

# **CLEAN DEVELOPMENT MECHANISM (CDM) AND CARBON TRADING IN INDIA**

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## **CLEAN DEVELOPMENT MECHANISM**

### **GLOBAL WARMING- THE ISSUE**

The Earth has an atmosphere of the proper depth and chemical composition. About 30% of incoming energy from the sun is reflected back to space while the rest reaches the earth, resulting in warming the air, oceans, and land, and maintaining an average surface temperature of about 15 °C.

The chemical composition of the atmosphere is also responsible for nurturing life on our planet. Most of it is nitrogen (78%); about 21% is oxygen, which all animals need to survive; and only a small percentage (0.036%) is made up of carbon dioxide which plants require for photosynthesis.

The atmosphere carries out the critical function of maintaining life-sustaining conditions on Earth, in the following way: each day, energy from the sun is absorbed by the land, seas, mountains, etc. If all this energy were to be absorbed completely, the earth would gradually become hotter and hotter. But actually, the earth both absorbs and, simultaneously releases it in the form of infra red waves (which cannot be seen by our eyes but can be felt as heat, for example the heat that you can feel with your hands over a heated car engine). All this rising heat is not lost to space, but is partly absorbed by some gases present in very small (or trace) quantities in the atmosphere, called greenhouse gases (GHGs).

Greenhouse gases (for example, carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), water vapour), re-emit some of this heat to the earth's surface. If they did not perform this useful function, most of the heat energy would escape, leaving the earth cold (about -18 °C) and unfit to support life.

However, ever since the Industrial Revolution began about 150 years ago, man-made activities have added significant quantities of GHGs to the atmosphere. The atmospheric concentrations of carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), and nitrous oxide (N<sub>2</sub>O) have grown by about 31%, 151% and 17%, respectively, between 1750 and 2000 (Intergovernmental Panel on Climate Change, IPCC 2001).

As the GHGs are transparent to incoming solar radiation, but opaque to outgoing longwave radiation, an increase in the levels of GHGs could lead to greater warming, which, in turn, could have an impact on the world's climate, leading to the phenomenon known as climate change. Indeed, scientists have observed that over the 20th century, the mean global surface temperature increased by 0.6°C (IPCC 2001). They also observed that since 1860 (the year temperature began to be recorded systematically using a thermometer), the 1990's have been the warmest decade.

Important greenhouse gases are: carbon dioxide (CO<sub>2</sub>), methane (CH<sub>4</sub>), nitrous oxide (N<sub>2</sub>O), hydrofluorocarbons (HFC), perfluorocarbons (PFC), and sulfur hexafluoride (SF<sub>6</sub>). Water vapor is also an important greenhouse gas, but since humans do not generally have a direct affect on water vapor concentration in the atmosphere, it is not included in this paper. Because each greenhouse gas traps different amounts of heat and stays in the atmosphere for different

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lengths of time, studies use measures of global warming potential (GWP) to compare between gases. Carbon dioxide is used as the benchmark, so all other gases are measured in carbon dioxide equivalence (CO<sub>2</sub>e)<sup>2</sup>.

**Table 1:** The global warming potential of six major greenhouse gases

*(This measure takes into account the heat trapping abilities and the time the gas stays in the atmosphere (IPCC 2001a, 2001b))*

<u>Gas</u>	<u>Global Warming Potential</u>	<u>Atmospheric Life (years)</u>
CO <sub>2</sub>	1	5 to 200
CH <sub>4</sub>	21	12
N <sub>2</sub> O	310	114
HFC	140 to 11,700	1.4 to 260
PFC	6,500 to 9,200	10,000 to 50,000+
SF <sub>6</sub>	23,900	3200

#### NATURAL AND ANTHROPOGENIC CAUSES OF GLOBAL WARMING

Another IPCC publication states that there is a “very high confidence” that human activities have caused a net warming of the planet (IPCC 2007a).

#### KYOTO PROTOCOL

Presently, a variety of approaches are being implemented to reduce carbon emissions. These range from efforts by individuals and firms to reduce their climate footprints to initiatives at city, state, regional and global levels. Among these are the commitments of governments to reduce emissions through the 1992 United Nations Framework Convention on Climate Change (UNFCCC) and its 1997 Kyoto Protocol.

In 1992 famous Rio earth summit, United Nation Framework Convention on Climate Change (UNFCCC) was adopted with an objective to stabilize atmospheric concentration of GHG at levels that would prevent dangerous humane interference with climate system. The UNFCCC came into effect on 21<sup>st</sup> March, 1994 according to which industrialized countries shall have the main responsibility to mitigate climate change. Such countries are listed as Annex- I countries. Under UNFCCC all the member countries were to report on their national GHG emissions inventories and propose climate change mitigation strategies. After two and half years of intense negotiation between Annex-I countries, an agreement was struck at the now famous Kyoto protocol on 11 December 1997 in Kyoto, Japan. Born in the 1997 World Earth Summit held at Kyoto, Japan, this Protocol is making miracles in society today. The convention, participated by 160 countries of the world, was to negotiate binding limitations on greenhouse gases for the developed nations pursuant to the objective of the Framework Convention on Climate Change of 1992.

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<sup>2</sup> how much carbon dioxide it would take to cause the same amount of warming

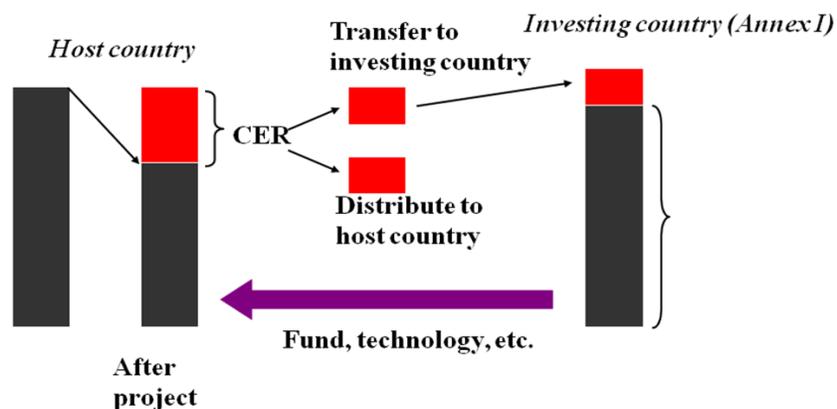
Under the Kyoto Protocol, emission caps were set for each Annex-I countries, amounting in total to an average reduction of 5.2% below the aggregate emission level in 1990. Each country has a predetermined target of emission reduction as compared to 1990 level. No emission cap is imposed on Non – Annex I countries. However, to encourage the participation of Non-Annex I in emission reduction process a mechanism known as Clean Development Mechanism (CDM) has been provided.

The carbon markets are a prominent part of the response to climate change and have an opportunity to demonstrate that they can be a credible and central tool for future climate mitigation.

The outcome was the Kyoto Protocol, in which the developed nations agreed to limit their greenhouse gas emissions, relative to the levels emitted in 1990 or pay a price to those that do. At this point comes the carbon trading.

### CARBON CREDITS

The primary purpose of the Protocol was to make developed countries pay for their ways with emissions while at the same time monetarily rewarding countries with good behaviour in this regard. Since developing countries can start with clean technologies, they will be rewarded by those stuck with ‘dirty’ ones. This system poises to become a big machine for partially transferring wealth from wealthy, industrialised countries to poor, undeveloped countries. A CER or carbon Credit is defined as the unit related to reduction of 1 tonne of CO<sub>2</sub> emission from the baseline of the project activity.



Let us say that India decided to invest in a new power station, and has decided on a particular technology at the cost of X crore. An entity from an industrialised country (which could even be a company) offers to provide India with slightly better technology, which costs more (say Y crore), but will result in lower emissions. The industrialised country will only pay the incremental cost of the project – viz. Y minus X. In return, the ‘investing’ country will get certified emission reductions’ (CERs), or credits, which it can use to meet its Kyoto commitments.

This is a very good deal indeed – but for the investing country. Not only do they sell developing countries their technology, but they also meet their Kyoto commitments without lifting a finger to reduce their domestic emissions. Countries like the US can continue to pollute at home, so long as it makes the reductions elsewhere.

The World Bank has built itself a role in this market as a referee, broker and macro-manager of international fund flows. The scheme has been entitled Clean Development Mechanism, or more commonly, Carbon Trading.

### **CDM PROJECT TYPES**

Carbon Credits are sold to entities in Annex-I countries, like power utilities, who have emission reduction targets to achieve & find it cheaper to buy 'offsetting' certificate rather than do a clean-up in their backyard.

Type of projects, which are being applied for CDM and which can be of valuable potential, are:

- **Energy efficiency projects**
    - Increasing building efficiency (Concept of Green Building/LEED Rating), eg. Technopolis Building Kolkata
    - Increasing commercial/industrial energy efficiency (Renovation & Modernization of old power plants)
    - Fuel switching from more carbon intensive fuels to less carbon intensive fuels; and
    - Also includes re-powering, upgrading instrumentation, controls, and/or equipment
  - **Transport**
    - Improvements in vehicle fuel efficiency by the introduction of new technologies
    - Changes in vehicles and/or fuel type, for example, switch to electric cars or fuel cell vehicles (CNG/Bio fuels)
    - Switch of transport mode, e.g. changing to less carbon intensive means of transport like trains (Metro in Delhi); and
    - Reducing the frequency of the transport activity
  - **Methane recovery**
    - Animal waste methane recovery & utilization
      - Installing an anaerobic digester & utilizing methane to produce energy
    - Coal mine methane recovery
      - Collection & utilization of fugitive methane from coal mining;
    - Capture of biogas
      - Landfill methane recovery and utilization
    - Capture & utilization of fugitive gas from gas pipelines;
    - Methane collection and utilization from sewage/industrial waste treatment facilities
  - **Industrial process changes**
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Any industrial process change resulting in the reduction of any category greenhouse gas emissions

- **Cogeneration**

Use of waste heat from electric generation, such as exhaust from gas turbines, for industrial purposes or heating (e.g. Distillery-Molasses/ bagasse)

- **Agricultural sector**

- Energy efficiency improvements or switching to less carbon intensive energy sources for water pumps (irrigation)
- Methane reductions in rice cultivation
- Reducing animal waste or using produced animal waste for energy generation (see also under methane recovery) and
- Any other changes in an agricultural practices resulting in reduction of any category of greenhouse gas emissions

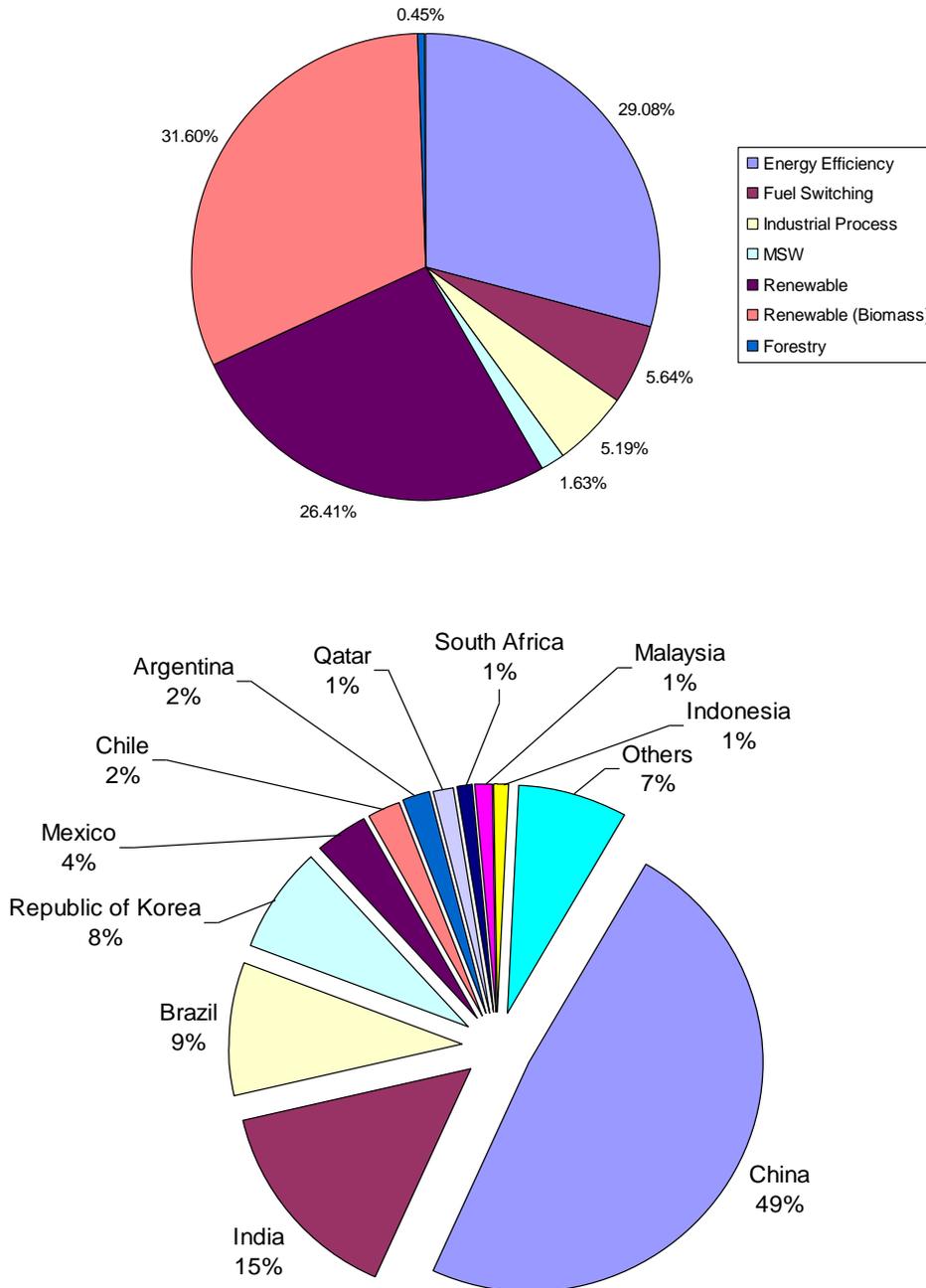
### **INDIAN SCENARIO- FAVOURING POINTS**

- a) India - high potential of carbon credits
- b) India can capture 10% of Global CDM market
- c) Annual revenue estimated range from US\$10 million to 330 million
- d) Wide spectrum of projects with different sizes
- e) Vast technical human resource
- f) Strong industrial base
- g) Dynamic, transparent & speedy processing by Indian DNA (NCDMA) for host country approval
- h) MoU Signed between MoP and GTZ (Oct 2006)- Indo German Energy program (IGEN)
  - Baseline CO<sub>2</sub> Emissions from Power Sector already in place- first CDM country
  - Improvement in EE
  - CDM in Power Sector

## CDM POTENTIAL FOR INDIA

Sector-wise break-up: Investment done in host country approved project as on 2<sup>nd</sup> July 2007

So far, India Concentrated mainly on renewable energy (biomass, wind power, etc.) / waste heat recovery projects which generate much less CERs compared HFC23 projects.



## **POLICIES AND WAY AHEAD**

Greenhouse gas abatement policy design is exceedingly difficult because GHG emissions result from nearly all modern human activities. It involves every sector of the economy as well as habits and choices of individuals. Economics is more than just a study of business, it is the science which studies human behavior as a relationship between aspirations and the scarce means to reach those goals. Individuals make decisions every day that influence the amount of greenhouse gases that enter the atmosphere. If a stable climate is one objective among the many to which society aspires, then economics is a tool well-suited to understand how those decisions are made and how efficient and effective outcomes can be reached.

### **Indian Forum**

India is a Party to the United Nations Framework Convention on Climate Change (UNFCCC) and the objective of the Convention is to achieve stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system.

To strengthen the developed country commitments under the Convention, the Parties adopted Kyoto Protocol in 1997, which commits developed country Parties to return their emissions of greenhouse gases to an average of approximately 5.2% below 1990 levels over the period 2008-12.

The Seventh Conference of Parties (COP-7) to the UNFCCC decided that Parties participating in CDM should designate a National Authority for the CDM and as per the CDM project cycle, a project proposal should include written approval of voluntary participation from the Designated National Authority of each country and confirmation that the project activity assists the host country in achieving sustainable development.

Accordingly the Central Government constituted the National Clean Development Mechanism (CDM) Authority for the purpose of protecting and improving the quality of environment in terms of the Kyoto Protocol.

The CDM Authority has the powers:

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| (a) | to invite officials and experts from Government, financial institutions, consultancy organizations, non-governmental organizations, civil society, legal profession, industry and commerce, as it may deem necessary for technical and professional inputs and may co-opt other members depending upon need. |
| (b) | to interact with concerned authorities, institutions, individual stakeholders for matters relating to CDM.   |
| (c) | to take up any environmental issues pertaining to CDM or Sustainable Development projects as may be referred to it by the Central Government, and  |
| (d) | to recommend guidelines to the Central Government for consideration of projects and principles to be followed for according host country approval.   |

As discussed above, India has a vast opportunity to explore in terms of CDM and carbon-credits. Through its giant ongoing Infrastructure projects and projects on non-conventional

energy sources, a new phase of development is still to be observed, moderate start of which has already begun.

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