4.1: Non- carbon effects of energy options in Brazil.

	Environmental Impacts	Development Impacts	Social Impacts
Chemical cogeneration of electricity	**Positive** Medium	**Positive** Low	**Positive** Low
Plantations	Negative Low	**Positive** Low	**Positive** Low
Biomass electricity	Negative Low	**Positive** Medium	**Positive** Low
Sustainable forest management	**Positive** High	**Positive** Medium	**Positive** Medium
Wind energy	**Positive** High	**Positive** Low	**Positive** Low
Ethanol with electricity cogeneration	Negative Low	**Positive** High	**Positive** Low

Source: *Hans H. Kolshus Cicerone 3/2001.*

Thus, it is seen that Brazil is fully into CDM activities and is aware of the political and technical issues of the objectives stated by the CDM. A high potential for CDM does exist in various sectors of the Brazilian economy and though little is been thought about the sustainability of the projects but it is also true that the maximum input is given to this question of sustainability. Such expertise is held by a relatively small group of governmental and university officials, with high level decision makers, both at the governmental and private sectors, more domestic and international participation is however largely needed.

4.3.2. India and sustainable development in CDM

India, being a non-Annex I country, the basic objective for the CDM in India is to attain sustainable development. As regards India's current position in Clean Development Mechanism's projects, Indian government lays emphasis in the effective management of all the available resources to achieve the national objective of development. Balanced

fuel mix is the key to a sound sustainable development. Proper utilization of energy resources particularly renewable energy resources are thus looked upon as a probable solution. The government of India plays a prominent role in fostering renewable resources in Indian energy matrix. As per the draft of Renewable Energy Policy, the major areas of CDM application in India are:

- Minimum rural energy needs,
- Decentralized energy supply for agriculture, industry, commercial and household sectors in rural and urban areas,
- Grid quality power generation and supply.

India envisions a consumption of about five million solar lanterns; electrification of at least 18,000 villages through the use of renewable; the use of solar water heating system in about one million households by the year 2012. Besides, as regards the estimates, the renewable energy sources in India are perceived to mitigate 154 MTCO2 till 2012 (TERI, 2005)

The development of Renewable Energy in India aims at technological and market expansion. The various renewable energy based projects taken up by India to meet the sustainable requirement are:

- The use of SPV lighting systems in rural India and grid connected wind electric generators that have the same performance level as of the present ones.
- The application of advanced biomass power generation systems, SPV for peak shaving applications, and fuel cells.

All these plan the entrance of private sector investment and in turn, the government plans to convert these projects into 'unilateral CDM projects' so as to offer the resultant CERs for sale in the carbon trading markets.

The priority areas for Clean Development Mechanism projects in India to foster sustainable development criteria are:

- Wind Power
  - MW size wind power systems.
  - Wind machines for low wind regimes
  - Better designed rotor blades, gear boxes and control systems.

- Biomass Power
  - Advanced biomass gasification technologies.
  - MW size biomass combustion systems.
  - High pressure co-generation systems.

- Small Hydro Power
  - Low head power generation systems.
  - High efficiency systems.
  - Portable hydro sets.

- Village Electrification
  - Advanced hybrid systems.
  - Island electrification.
  - Innovative technology packages.

- Energy Recovery from Wastes
  - High rate bio- methanation systems.
  - Incineration.
  - Sanitary landfills.

- Solar thermal Systems for Energy Applications.
- Solar Thermal Power Generation.
- Alternate Material Solar PV cells.
- Electric Vehicles.

Ocean Energy Technologies (Wise, 2005)

This ongoing momentum of renewable energy development in India with resource availability thus ensures the advantage of sustainable development. These renewable energy sources are an alternative to the conventional sources. So, it helps meeting the basic energy needs of the rural population at a cost effective manner thereby increasing the requirement of power associated with high energy growth. The Indian government

envisages the use of renewable energy sources and promises to meet up the energy demand of the population by these alternatives within 2050. There are projects taken up by the government and other organizations to enhance sustainable development in various states in India.

The promotion of bio fuel projects in the remote villages in India (particularly in Chattisgarh) addresses issues relating to energy security, poverty reduction, environmental concerns, livelihood issues and the overall quality of life of those who inhabit remote villages to which the conventional grid cannot be extended.

The three year project of **mitigation of Greenhouse Gas and other harmful engine emissions and local pollutants from the transportation sector in five Indian cities** (Mumbai, New Delhi, Kolkata, Bangalore and Chennai) aim at a healthy transport sector. The implementers, stakeholders, key government departments, transport sector, the automobile industry and the fuel research institutes work together to achieve this aim.

The information sharing system to enhance coping capacities of farming communities in dealing with climate variability and climate change particularly in the agricultural sectors also aim at attaining sustainability to the economy thereby reducing the risk in the sector.

The project dealing with **analysis and evaluation of CDM prospects for coal bed methane** in India aims to secure additional funding for capital intensive projects.

The project of **energy pooling in the industrial sector** enables the feasibility of the utilization of waste heat from one industrial unit to provide the thermal energy needs of the neighboring unit. It aims in energy conservation and improving local environment thereby attaining the goal of sustainable development.

The **displacement of diesel based captive generation** aiming at understanding of key legal, financial, economic issues related to the efficiency or inefficiency of captive units attain the sustainable development in transport and industrial sector.

The project exploring **opportunities for technology transfer to the developing countries for mitigation of climate change** explores alternative options of transferring technologies to the developing countries under UNFCCC other than that is provided in the CDM also enhance the sustainability criteria promised by CDM.

All these and much more projects in India are now gaining momentum to attain sustainability options. India, being a developing nation, is now much more concerned with the question of sustainable development in order to match up the future needs of the population. The government and also other private entities in India are now heading towards such objectives.

4.4. The role of Private Sector in Clean Development Mechanism

The Clean Development Mechanism is a market based mechanism created by Kyoto Protocol that aims at performing developmental projects in the developing countries by the industrialized countries in lieu of lower emissions of Greenhouse gases. Article 12.9 of the Kyoto Protocol states that acquisition of Certified Emission Reduction may involve private and public entities. Being a market based instrument, the CDM are subjected to the same economic influences as shares and other investments. Financers will naturally move into the most competitively priced markets, offering minimal investment risks and reduced entry barriers.

The private sector can help ensure an emphasis on efficiency and the development of clear and simple rules. Including the participation of the private sector in the institutional building process encourages a less bureaucratic and more result-oriented approach in the procedure. The private sector is essential for driving the CDM, as investors seek cost efficient means of mitigating their emissions.

The private sector was expected to dominate the investment structure in the mechanism since the technology rests in the hands of the private sector. However, it is observed, that in the case of the developing countries in which the private sector is strong are not poor and they have much better institutional infrastructure to deal with the Foreign Direct Investment (FDI). In the poorest countries, the private sector is seen weaker.

The United Nations Conference on Trade and Development (UNCTAD) estimates that if the CDM captures 35percent of the market from greenhouse gases, there is a potential for $18 billion per year. It is been argued that the investment generally comes from the north[3].

[3] Ibid.

The Clean Development Mechanism is the first attempt to address a universal problem using a global market. The CDM was designed with the perception that the marginal cost of emissions reductions in developing countries would be less than for developed ones[4]. The Clean Development Mechanism has various actors associated with its project scenario. Active support from all sectors of the society (civil, NGOs, private and public sector) and different sectors of the economy (industry, energy, agriculture, forestry) build up a sound CDM project. Even among these, the private sector approach has gained momentum.

The private sector can help ensure an emphasis on efficiency and the development of clear and simple rules, including the participation of the private sector in the institution building process encouraging a less bureaucratic and more result oriented approach in the procedure. The private sector is essential for driving the Clean Development Mechanism thereby helping the investors seeking cost- efficient means of mitigating their emissions.

The Non- governmental organizations (NGOs) also play an important role in the development and implementation of the CDM strategy, thereby bringing the environmental and social focus to the institutional agenda. They provide valuable scientific expertise and technical know-how in the development and evaluation of the projects.

The United Nations Development Program (UNDP), along with the World Business Council for Sustainable Development (WBCSD), aims to engage the private sector and facilitate the private sector investment in the potential Clean Development Mechanism. The projects aim to:

- Engage and build capacity and capability within the private sector, and between the private sector and the government, to formulate, shape and implement CDM projects.
- Help informing the rules of the CDM and the operational procedures, so as to attract private sector investment.

[4] Michael A. Toman, Richard D. Morganstern & John Anderson, *The Economics of Flexibility in the Design of Greenhouse Gas Abatement Policies,* resources for the Future Discussion Paper 99-38-REV, 2-3, (1999).

It is considered important to regulate the growth of market and private sector participation in CDM since it can be detrimental to the technological innovation in developed countries, as they become dependent on offshore credit to meet their domestic abatement needs.

4.4.1. Private sector influence in Brazilian perspective to the Clean Development Mechanism

In Brazil, several proposals by the private sector and other segments of society are being considered by the Brazilian government, with a view of promoting a national "fast track" by the certification of greenhouse gas emission reductions. For that to happen it is necessary to create national certification instruments.

In Brazil, to enhance a fast track growth of the CDM, the government are involving the private sector who inturn, are putting up proposals for the promotion of economic and social development by the creation of a special fund to buy and keep a portfolio of emission reduction certificates (CER) issued in projects developed in the country. Here comes the role of the institutions which aim in financing projects that somehow reduce greenhouse gas emissions, paying an small amount (from US$ 1 to US$ 10) per ton of carbon. This institution would keep the CERs for future and would offer them for sale abroad, either directly to clients or by means of auctions, making the prices to increase. That is what is expected to happen as of 2001 when the CDM is completely operational at the international level. This role of the financial institution is maintained even if the projects may not happen to be in accordance with the EB.

Companies that pursue energy efficiency and greenhouse gas mitigation projects tend to reduce their cost of production thereby offering a tough competition to other firms.. The CDM offers these companies an opportunity to attract outside investment, which may help to reduce the financial barriers of project implementation. Long term measures that the Brazilian government has taken to address barriers to project implementation include the following:

- Adjust energy prices to reflect true environmental costs;
- Develop the infrastructure for recovery of non used products, e.g. aluminum beverage can scrap;
- Facilitate coordination among industry to identify and exchange valuable by-products;
- Adoption of technological knowledge to enforce low cost and maximum productivity and low carbon distributed generation, e.g. providing incentives to shift from steel production at integrated mills to electric arc furnaces;
- Investigate the use of sectoral policies as CDM projects under the framework of the Kyoto Protocol;
- Continue outreach efforts to inform industry of the opportunities of participating in the CDM and, more broadly, the climate change debate (Haroldo Machado Filho, 1999).

Brazil attaches a high importance to the Clean Development Mechanism. The CDM, according to Brazil performs a varied number of functions including the GHG mitigation. It contributes to the fulfillment of the of the ultimate objective of the Convention; it, as a flexible mechanism supports the interest of the Annex I countries commitments; the mitigation efforts promised by it is economically otherwise; it involves governments, civil societies and business community and; it also allows the population of the developing countries to meet their legitimate aspirations of raising their living standards in ways that are compatible with sustainable development.

4.4.2. Private sector participation of India's CDM.

A number of private sector companies and associations are engaged in the Clean Development Mechanism in India. The first big industries to be associated with the mechanism were the Confederation of Indian Industries (CII), the Associated Chambers of Commerce and Industry of India (ASSOCHAM) and the Federation of Indian Chamber of Commerce and Industry (FICCI). They organized workshops to inform their members about CDM and the business. Then, there were also a number of

consultancies that had been involved in climate policy related donor programmes. They are subsidiaries of multinational companies like the PriceWaterhouseCoopers (PWC), Winrock International India (WII), Louis&Berger (L&B), Ernst&Young (E&Y) and also some small industries. The Indian NGOs like The Energy and Resource Institute (TERI) and Development Alternatives (DA) played a major role in fostering growth to the Indian participation in CDM activities. Besides, the financial institution like the Infrastructure Development Financing Company (IDFC) played a major role in negotiating bankable projects to India. Today, a large number of private companies are associated with the project implementation of Clean Development Mechanism.

Considerable researches have been made about the concept of sustainable development since the launching of the term in 1987. However, the sustainable development assured by the Clean Development Mechanism is still way to go. There are a few governments, which adhere to the old nostrum of "grow now and clean up later", which might have slowed down the process, but not that a complete ignorance about the topic prevails. The developing countries are doing particularly, India and Brazil, as best as they could to achieve sustainability within the preview of CDM which is a market mechanism. The private sector in this field is also participating to achieve the goal. The private sector though is still concentrating on the mitigation of GHGs and profit in the carbon market, still there are things been done. It's just that there are ways to go and mileage to be achieved only if proper pace and velocity is maintained.

Chapter 5

Conclusion

Conclusion

Clean Development Mechanism is a compliance mechanism of the Kyoto Protocol (Article 12), a specific agreement under the United Nations Framework Convention on Climate change, that serves both as a mitigating agent for Greenhouse gases in the Annex I country to let it meet up the Kyoto target of emission reduction within a specific period (2008-2012) and also serves as a means to attain sustainable development in the developing (non Annex I) country with the aid of cleaner technology used in the project by the industrialized (in this case, the Annex I) country. The mechanism involves projects in various sectors and undergoes a rigorous process of formulation, validation, registration, and certification and so on. There are separate entities appointed to look after the task of each process.

The origin of the Clean Development Mechanism suffered enough revisions. It was taken as a political document aimed to satisfy the developing countries especially by the United States which refused to ratify the Kyoto Protocol on the ground that emission reduction targets should be made universal and exempting China and India from it would mean its failure as globally beneficial. The CDM, with its project activities were however criticized on the ground that at the end of the day, offering sustainable development benefits to the developing countries can be real tough since the definition of sustainability was not properly put forth by the Article 12 of the Kyoto Protocol that actually defined CDM. The reality was however a little different and though undergoing a number of projects in the mechanism, the CDM is still not taken as a dependable means to dish up the welfare of the developing countries since they complain the mechanism to be serving the interest of the industrialized countries. The developed countries are charged to be taking up the CDM projects in the developing countries where the cost of production is

much less and thus, they are actually seen to be polluting the host country's environment. The projects which form the main topic of discussion, are also seen to be more oriented to the mitigation of harmful greenhouse gases rather than renewable and energy efficiency projects which can serve a base for technology transfer and other developmental needs of the developing countries.

In the third chapter, that aims to find the position and comparison of India and Brazil with regard to the CDM projects, it is seen that both the countries are now taking up unilateral projects that doesn't involve any industrialized country. All the project formalities and even the project itself are carried out by one country, essentially the host country and the resultant carbon reduction unit is sold in the market. So, this single player projects are simple and devoid of the politics that was charged against the industrialized countries. It also came out that both Brazil and India which started off so well initially (especially Brazil), gradually is loosing its position, since they are more concentrated in energy efficiency and renewable projects and not carbon and harmful chemical reduction projects that earn high carbon emission units in the market. The payment from carbon involves high credit rates that come up with earning strong currencies that are seem to be not so common in capital constrained countries like India and Brazil.

In the fourth chapter, the objective of CDM (one of which is essentially sustainable development) that attracted the maximum attention of the developing countries was clearly dealt with. In this regard, it is observed that even lots are been done, still there are much left to attain the objective of sustainability by the developing countries. The countries are more concerned to overcome their own problem and listing up their problem as that of sustainable development criteria which hampers the universal appeal of sustainability. Even, the developed countries become confused as to what the term sustainability actually refers to, since there is no clear cut definition about this topic. Also, though much was promised by the Clean Development Mechanism as regards the sustainable development, the developing countries still suffer from the problems of poverty, unemployment, poor living infrastructure. The Indian and the Brazilian national poverty rate is still 29 and 22 respectively. Also, the projects are not so uniformly distributed with in the country as incase of India, very little projects are being taken up in the eastern and southern parts of the country and more inclination of the projects are in

the northern and western parts of the country. As regards the private sector interference in the CDM, the countries are coming up with several MNCs, NGOs and other private sectors. This is no doubt a good omen, but, the main interests of this sector are still on the high priced carbon earning rather than developmental needs. It is very natural on their part that they remain as a profit motive organization.

The Clean Development Mechanism is an important element of the current Kyoto Protocol structure, with significant potential for the future only if proper care is taken of. It can contribute significantly and efficiently in achieving the emission reduction and avoidance that are required which will ultimately accomplish the ultimate objective of the UNFCCC. In order to work effectively, the CDM requires immediate changes related to governance, market functioning and project scope, along the lines of the recommendations put forward in this report. To build a CDM bridge to the future, and avoid its collapse in the near term, modifications should be made in the short term in the context of a strategic perspective with clearly defined objectives. It is critical that such changes be significant enough to create continuity, the perception of continuity and to restore confidence in the UNFCCC's ability to implement the mechanism. The mechanism faces several problems

Problems faced by the Clean Development Mechanism.

The CDM funds certified emissions reductions once they are actually realized. This can be 5 years or even up to 20 years after the start of the project. While, the project needs quick investment for its set up. CDM cannot offer this money. So there should be a provision targeted subsidy levels and funding for training.

There is also the problem of considerable monitoring costs and the uncertainties surrounding the post 2012 mechanisms.

Also, additional sustainability benefits such as avoided fuel wood harvesting are not covered by CDM financing.

Some projects (e.g. Biogas) cannot qualify or break even due to rigid accounting methodology, high administrative and monitoring costs, delayed payments and bundling rules.

The free-trade mechanism of the CDM is also criticized on the ground that it leads to further dependency rather than technology transfer. It is also seen that since, the emissions are treated as commodities and they are been bought and sold in the market, the structural inequality of commodity trading between the North (mostly Industrialized countries) and the South (mostly developing countries) are still perceived. Moreover, the investments in "carbon sinks" (such as large-scale tree plantations) in the South would result in land being used at the expense of local people, accelerate deforestation, deplete water resources and increase poverty. Entitling the North to buy cheap emission credits from the South, through projects of an often exploitative nature, constitutes "carbon colonialism"(Corporate Europe Observatory, 2001). Furthermore, as the *Corporate Europe Observatory* points out, the trade in emissions resulting in carbon credits would lead to "unequal property rights to the atmosphere" which in turn "would consolidate the historic overuse by Northern industry at the expense of the South (80% of all CO2 emitted since 1850 has come from the North). A market without clearly defined property rights can never function and the unfair property rights that underlie the currently proposed emissions markets will eventually be rejected by those losing out"(Corporate Europe Observatory, 2001).

Future Possibilities for CDM

CDM, with the above mentioned loophole stands at a verge where its existence is to be questioned (Michel Wara, 2006). In order to keep the mechanism in run even after the completion of its first commitment period of 2012, the mechanism needs to be reformed and improvement in certain sections need to be made.

- Without recognizing and listing all the six greenhouse gases in the mitigation list under CDM, any future climate regime, any future treaty or treaties can be set up that should address each gas separately. This way, the current CDM is rested with

abatement of one particular GHG and thus the inefficiencies can be recognized, if any.

- The price for carbon is fixed up in the carbon market under the CDM. However, it is seen that the other GHGs can be abated at a very low cost and at a relatively a small number of facilities. So, in order to restrain from inequality of abatement scenario where the developed country can charge that "they are subsidizing their abatement at a price far in excess of cost" (Wara, 2006), a global GHG market should be ensured which includes price for not only carbon, but for other greenhouse gases too.
- Large scale power projects which are mostly absent are to be taken up to ensure uniformity in the distribution of projects.
- Climate change is a long-term problem that requires long term solutions. Lack of meaningful participation by the key global players in the most important climate change regime is making the effort slower. So, to attract the attention of the key players, like US, the mechanism must be properly revised on the light of perhaps the inclusion of nuclear energy. According to the Environmental Protection Agency, the nuclear power is space efficient (takes only 0.85 sq. km. of land as compared to 2,600 sq. km. of land by biomass generation) and the emission level is almost nil in case of nuclear energy.
- Innovative projects, mainly privately run, signal the growing importance of renewable resources in the Indian power mix. The inclusion of newer technologies can help achieve the goal of "power for all". More biomass powers are to be taken up since solar and wind experience technical obstacles very often.
- The overall regional development regarding the CDM should be ensured to avoid the inequality in the project cycle.
- Efficient and proper functioning of the management level is also needed. In this regard, a global supervisory committee should be set up that looks after the global positioning of the projects and proper formulation of the project activities with regard to the geographical positioning of each country can be taken up.

- More emphasis on the sustainable development projects must be given. Economic incentive to the private sectors and NGOs that take up sustainable development projects under this CDM should be given. Moreover, a clear definition of the term sustainability under CDM should be formulated that ensures its segregation from the general topic which, in turn, makes it more complex and longer.

Thus, more are been done to enhance the Clean Development Mechanism as both a mitigating mechanism and also as a developing mechanism. Still, in order to keep it safe even after 2012, a renovation should be made. This would ensure CDM not only as a Kyoto mechanism but also to have a separate identity of its own: an "umbrella mechanism" for the both the North and the South to check both the hazards of climate change and the enrichment of sustainable development.

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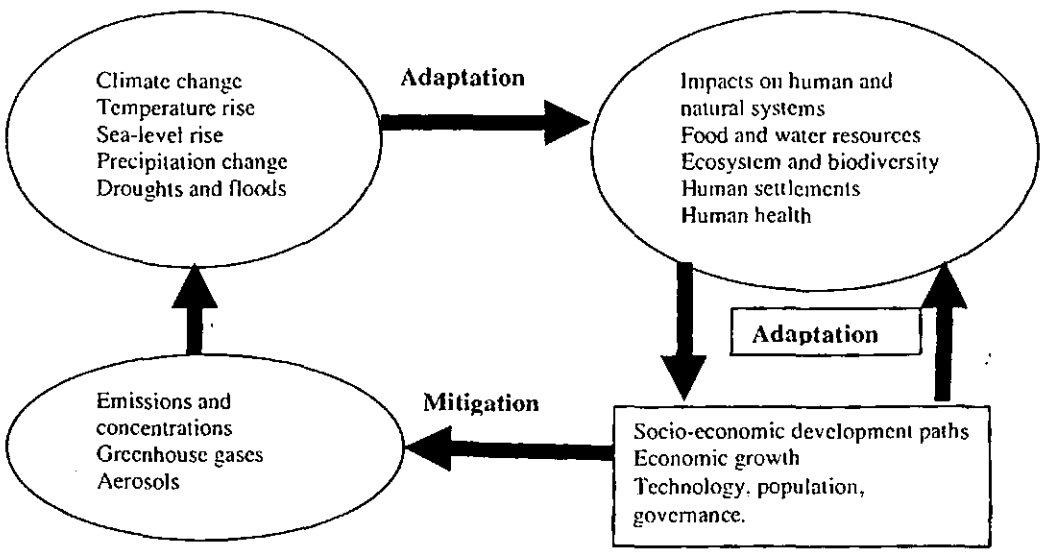
Appendix

Figure 1.1: Climate change: an integrated framework



Source: IPCC, (2001c)

Table 1.2: Global Average Temperature and atmospheric concentrations of Carbon dioxide: 1950 to 2002.

Year	Temperature in °C	Carbon dioxide (parts per million)	Emission from fossil fuel burning (million tonnes of carbon)
1950	13.87	-	1612
1955	13.88	-	2013
1960	14.01	316.8	2535
1965	13.9	319.9	3087
1970	14.02	325.5	3997
1975	13.94	331	4518
1980	14.16	338.5	5177
1985	14.03	345.7	5277
1990	14.37	354	5953
1995	14.37	360.9	6187
2000	14.31	369.4	6315
2001	14.46	370.9	6378
2002	14.52	372.9	6443

Source: Brown, L.R. Renner, M. Halweil, S. 2003. *Vital Signs 2003*

Table 1.3: Target Greenhouse Gas Emission Reduction by 2012, Kyoto.

Country	Kyoto Target (percent change from 1990 emissions)	Country	Kyoto Target (percent change from 1990 emissions
Australia	8	Monaco	-8
Bulgaria	-8	New Zealand	0
Canada	-6	Norway	+1
Croatia	-5	Poland	-6
Estonia	-8	Romania	-8
European Union	-8	Russian Federation	0
Hungary	-6	Slovakia	-8
Iceland	+10	Slovenia	-8
Japan	-6	Switzerland	-8
Latvia	-8	United States	-7
Liechtenstein	-8	Ukraine	0
Lithuania	-8		

Source: Marland, G., T. A. Boden, R.J.Andres, A.L.Brenkert, and C. Johnston. 1999.

Table 1.4: Status of Kyoto Ratification

Countries	Percentage contribution to the total CO2 emission in 1990	Status
USA	36.1	-
Russia	17.4	Ratified November 2004
Japan	8.5	Accepted June 2002
Germany	7.4	Ratified May 2002
United Kingdom	4.3	Ratified May 2002
Canada	3.3	Ratified December 2002
Italy	3.1	Ratified May 2002
Poland	3.0	Ratified December 2002

Source: Abbi, Y.P, December 11, 2006, workshop on Identification of CDM Projects in Power Sector in India, TERI.

Table 1.5: Annual average reductions in greenhouse gas emissions (tonnes of CO2 equivalent) by country

Country	Average annual reductions	Country	Average annual reductions
Argentina	1 765 007	Indonesia	416 351
Armenia	197 832	Israel	93 452
Bangladesh	169 259	Jamaica	52 540
Bhutan	524	Malaysia	1 682 653
Bolivia	82 680	Mexico	4 450 794
Brazil	14 643 869	Mongolia	11 904
Cambodia	51 620	Morocco	223 313
Chile	2 183 123	Nepal	93 883
China	36 883 481	Nicaragua	336 723
Colombia	98 847	Panama	60 343
Costa Rica	162 515	Papua New Guinea	278 904
Ecuador	284 291	Peru	199 265
Egypt	1 065 881	Philippines	152 684
El Salvador	360 268	Republic of Korea	11 085 301
Fiji	24 928	Republic of Moldova	47 343
Guatemala	142 245	South Africa	156 613
Honduras	205 251	Sri Lanka	104 130
India	11 522 372	Tunisia	369 664
		Viet Nam	681 306

Source: http://cdm.unfccc.in>t, last accessed on November 3, 2006.

Table 1.6: Countries listed in Annex I of the UNFCCC

Australia	**Greece**	**Romania**
Austria	**Hungary**	**Russia**
Belarus	**Iceland**	**Spain**
Belgium	**Ireland**	**Sweden**
Bulgaria	**Italy**	**Switzerland**
Canada	**Latvia**	**Turkey**
Czechoslovakia	**Lithuania**	**Ukraine**
Denmark	**Luxemburg**	**UK and North Ireland**
EU	**Netherlands**	**United States of America**
Estonia	**New Zealand**	**Japan**
Finland	**Norway**	**Germany**
France	**Poland**	**Portugal**

Table 1.7: Eligible non-Annex I countries

Antigua and Barbuda	El Salvador	Mali	Sri Lanka
Argentina	Equatorial Guinea	Ecuador	UR of Tanzania
Armenia	Fiji	Malta	Thailand
Azerbaijan	Gambia	Mauritius	Trinidad & Tobago
Bahamas	Georgia	Mexico	Tunisia
Bangladesh	Ghana	Micronesia	Turkmenistan
Barbados	Grenada	Mongolia	Tuvalu
Benin	Guatemala	Morocco	Uganda
Bhutan	Guinea	Nauru	Uruguay
Bolivia	Honduras	Nicaragua	Uzbekistan
Brazil	India	Palau	Vanuatu
Burundi	Jamaica	Panama	Viet Nam
Cambodia	Jordon	Papua New Guinea	Dominican Republic
Cameroon	Kazakhstan	Paraguay	Maldives
Chile	Kiribati	Peru	South Africa
China	Kyrgyzstan	Republic of Korea	Djibouti
Colombia	Lao PDR	Republic of Moldova	Malaysia
Costa Rica	Lesotho	Samoa	Solomon Islands
Cuba	Liberia	Senegal	
Cyprus	Malawi	Seychelles	

Figure 2.4: CDM project and methodology approval process.

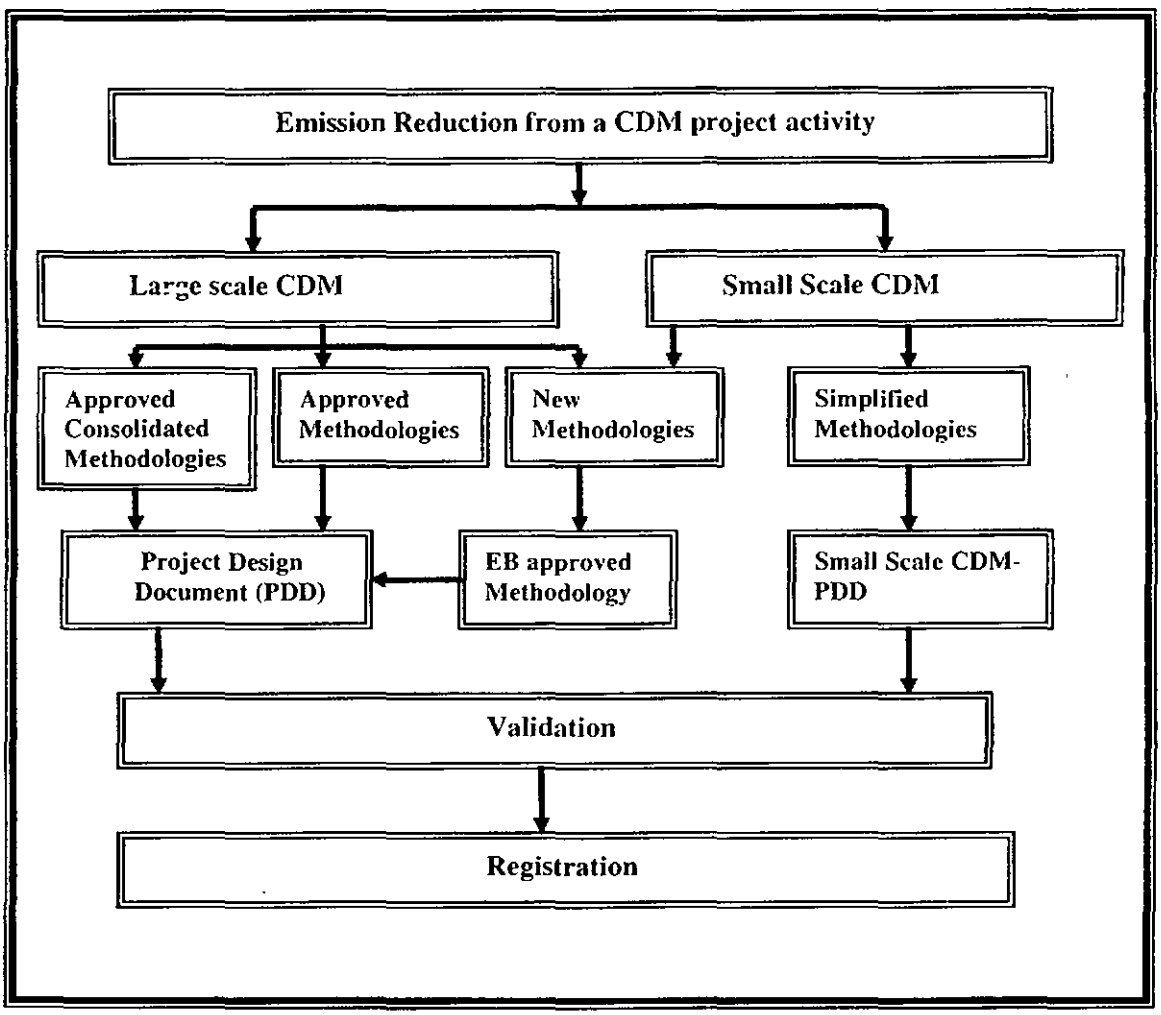
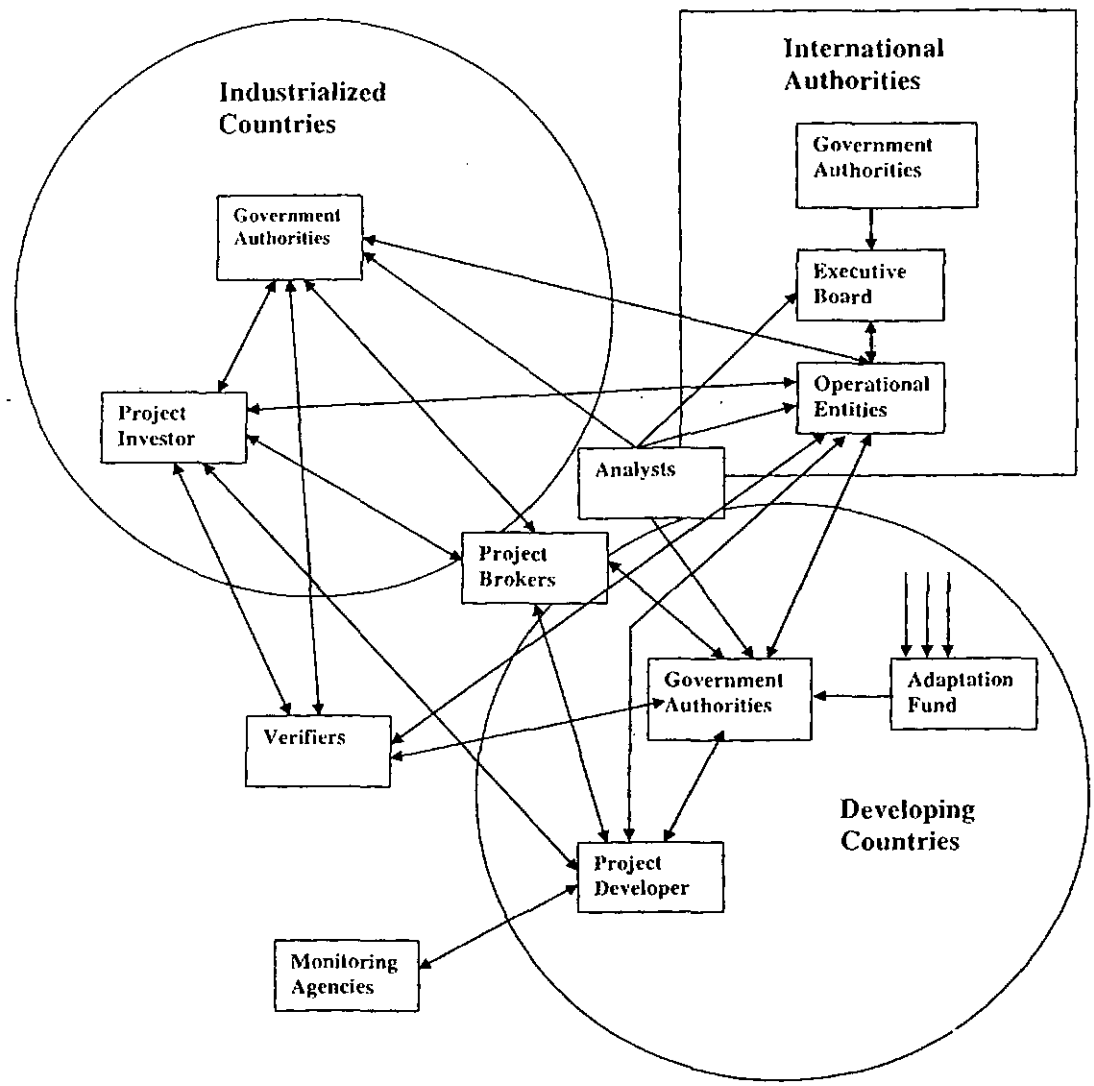
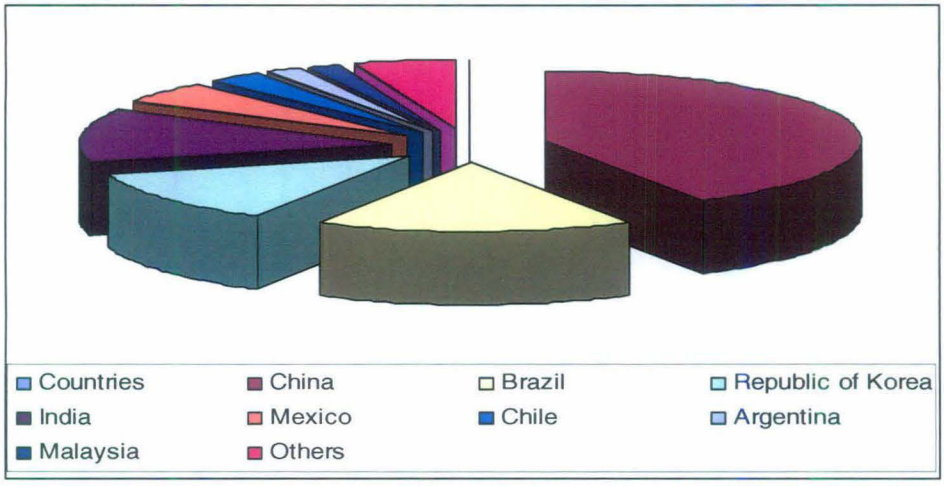


Figure 2.3: Interactions of the Players in the CDM



Source: TEDDY, 2005-06.

Figure 2.5: Expected average annual certified emission reductions from registered projects by the host party.



Source: http://cdm.unfccc.int., last accessed on 3 November, 2006.

Table 2.3: Example of CDM project sectors

Sector	Examples
Power	• Renewable energy (hydro, solar, wind, biomass gasification) • Fuel substitution • Clean coal technologies • Enhanced transmission and distribution
Energy Efficiency	• Retrofitting of commercial/ institutional buildings • Industrial process changes • Industrial process efficiency • High efficiency lighting equipment
Transportation	• Fuel switching • Improved vehicle efficiency • Public transit expansion • Biofuels
Oil and Gas	• Reduction of pipeline leakage
Municipal Solid Waste	• Landfill gas recovery and use
Agriculture	• Improved cultivation methods • Reduction of energy use • Improved manure management • Improved fertilizer use
Sinks	• Afforestation • Reforestation

Source: Resource Futures International & Confederation of Indian Industries, 2004. Source: Resource Futures International and Confederation of Indian Industries, 2004.

Table 3.1: The change of various social and demographic elements in Brazil (1900-2005)

Year	Population in million	Illiteracy level	Infant mortality in child/ thousand	Life expectancy in years	Per capita income in R$
1900	17.4	65.10%	162.4	33.6	516
2005	180	11.8	27.5	71.3	8000

Source: the ministry of Science and Technology of Brazil; 2006.

Figure3.1: Population Pattern of Brazil, 2000.

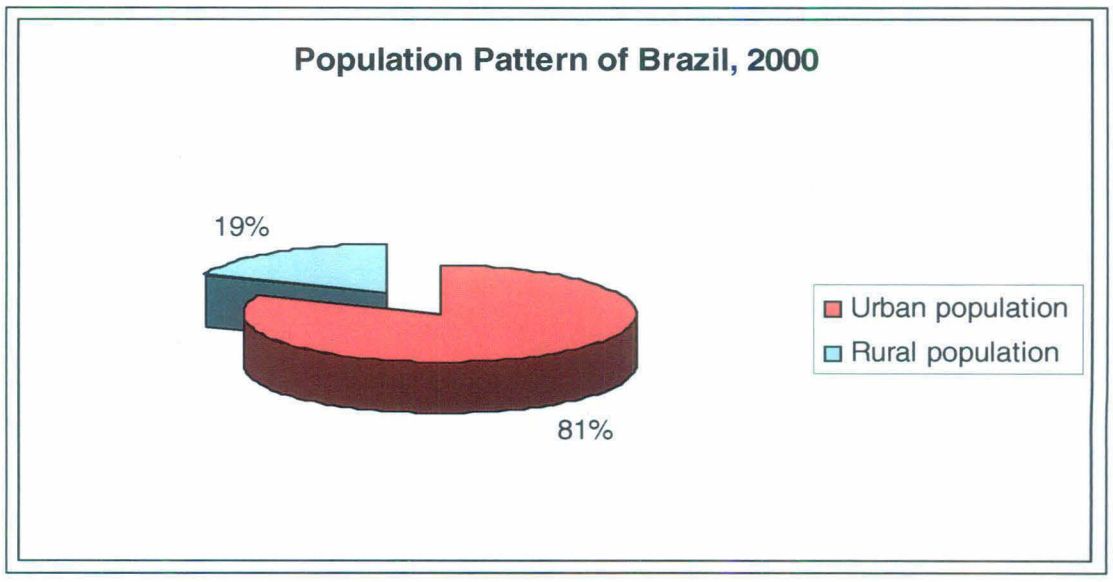


Table3.2: The percentage contribution of the agricultural sector to Brazilian GDP

Year	Contribution of agricultural sector to Brazilian GDP
1950	24%
1980	9%
2000	11%

Source: Centre for Clean Air Policy, 2006.

Table 3.3: Annual Energy Consumption in Brazil by source, 1990-2005.

	GN	Wood	Diesel	Fuel Oil	LPG	Street Gas	Charcoal	Kerosene Oil	Other Oil Products	Electricity
1990	0.13	4.9	5.07	14.32	14.86	1.26	2.34	0.04	0.17	151.03
1995	1.3	3.81	10.68	28.22	7.7	1.09	2.43	0	0.71	199.3
2000	3.18	3.14	7.75	24.62	24.54	0.88	2.64	0	0.88	276.09

Source: MME (2004) and IPCC (1996)

Table 3.4: Share of total annual CO2 emissions in Brazil, 1990- 2000,%

	GN	Wood	Diesel	Fuel Oil	LPG	Channeled Gas	Charcoal	Kerosene Oil	Other Oil Products	Electricity
1990	0.21	16.34	11.41	33.7	28.51	2.55	6.75	0.09	0.37	0.07
1995	1.69	9.7	18.36	50.68	11.28	1.69	5.33	0	1.21	0.07

Source: MME (2004) and IPCC (1996)

Table3.5: CO2 Emission from the transport sector in Brazil, 2005.

Mode	Fuel	Fuel Consumption (10^3toe)	Share of Total Annual Fuel Consumption (in %)	CO2 Emissions (MMTCO2)	Share of Total CO2 Annual Emissions. (in %)
Truck	Diesel	24,718	80.9	69.0	72.0
Bus	Diesel	1,829	5.98	5.10	5.32
Air plane	Jet Fuel	3,726	12.2	10.0	10.5
	Aviation Gasoline	115.2	0.38	0.30	0.31
Train	Diesel	21.8	0.07	1.45	1.51
	Electricity	5.60	0.02		0.00
Barge	Fuel Oil	45.2	0.15	3.15	3.28
Mass transit	Diesel	102.7	0.34	6.85	7.14
Total		30,564	100.00	95.87	100.00

Source: international developing country analysis and dialogue, 2006.

Table3.7: Project size and transaction cost in India.

Project size	Reduction (TCO2eq/year)	Transaction cost (USD/TCO2eq)
Very large	>200,000	0.1
Large	20,000-200,000	0.4-1.3
Small	2000-20,000	13
Mini	200-2,000	130
Micro	<200	1300

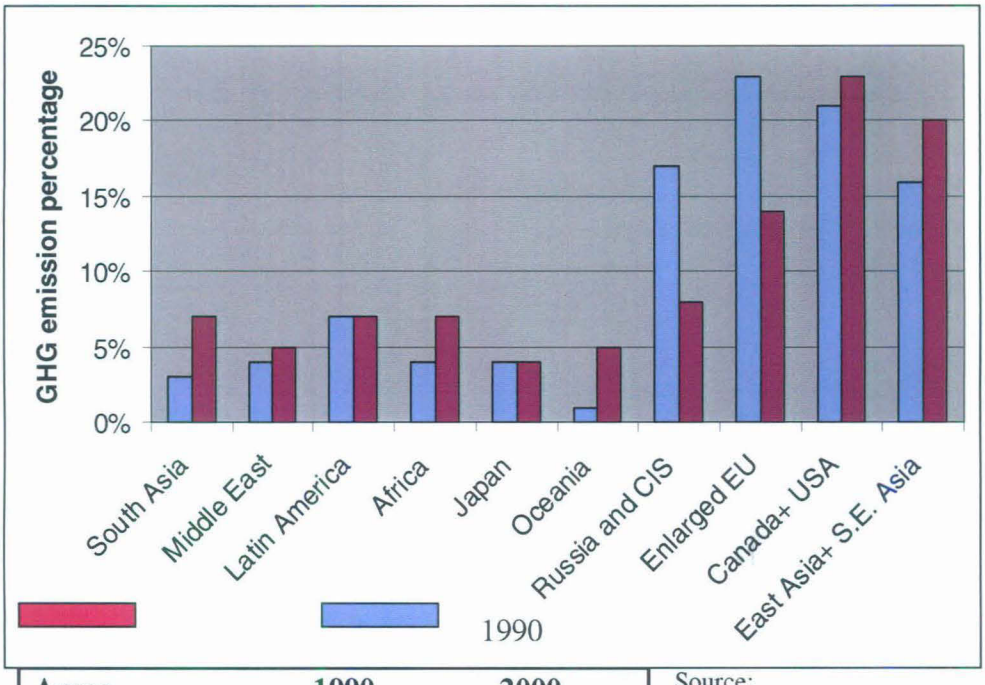
Source: Michaelowa and Jotzo, 2003.

Table3.8: Sectoral potential of greenhouse gas mitigation in India.

Sectors in India	Mitigation (MTCO2eqv)
Transport	41
Power generation	319
Renewables	154
Fossil fuel based	102
MSW to energy	63
Industries	57
N2O	10
Cement	5
Iron and Steel	14
Aluminium	3
Fertilizer	14
HFC23	12

Source: TERI & IGES, 2005.

Figure 1.5: Regionwise GHG emissions in 1990, 2000.



Areas	1990	2000
South Asia	3%	7%
Middle East	4%	5%
Latin America	7%	7%
Africa	4%	7%
Japan	4%	4%
Oceania	1%	5%
Russia and CIS	17%	8%
Enlarged EU	23%	14%
Canada+ USA	21%	23%
East Asia+ S.E. Asia	16%	20%

Source:
http://www.rivm.nl/edgar/model/ghg/index.jsp.