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Title - A World of Carbon Market And India

ABSTRACT

Industrialization plays a pivotal role in human existence. India is fourteenth in the world race of developing countries for being —more economic developed one”. Industrialization affects the environment in diverse ways. **This study focuses on the extent of pollution and harmful impact on the environment of India. It also has been vividly discussed and policy measures outlined to be undertaken by different large and small industries and government to maintain a healthy environment along with the spirit of creating environmental consciousness and awareness about Kyoto agreement.** Governments in most countries are coming up with the policy of ‘polluters pay’, thereby increasing cost to such organization. Global warming is the increase in the average temperature of earth’s surface due to increasing concentration of CO₂ in the atmosphere. Increasing greenhouse gas emission in the atmosphere is leading to global warming. Global warming is the increase in the average temperature of Earth's near-surface, air and oceans. Change in land, converting forests to urban centers (deforestation), has altered the climate system .Variation in solar output (from the sun) and CO₂ emitted by volcanic eruption has also lead to increase in CO₂ concentration in the atmosphere Outcome .UNFCCC has taken various steps towards drafting and implementation of the Kyoto Protocol Kyoto . To fight climate change, Kyoto Protocol was formed under the UNFCCC with an objective to Global reduce carbon emission .Three mechanism were adopted to reduce emissions initiative – Clean Development Mechanism (CDM) P – Joint Implementation – International Emission Trading To tackle the problem of global warming, United Nations Framework Convention on Climate Change (UNFCCC or FCCC) - an international environmental treaty - was formed at the United Nations Conference on Environment and Development (UNCED), informally known as the Earth Summit, held in Rio de Janeiro .India is the largest developer of CDM projects and provider of CER after China CDM Authority Trading Players, Indian **Carbon market** Projects under CDM • India is second largest provider of CDM projects .**So can industrialist should convert the threat (Global Warming) in to opportunities through showing there excellence by managing & coping with toxic environment.**

Key Words - Carbon Market, Global Trading, CDM Technology, Green Environment

A World of Carbon Market And India

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Give us your waste; we can convert it in gold

1.1 Introduction

Industrialization plays a pivotal role in human existence. India is fourteenth in the world race of developing countries for being —**more economic developed one** .The industrialization defines the process by which manufacturing industries develop from a primarily agrarian society.

Industrialization includes the scientific methods and mechanization to solve scrape generated by a factory system for the growth of the money economy, and the management of the labor force— both geographically and socially. Urbanization is encouraged to develop and change the whole of civil society." Industrialization affects the environment in diverse ways. Increasing trend of environmental pollution is the burning problem nowadays. Hence, requires making an intensive study on the facet of impact due to industrialization on the environment. The Vedas are a collection of hymns, mantras and prayers written in Sanskrit. The Vedic tradition is the root of cosmology and knowledge for the vast majority of Indians.

According to Vedas- — the nature is controlled by a supreme power that can never be ruled by human, and if interrupted by human chaotically, it shows itself in various form of natural disasters.— In Vedas to prevent the environment, there exists rules and restrictions in Indian culture, e.g. not to cut Banyan tree, pipal tree and not to pollute river.

This study focuses on the extent of pollution and harmful impact on the environment of country India, efforts to provide sufficient frameworks for environmental safety and health aspects with respect to industrial growth. It also has been vividly discussed and policy measures outlined to be undertaken by different large and small industries and government to maintain a healthy environment along with the spirit of creating environmental consciousness and health awareness.

The objective of the study is to suggest development of new business strategy to create awareness of environmental and innovative market –carbon trading, among the industrialists of the country.

1.2 Research Objective

- 1) To find out new market opportunity in carbon market.
- 2) To increase the awareness of about toxic trading on environment among Indian manufacturing society.
- 3) To study global contribution to earn foreign currency by carbon trading.
- 4) To provide an effective and all-inclusive platform for global carbon market stakeholders to engage with a large number of Indian project developers
- 5) To enable the growth of the Indian CDM project pipeline

1.3 Methodology

The present study is an exploratory investigation in which an attempt has been made to understand the awareness of carbon market & trading among the Indian and global manufacturers.

The research design can be understood as mentioned under:

- The data used in this project is secondary data.
- The data is collected by means of Journals, Periodicals, Annual reports, Reference Books & Internet

1.6 Facts and Figures of Country India

1.4 Study Area of Country India

1.4.1 Industrial Profile of Country

Industries that contribute to India's GDP: There are various sectors that contribute to India's GDP. Some of the major sectors are Automobile Industry, Steel Industry, Real Estate Industry, Tourism Industry, Energy Sector, Textile Industry, Airlines Industry, Medical Industry, Biotechnology Industry, Electronics and Hardware and the power industry. Besides these industries, there are several other sectors that are important contributors to the GDP of India.

GDP: \$1.209 trillion (2008 Estimate)

GDP growth: 6.7% (2009)

GDP per capita: \$1016

Inflation (CPI): 7.8% (CPI) (2008)

Unemployment: 6.8% (2008 Estimate)

The fertilizer industry of India makes more than a 20% contribution to the GDP. Another sector that seems very promising for the future is biotechnology. This sector is very young, but it is growing at a very fast pace and will undoubtedly become one of the leading sectors contributing to the GDP in the near future. Currently this sector generates \$ 2 billion revenue for the Indian economy. The real estate sector has witnessed a huge boom of late and has made significant contributions to the GDP of India.

The real estate sector is one industry that has made significant contribution to the country's GDP. Due to the enormous demand in the retail and other sectors of the economy, more demands are being created for real estate. The automobile industry is another sector that makes good contribution to the Indian economy. Due to the changed lifestyle of the consumer the demand for vehicles is increasing at a huge pace. Industry accounts for 28% of the GDP and employs 14% of the total workforce. However, about one-third of the industrial labour force is engaged in simple household manufacturing only. In absolute terms, India is 16th in the world in terms of nominal factory output. Economic reforms brought foreign competition, led to privatization of certain public sector industries, opened up sectors hitherto reserved for the public sector and led to an expansion in the production of fast-moving consumer goods. Post-liberalization, the Indian private sector, which was usually run by oligopolies of old family firms and required political connections to prosper was faced with foreign competition, including the threat of cheaper Chinese imports. It has since handled the change by squeezing costs, revamping management, focusing on designing new products and relying on low labour costs and technology. Textile manufacturing is the second largest source for employment after agriculture and accounts for 26% of manufacturing output. Ludhiana produces 90% of woollens in India and is also known as the Manchester of India. Tirupur has gained universal recognition as the leading source of hosiery, knitted garments, casual wear and sportswear. Dharavi slum in Mumbai has gained fame for leather products. Tata Motors' Nano attempts to be the world's cheapest car. India is fifteenth in services output. It provides employment to 23% of work force, and it is growing fast, growth rate 7.5% in 1991–2000 up from 4.5% in 1951–80. It has the largest share in the GDP, accounting for 55% in 2007 up from 15% in 1950. Business services (information technology, information technology enabled services, business process outsourcing) are among the fastest growing sectors contributing to one third of the total output of services in 2000. The growth in the IT sector is attributed to increased specialization, and an availability of a large pool of low

cost, but highly skilled, educated and fluent English-speaking workers, on the supply side, matched on the demand side by an increased demand from foreign consumers interested in India's service exports, or those looking to outsource their operations. The share of India's IT industry to the country's GDP increased from 4.8 % in 2005-06 to 7% in 2008. In 2009, seven Indian firms were listed among the top 15 technology outsourcing companies in the world. In March 2009, annual revenues from outsourcing operations in India amounted to US\$60 billion and this is expected to increase to US\$225 billion by 2020. Organized retail such supermarkets accounts for 24% of the market as of 2008. Regulations prevent most foreign investment in retailing. Moreover, over thirty regulations such as "signboard licenses" and "anti-hoarding measures" may have to be complied before a store can open doors. There are taxes for moving goods to states, from states, and even within states. Tourism in India is relatively undeveloped, but growing at double digits. Some hospitals woo medical tourism

1.4.2 Volume and Trend of Urbanization in India

India shares most characteristic features of urbanization in the developing countries. This process of urbanization in India reflects a gradual increasing trend of urbanization. India is at acceleration stage of the process of urbanization.

Number of million plus cities in India

Rank	City	Population (in million)			
		1951	1971	1991	2001
1	Bombay(Mumbai)	2.97	5.97	12.57	16.37
2	Calcutta	4.67	7.42	10.92	13.22
3	Delhi	1.44	3.65	8.38	12.79
4	Madras(Chennai)	1.54	3.17	5.36	6.42
5	Hyderabad	1.13	1.80	4.28	5.53
6	Bangalore	0.79	1.66	4.09	5.69
7	Ahmedabad	0.88	1.75	3.30	4.52
8	Pune	0.61	1.14	2.49	3.75
9	Kanpur	0.71	1.28	2.11	2.69

10	Nagpore	0.48	0.93	1.66	2.12
11	Lucknow	0.50	0.81	1.64	2.27
12	Surat	0.24	0.49	1.52	2.81
13	Jaipur	0.30	0.64	1.52	2.32
14	Kochi	0.18	0.51	1.14	1.35
15	Coimbatore	0.29	0.74	1.14	1.45
16	Vadodara	0.21	0.47	1.12	1.49
17	Indore	0.31	0.56	1.10	1.71
18	Patna	0.37	0.56	1.10	1.71
19	Madurai	0.37	0.71	1.09	1.19
20	Bhopal	0.10	0.38	1.06	1.45
21	Vishakapatnam	0.11	0.36	1.05	1.33
22	Vanarasi	0.37	0.64	1.03	1.21
23	Ludhiana	0.15	0.40	1.01	1.40

1.4.3 Infrastructure Development in India

Indian government's first priority is rising to the challenge of maintaining and managing high growth through investment in infrastructure sector, among others. The provision of quality and efficient infrastructure services is essential to realize the full potential of the growth impulses surging through the economy. India, while stepping up public investment in infrastructure, has been actively engaged in involving private sector to meet the growing demand. The demand for infrastructure investment during 11th Five Year Plan (2007-2011) has been estimated to be US\$ 492.5 billion(Planning Commission, 2007). To meet this growing demand, Government of India has planned to raise the investment in infrastructure from the present 4.7 percent of GDP to around 7.5 to 8 percent of GDP in the 11th Five Year Plan. In general, efforts towards infrastructure development is continued to focus on the key areas of physical and social infrastructure.

Overview of Physical Infrastructure

Particulars	1991	2000	2005	AAGR (%)
				(1991-2005)

Railways length (1000 km)	62.46	62.76	63.47	0.13
Road length (million km)	2.35	3.32	3.85	5.32
Fixed line and mobile phone subscribers (per 1,000 people)	7	36	28	150.35
Air freight (million tons per km)	493.10	547.65	773.22	4.73
Air passengers carried (million)	10.72	17.30	27.53	13.07
Air transport, registered carrier departures worldwide (million)	0.12	0.20	0.33	14.89
Container port traffic (million TEUs)	0.15	2.45	4.94	266.01
Electric power consumption (kWh per capita)	295.02	402.02	457.32	4.58
Electric power consumption (kWh)	255.65	408.42	493.78	7.76

Note: AAGR – Annual Average Growth Rate (%) for the period 1991 to 2005.

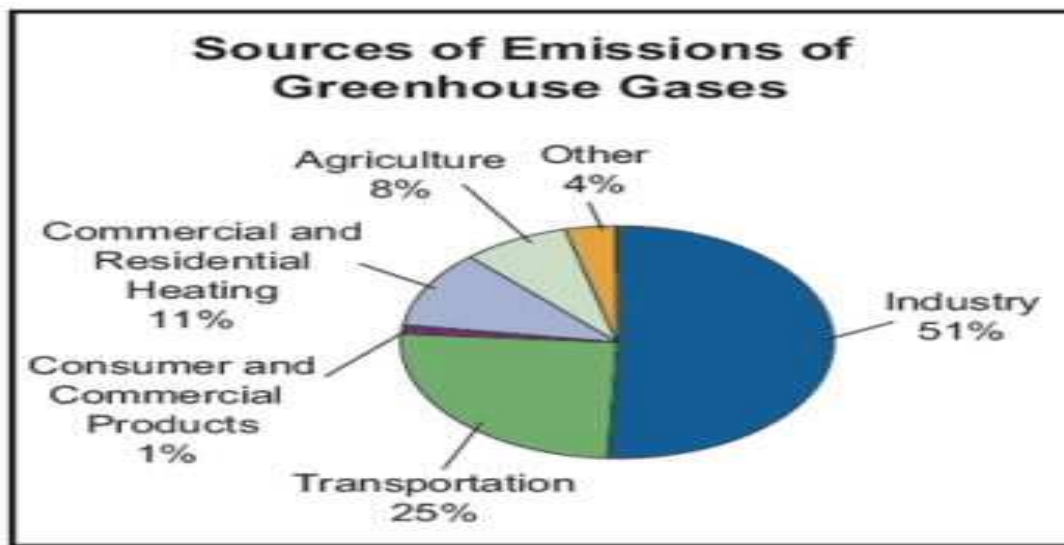
Source: World Development Indicators CD ROM 2007, World Bank

1.5 Effect of Global Warming On India – Negative Phase of Industrialization

Lakshadweep, comprising tiny low-lying islands, is at risk of being inundated by sea level rises associated with global warming. The effects of **global warming on the Indian subcontinent** vary from the submergence of low-lying islands and coastal lands to the melting of glaciers in the Indian Himalayas, threatening the volumetric flow rate of many of the most important rivers of India and South Asia. In India, such effects are projected to impact millions of lives. As a result of ongoing climate change, the climate of India has become increasingly volatile over the past several decades; this trend is expected to continue.

Greenhouse gases in India: Elevated carbon dioxide emissions from industries, factories, vehicles etc. have contributed to the greenhouse effect, causing warmer weather that lasted long after the atmospheric shroud of dust and aerosols had cleared. Further climatic changes 20 million years ago, long after India had crashed into the Laurasian landmass, were severe enough to cause the extinction of many endemic Indian forms. The formation of the Himalayas resulted in blockage of frigid Central Asian air, preventing it from reaching India; this made its climate

significantly warmer and more tropical in character than it would otherwise have been.



Effects of global warming on India: Several effects of global warming, including steady sea level rise, increased cyclonic activity, and changes in ambient temperature and precipitation patterns, have affected or are projected to affect India. Ongoing sea level rises have submerged several low-lying islands in the Sundarbans, displacing thousands of people. Temperature rises on the Tibetan Plateau, which are causing Himalayan glaciers to retreat.

Environmental: Increased landslides and flooding are projected to have an impact upon states such as Assam. Ecological disasters, such as a 1998 coral bleaching event that killed off more than 70% of corals in the reef ecosystems off Lakshadweep and the Andamans, and was brought on by elevated ocean temperatures tied to global warming, are also projected to become increasingly common. The first among the countries to be affected by severe climate change is Bangladesh. Its sea level, temperature and evaporation are increasing, and the changes in precipitation and cross boundary river flows are already beginning to cause drainage congestion. There is a reduction in fresh water availability, disturbance of morphologic processes and a higher intensity of flooding and other such disasters. Bangladesh only contributes 0.1% of the world's emissions yet it has 2.4% of the world's population. In contrast, the United States makes up about 5 percent of the world's population, yet they produce approximately 25 percent of the pollution that causes global warming.

Economic: The Indira Gandhi Institute of Development Research has reported that, if the predictions relating to global warming made by the Intergovernmental Panel on Climate Change come to fruition, climate-related factors could cause India's GDP to decline by up to 9%; contributing to this would be shifting growing seasons for major crops such as rice, production of which could fall by 40%. Around seven million people are projected to be displaced due to, among other factors, submersion of parts of Mumbai and Chennai, if global temperatures were to rise by a mere 2 °C (3.6 °F). Villagers in India's North Eastern state of Meghalaya are also concerned that rising sea levels will submerge neighboring low-lying Bangladesh, resulting in an influx of refugees into Meghalaya which has few resources to handle such a situation. If severe climate changes occur, Bangladesh will lose land along the coast line. This will be highly damaging to Bangladeshis especially because nearly two-thirds of Bangladeshis are employed in the agriculture sector, with rice as the single-most-important product. The economy has grown 5-6% over the past few years despite inefficient state-owned enterprises, delays in exploiting natural gas resources insufficient power supplies, and slow implementation of economic reforms. However, Bangladesh remains a poor, overpopulated, and inefficiently governed nation. If no further steps are taken to improve the current conditions global warming will affect the economy severely worsening the present issues further.

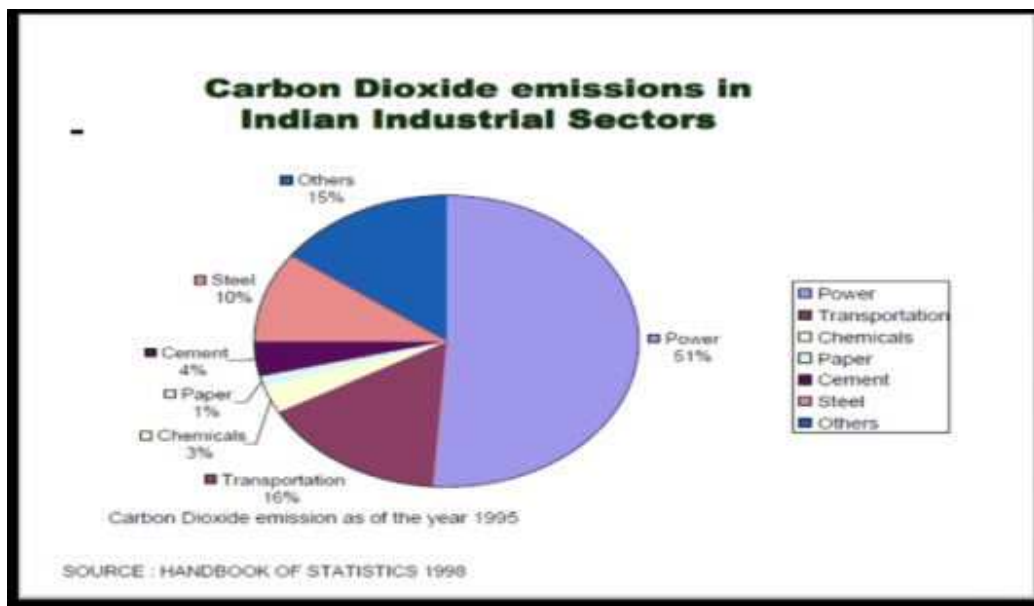
Social: Climate Change in India will have a disproportionate impact on the more than 400 million that make up India's poor (See Poverty in India). This is because so many depend on natural resources for their food, shelter and income. More than 56% of people in India work in agriculture, while many others earn their living in coastal areas.

Indian journalist, Praful Bidwai, argues that the Indian Government's climate policy does not address the interests of the majority of these peoples for whom climate change will mean hunger, food insecurity, and destruction of livelihoods but is instead focused on maximizing Indian elite's freedom to consume by maintaining high emissions-intensive GDP growth.

Past climate change Thick haze and smoke along the Ganges River in northern India. However, such shifts are not new: for example, earlier in the current Holocene epoch (4,800–6,300 years ago), parts of what is now the Thar Desert were wet enough to support perennial lakes; researchers have proposed that this was due to much higher winter precipitation, which coincided

with stronger monsoons. Similarly, Kashmir, which once had a warm subtropical climate, shifted to a substantially colder temperate climate 2.6–3.7 mya; it was then repeatedly subjected to extended cold spells starting 1 million years ago.

Pollution: Thick haze and smoke, originating from burning biomass in northwestern India and air pollution from large industrial cities in northern India, often concentrate inside the Ganges Basin. Prevailing waterlines carry aerosols along the southern margins of the steep-faced Tibetan Plateau to eastern India and the Bay of Bengal. Dust and black carbon, **which are blown** towards higher altitudes by winds at the southern faces of the Himalayas, can absorb shortwave radiation and heat the air over the Tibetan Plateau. The net atmospheric heating due to aerosol absorption causes the air to warm and convect upwards, increasing the concentration of moisture in the mid-troposphere and providing positive feedback that stimulates further heating of aerosols.



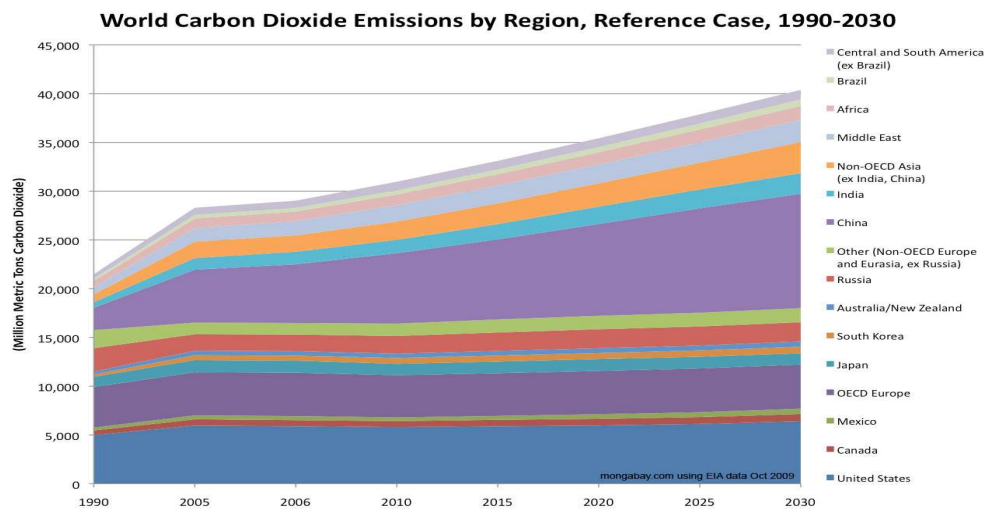
Awareness: Tribal people in India's remote northeast plan to honor former U.S. Vice President Al Gore with an award for promoting awareness on climate change that they say will have a devastating impact on their homeland. Meghalaya -- meaning 'Abode of the Clouds' in Hindi -- is home to the towns of Cherrapunji and Mawsynram, which are credited with being the wettest places in the world due to their high rainfall. But scientists state that global climate change is causing these areas to experience an increasingly sparse and erratic rainfall pattern and a lengthened dry season, affecting the livelihoods of thousands of villagers who cultivate paddy

and maize. Some areas are also facing water shortages. People are becoming aware of ills of global warming. Taking initiative on their own people from Sangamner, Maharashtra (near Shirdi) has started a campaign of planting trees known as Dandakaranya- the Green Movement. It was started by visionary & ace freedom fighter Late Shri. Bhausaheb Thorat in the year 2005. Till date, they have sowed more than 12 million seeds & half a million of plants.

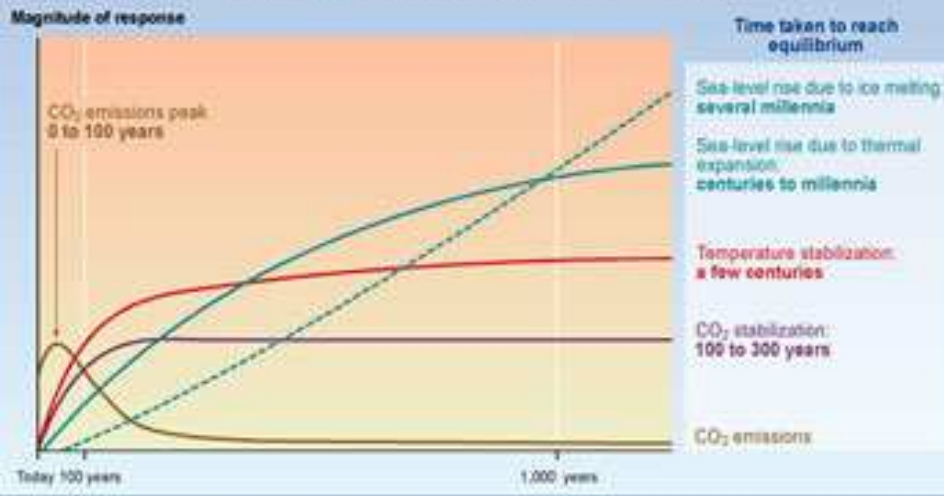
1.6 A World of Carbon Market And India

According to the Department of Energy's (DOE) Energy Information Administration (EIA), after China and the United States, among major polluters only India is expected to have significant growth of emissions over the next 20 years.

According to the Energy Information Administration, after China and the United States, among major polluters only India is expected to have **Carbon Dioxide Emissions by Country, 1990-2030**, indicated in following graph.



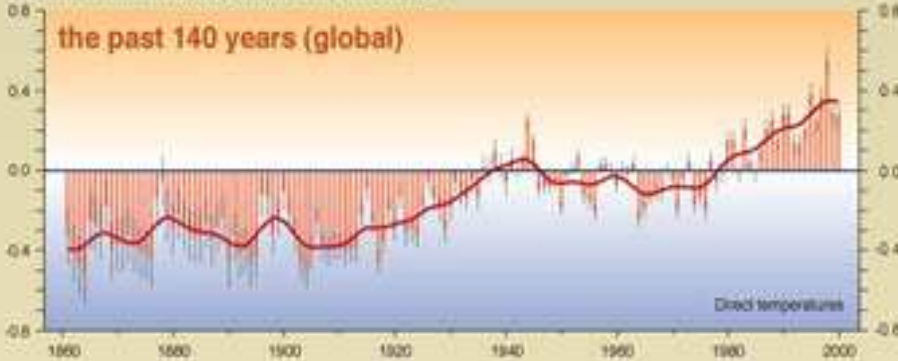
CO₂ concentration, temperature, and sea level continue to rise long after emissions are reduced



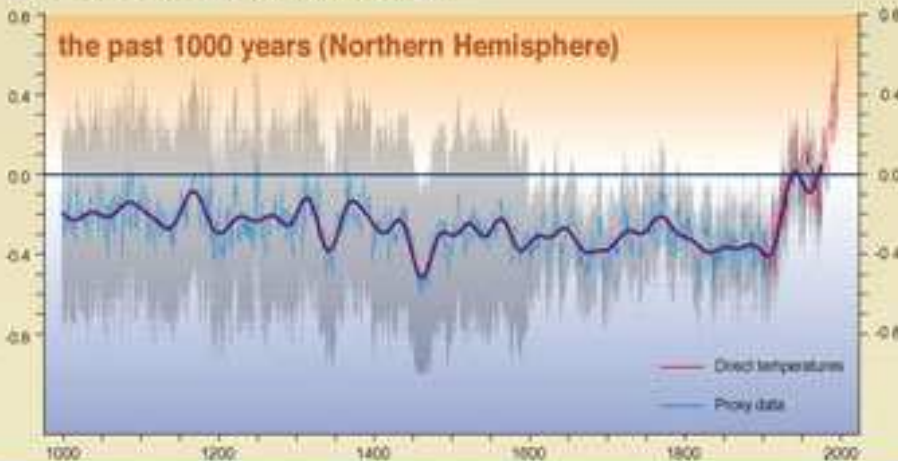
INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE

Variations of the Earth's surface temperature for...

Departures in temperature in °C (from the 1961-1990 average)



Departures in temperature in °C (from the 1961-1990 average)



INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE

1.7 Contribution to Global Warming - Carbon Trading by India

1.7.1 What is Carbon Market?

All emission units mentioned in this report ultimately owe their existence to the Kyoto Protocol of 1997. This Protocol is, in effect, an action plan to bring about greenhouse gas (GHG) reductions as proposed by the United Nations Framework Convention on Climate Change (UNFCCC), itself signed by most countries in 1994. Under the UNFCCC, a group of countries (basically the OECD plus the ex-Soviet Union countries) are known as Annex 1 countries. These countries agreed to limit their own GHG emissions to a percentage of previous output levels.

A subset of the Annex 1 countries that ratified Kyoto (a group known as Annex B) agreed to reduce their GHG emissions relative to 1990 levels on aggregate by 5.2%, averaged over the first commitment period (2008-2012). The EU, signing the treaty as a single body, has made a commitment to make an overall 8% reduction on 1990 emissions. The burden for achieving the EU target is divided unequally between EU member states under the 'Burden Sharing Agreement'.

Countries with such commitments must meet their targets primarily through national GHG reduction measures. However, as additional means of meeting these targets, the Kyoto Protocol introduced three market-based mechanisms, thereby creating what is now known as the '**carbon market**'.

1.7.2 The Kyoto Protocol

The Kyoto Protocol treaty was negotiated in December 1997 at the city of Kyoto, Japan and came into force February 16th, 2005. "The Kyoto Protocol is a legally binding agreement under which industrialized countries will reduce their collective emissions of greenhouse gases by 5.2% compared to the year 1990 (but note that, compared to the emissions levels that would be expected by 2010 without the Protocol, this target represents a 29% cut). The goal is to lower overall emissions from six greenhouse gases - carbon dioxide, methane, nitrous oxide, sulfur hexafluoride, HFCs, and PFCs - calculated as an average over the five-year period of 2008-12. National targets range from 8% reductions for the European Union and some others to 7% for the US, 6% for Japan, 0% for Russia, and permitted increases of 8% for Australia and 10% for Iceland." Greenhouse gas emissions – a new commodity. Parties with commitments under the Kyoto Protocol (Annex B Parties) have accepted targets for limiting or reducing emissions.

These targets are expressed as levels of allowed emissions, or “assigned amounts,” over the 2008-2012 commitment periods. The allowed emissions are divided into “assigned amount units” (AAUs). Emissions trading, as set out in Article 17 of the Kyoto Protocol, allows countries that have emission units to spare - emissions permitted them but not "used" - to sell this excess capacity to countries that are over their targets.

Thus, a new commodity was created in the form of emission reductions or removals. Since carbon dioxide is the principal greenhouse gas, people speak simply of trading in carbon. Carbon is now tracked and traded like any other commodity. This is known as the "carbon market."

Other trading units in the carbon market

More than actual emissions units can be traded and sold under the Kyoto Protocol’s emissions trading scheme. The other units which may be transferred under the scheme, each equal to one tonne of CO₂. A removal unit (RMU) on the basis of land use, land-use change and forestry (LULUCF) activities such as reforestation. An emission reduction unit (ERU) generated by a joint implementation project. A certified emission reduction (CER) generated from a clean development mechanism project activity. Transfers and acquisitions of these units are tracked and recorded through the registry systems under the Kyoto Protocol. An international transaction log ensures secure transfer of emission reduction units between countries. Relationship to domestic and regional emissions trading schemes. Emissions trading schemes may be established as climate policy instruments at the national level and the regional level. Under such schemes, governments set emissions obligations to be reached by the participating entities. As we know green house gas (GHG) emission is increasing day by day in developed as well as in developing countries.

According to the provision of the Kyoto Protocol (name of the scheme), which came into effect in February 2005, developed nations have to reduce their GHG emissions by an average of 5.2% below their 1990 levels by 2012. So they (developed countries) thought that plantations are one of the best solutions to curbing damage from GHG emissions. But the expenditure for that in developed countries is high. So companies there can fund plantations in countries like India, where the costs are low and in turn take credit for the carbon absorbed by the trees.

1.7.2.1 Kyoto Infrastructure

As the number of units and their location has to be tracked to determine if countries have met their obligations, the Kyoto protocol mandates that each Annex B country

create and maintain a registry for the holding of Kyoto units and provide a mechanism for their transfer (both domestically and internationally). AAUs, RMUs and ERUs are issued by the national registry in each country. CERs are issued by the UNFCCC-operated CDM registry once the emission reductions from a project have been independently verified. Once issued, units can be freely transferred between accounts on the registry. A country can decide whether to hold all the units in its own name, or transfer units to companies with high emissions levels. Transfers can also be made to accounts on a foreign registry (subject to each country maintaining a commitment period reserve³). Therefore, a national registry can hold AAUs, RMUs, ERUs that it has itself issued, plus AAUs, RMUs and ERUs issued by other countries, as well as CERs issued by the CDM registry. International transfers are verified by another Kyoto mechanism, the International Transactions Log (ITL), administered by the UNFCCC. The ITL verifies transactions proposed by registries to ensure they are consistent with rules agreed under the Kyoto Protocol. Once approved, registries complete the transaction. In the event that a transaction is rejected, the ITL sends a code indicating which ITL check has been failed and the registry terminates the transaction. At the end of the commitment period (2012), the actual emissions of each Annex B country over the period will be compared with the holding of all the units in the registry. If a country does not have enough units to cover its emissions, it has to make good the shortfall plus an additional 30% of the shortfall. Some trading of AAUs between nations has taken place in the past. Some of this trade is controversial, especially the purchase of AAUs from the old Eastern Block. The baseline for Kyoto was 1990, which was just at the point that these inefficient economies started to collapse. This meant that current emissions for this region are well below 1990 levels. These excess units are known as 'hot air'. In an effort to improve the situation, the Green Investment Scheme (GIS) was developed, obligating participating countries who sell such excess units to reinvest the proceeds in green projects.

1.7.2.2 How Kyoto units are created / issued

I] Kyoto allocation of AAUs

The amount of AAUs allocated to a country is dependent on its emissions target for the period 2008 to 2012, based on the 1990 baseline. At the start of the period each country was allocated all of its units for the five-year period – i.e. it received (tonnes emitted in 1990) * (100 - reduction percentage)*⁵⁴. These units are created in the

national registry for that country, and the government of the country could then decide whether to manage the holdings themselves, or issue them to major energy consuming businesses to encourage emissions reductions at source.

II] RMUs

RMUs are issued into the national registry of the country that hosts the project that results in net removal of carbon from the atmosphere (by creating or enhancing a carbon sink).

3 The commitment period reserve is a requirement under the Kyoto Protocol that requires each Party to maintain a reserve of ERUs, CERs, AAUs and/or RMUs in its national registry at least equal to 90% of the Party's assigned amount (KP Emissions Trading).

4 Not all countries are subject to a reduction on 1990 levels. Australia, which did not initially ratify Kyoto, negotiated an 8% increase.

III] ERUs from JIs

ERUs differ from other units, in that they can only be created if another unit type is cancelled. ERUs result from projects in one Annex B country sponsored by another. These units can be used by the sponsor to add to its holdings in its own country. The conversion of AAUs or RMUs to ERUs prevents double counting. The units are issued in the host country's national registry.

IV] CERs from CDM

The CDM process is one of the major planks of Kyoto. As mentioned, it encourages emission projects in less developed countries, where the environmental benefit may be produced at a lower cost than could be done in a developed country. As GHGs know no national boundaries, saving carbon emissions in India, for example, has the identical impact of saving carbon emissions in Germany. A key imperative of CDM schemes is additional. Additionality is the requirement that the greenhouse gas emissions after implementation of a CDM project activity are lower than those that would have occurred in the most plausible alternative scenario to the implementation of the CDM project activity. An example would be the building of a wind farm instead of a thermal power station. The UNFCCC operates a comprehensive approval process to determine which projects are eligible as well as a verification process to ensure the emission reductions have actually taken place. Each year, once the verification has taken place, the resulting CERs are issued on the CDM registry in the name of the project developer. These units

can then be sold to Annex B countries, industrial users or traders. Once transferred, they can exist in the holding accounts in national registries.

1.7.3 Carbon Trading Mechanisms

These are:

- Emissions Trading
- The Clean Development Mechanism (CDM)
- Joint Implementation (JI)

are discussed in detail in the following sections.

1.7.3.1 Emissions Trading

Countries with commitments under the Kyoto Protocol have accepted targets for limiting or reducing emissions. These targets are expressed as levels of allowed emissions, or 'assigned amounts', over the 2008-2012 commitment period. Allowed emissions are divided into assigned amount units (AAUs – each AAU representing one tonne of CO₂e) and issued to each country at the level of its emissions target (i.e. a country will get fewer AAUs than would cover the existing, business as usual, emissions levels). Emissions trading allows countries that have unused emission allowance units – allowances allocated to them but not 'used' – to sell this excess capacity to countries that are over their targets. Greenhouse gas is the name for the group of six gases (including CO₂) which have an impact on global warming. CO₂e is the unit of measurement used to compare the relative climate impact of the different GHGs. The CO₂e quantity of any greenhouse gas is the amount of carbon dioxide that would produce the equivalent global warming impact. Annex 1 countries can achieve their targets by allocating their reduced annual allowances to major operators within their borders; operators who have reduced their emissions below their level of allocation can sell this excess to operators who exceed their allocations. This type of trading scheme is known as 'Cap and Trade'.

1.7.3.2 The Clean Development Mechanism (CDM)

The Clean Development Mechanism (CDM), defined in Article 12 of the Protocol, allows a country with an emission-reduction or emission-limitation commitment under the Kyoto Protocol (Annex B Party) to implement an emission-reduction project in developing countries. Such projects can earn saleable certified emission reduction (CER) credits, each equivalent to one tonne of CO₂, which can be counted towards meeting Kyoto targets.

The mechanism is seen by many as a trailblazer. It is the first global, environmental investment and credit scheme of its kind, providing standardized emissions offset instrument, CERs.

The Clean Development Mechanism (CDM), allows a country with an emission reduction commitment to implement an emission-reduction project in developing countries, where the cost of reducing emissions may be cheaper than at home.

Such projects can earn saleable Certified Emission Reduction (CER) credits, each equivalent to one tonne of CO₂, which can be counted towards meeting Kyoto targets. In this way countries (and operators within a country) can purchase CERs to meet their obligations if they face a shortfall. A CDM project activity might involve, for example, a landfill methane capture project, a rural electrification project using solar panels or the installation of more energy-efficient boilers. The idea is that the mechanism stimulates sustainable development and emission reductions, while giving industrialized countries some flexibility in how they meet their emission reduction targets. The mechanism stimulates sustainable development and emission reductions, while giving industrialized countries some flexibility in how they meet their emission reduction or limitation targets.

Types of projects in CDM:

1. Renewable energy
2. Switching to alternate fuels
3. Energy efficiency
4. Waste management
5. Industrial process
6. Agriculture
7. Carbon sequestration in forests

Registration of CDM Projects: CDM has to undergo through a project cycle involving 4 stages such as: **(1)** Project Development **(2)** Validation and Registration **(3)** Project Monitoring **(4)** Verification, Certification and Issuance of CERs.

A CDM project must provide emission reductions that are additional to what would otherwise have occurred. The projects must qualify through a rigorous and public registration and issuance process. Approval is given by the Designated National Authorities. Public funding for CDM project activities must not result in the diversion of official development assistance.

The mechanism is overseen by the CDM Executive Board, answerable ultimately to the countries that have ratified the Kyoto Protocol.

Operational since the beginning of 2006, the mechanism has already registered more than 1,650 projects and is anticipated to produce CERs amounting to more than 2.9 billion tones of CO₂ equivalent in the first commitment period of the Kyoto Protocol, 2008–2012.

The main new features of the proposed registry are as follows:

□ All functions related to the EU ETS will be carried out on the Union Registry.

Thus all transfers as a result of trading activity will be processed by the Union Registry.

□ The Union Registry will operate a single, central infrastructure on behalf of the national registries, which will still be responsible for opening accounts. Thus, an institution could have multiple accounts in the Union Registry depending on the number of national registries in which it has opened accounts. The services provided will, however, be identical across all the accounts, as they will be provided centrally by the Union Registry.

□ National registries will remain responsible for functions required under the Kyoto Protocol, such as managing the surrender of units. Units will therefore be returned to national registries when needed for this process to be carried out.

□ Regulated exchanges and trading venues will be able to open a trading platform holding account.

□ Account holders will be able to nominate that their account is accessible through a trading platform.

□ The arrangements for technical connectivity to the Union Registry are still under discussion. It is not decided yet whether there will be a Registry. Electronic Interface (REI) from the beginning. Although there will be a single secure web portal, users may still require separate passwords to access accounts opened through different national registries.

□ Security arrangements will allow for more sophisticated authorization controls over transfers.

□ There will be specific facilities to back out of transfers clearly made in error.

□ The registry system operator will be required to “*take all reasonable steps*” to make the system available 24 hours a day, 7 days a week.

□ The location of the Union Registry has not yet been decided.

1.7.3.3 Joint Implementation (JI)

The Joint Implementation mechanism (JI) allows a country with an emission reduction commitment to earn Emission Reduction Units (ERUs) from an emission reduction or emission removal project in another Annex B country, each equivalent to one tonne of CO₂, which can be counted towards meeting its Kyoto target. The idea behind JI is that it offers countries a flexible and cost-efficient means of fulfilling a part of their Kyoto commitments, while the host country benefits from foreign investment and technology transfer. These projects are similar to CDM projects but the creation of units is different. ERUs come about by the conversion of AAUs (or RMUs – see below) into ERUs; the latter can then be sold to meet a Kyoto reduction target. They do not add to the overall supply of units in the market.

Other Method -Removal Units

In addition to the above mentioned market mechanisms, there is a fourth unit which can be created and traded under the Protocol. These are removal units (RMUs) and are given for net removals of carbon by sinks from activities in the Land Use, Land Use Change and Forestry sector (LULUCF).

1.7.4 Participants in the Carbon Market

A) Installations

The primary participants in the market are the 12,000 or so installations covered under the EU ETS, who receive allocations of EUAs in each phase of the scheme. These installations need to annually match their actual measured emissions with their holdings of EUAs (or other acceptable units). If they are successful in reducing emissions below their EUA allocation, they can sell the surplus. If they are short, they need to purchase EUAs, or other units such as CERs.

B) CDM project developers

Project developers provide the finance for CDM projects. They receive the actual CERs created from these projects once the emission reductions have been verified. However, it is possible to sell Primary CERs (see following) to organisations that wish to

C) Brokers

Brokers exist to facilitate trading in financial assets. In the emissions space, specialist brokers have emerged, and established brokers in other assets have moved into the emissions space. Some brokers specialize in the CER market, sourcing CERs (pre- or

post-issuance) directly from CDM schemes for their customers; others operate exclusively in the secondary market.

D) Traders

Like any financial asset, emission units vary in price over time and provide another vehicle for traders to profit from. Traders are an essential component of the secondary market.

E) Voluntary off setters

There are many opportunities for companies and individuals to offset their own emissions by buying emission units. Such units are often sourced from voluntary schemes but there is nothing preventing such buyers from purchasing EUAs, CERs or other Kyoto units. For example, the Easy Jet offsetting scheme, whereby passengers can purchase offsets at the time of booking a flight, meets the offset by buying CERs from a small hydro project in Ecuador. These schemes only account for a small proportion of the overall market.

1.7.5 How And Where Emissions Are Traded?

1.7.5.1 Primary market

Increasingly, allowances and credits first become tradable through an auction process. National governments have evolved this method of allocating a proportion of the allowances that are distributed to installations. It not only raises revenue but also helps to ensure that the allowances maintain a market value which provides an incentive for installations to reduce emissions. The auction method is also used to sell CER credits released by CDM projects. The objective is for the project developer to maximise the revenue from a block of CERs, avoiding the potential market impact on the price if they were sold into the secondary market.

Auctions are operated as a service by some of the organizations running secondary markets, such as EEX, BlueNext and Climex. The UK government Debt Management Office organizes the auction of EUAs to obligated emitters, using its long experience of auctioning government bonds. Direct participants in the auction are banks who act on behalf of the compliance buyers.

Phase 3 of the EU ETS will rationalise the auction process across all EU countries and will require governments to increase the percentage of allowances which are

distributed through auctioning.

1.7.5.2 Types of Secondary Trading

A] Private Contract

Like any asset, it is possible to exchange units for cash with another party by private contract. In this way installations that have an excess of EUAs as a result of being successful in their emission reduction efforts can transfer them directly to another party in exchange for cash. Units can be transferred directly between holdings accounts in the national registries or from a holding account on one national registry to a holding account on another national registry. The cash and the asset transactions are not directly linked, so the parties have to agree on the timing of the two exchanges (units and cash). This creates a counterparty risk which will be commented on later in this report.

B] OTC Markets

Much trading of spot and futures contracts takes place in the OTC markets. Brokers bring together buyers and sellers, and offer either spot contracts or forward contracts, covering EUAs and Primary and Secondary CERs.

C] Exchange Markets

Exchange Markets provide an open and transparent marketplace for emissions units. The various markets offer spot, futures and options contracts.

Forms in Which Units Are Traded

a) Spot

Spot trading is trading for immediate delivery. The buyer and seller agree a price for an amount of EUAs or Secondary CERs and settlement takes place within two or three days. Transfer of cash and units takes place independently due to most registries not having facilities to allow for delivery versus payment (DVP), with the exception of the French registry.

b) Forwards

Forward contracts are offered by many brokers, in EUAs, Primary CERs and Secondary CERs. These contracts allow buyers and sellers to lock in a price for a delivery sometime in the future. Most of these contracts carry counterparty risk as they are not cleared.

There is an active market in Primary CERs. Primary CERs are CERs that do not yet exist but will be issued to the Project Developer in the underlying CDM project. These are effectively forward contracts on CERs that are expected to be issued. There is, of course, a risk that the number of CERs issued will be less than expected, or that none will be issued. For this reason, Primary CERs trade at a discount to Secondary CERs – that is, CERs already verified and issued, the level of discount being proportional to the project risk.

c) Futures

Cleared futures contracts on EUAs and CERs are offered by the major emissions contract exchanges. The great majority of futures contracts are for December delivery⁷, allowing installations to lock in a price for any units they may need to buy to meet their obligations or to profit from any excess units they may hold. There is an active secondary market in such units, supported by speculators. Contracts are cleared through a recognised clearing house, protecting participants from the failure of a counterparty. Daily futures, which expire and settle on the day after trade date, are offered by some exchanges as a surrogate spot contract. They have the side effect of being classed as derivatives and, for instance in the UK, being regulated by the FSA.

d) Options

Options are offered by a couple of regulated exchanges, notably on ECX/ICE. These are European style options on futures contracts. On expiration the option holder has the right to buy (in the case of a call) or sell (in the case of a put) a December expiring futures contract. Options have been offered for a while but growth in volume has been more recent. Exchange options contracts are cleared.

1.7.6 Major Exchange Markets

There are six significant operators of exchanges offering trading in EU ETS eligible units.

i) BlueNext

BlueNext is a joint venture between the NYSE Euronext global exchange group and Caisse des Dépôts et Consignations (CDC) a unique French public institution with a high credit rating and a remit to encourage sustainable development.

Only Nord Pool offers clearing for forwards.

Nord Pool offers quarterly expiries but the majority of the volume is in the December contracts.

ii) Climex

Climex is a private venture jointly owned by Rabobank and TenneT, the operator of the Dutch electricity grid. It has a contractual relationship with APX-ENDEX, operators of electricity and gas markets in the Netherlands, Belgium and the UK.

iii) European Climate Exchange (ECX/ICE)

ECX was established by the Chicago Climate Exchange, one of the earliest entrants into emissions trading. The market is operated in partnership with Intercontinental Exchange (ICE) Europe. ICE provides the exchange trading platform, clearing house, market regulation and business development functions for contracts devised by ECX. At the time of writing ICE is in the process of concluding the purchase of ECX and its parent group.

iv) European Energy Exchange (EEX)

EEX is the German-based electricity and gas exchange. Its major shareholders are Eurex, the German/Swiss derivatives exchange and Landesbank Baden-Württemberg, the remainder being owned by market participants.

v) The Green Exchange

The Green Exchange is a venture recently launched by the CME Group, the US operator of the largest futures exchange in the world. It aims to focus the trading in environmental instruments which is currently conducted by the NYMEX division of the group into an exchange with its own regulatory license in the USA and regulatory permissions to also operate in Europe, with its European base in London.

vi) Nord Pool

Nord Pool is the Nordic Electricity exchange owned by NASDAQ OMX, the global exchange operator.

Each exchange offers a different mix of contract types and trading methodology.

1.7.7 India Sets Target on Carbon Emissions

The Copenhagen Accord recognizes the validity of the 2 degree Celsius temperature threshold. Given that the most countries have agreed to keep the political declaration in mind while

negotiating a climate deal, there is an acceptance that a limit has been set on the total global carbon emission. An equitable sharing of this carbon space in a manner that allows developing countries to pursue their growth agenda has become imperative. Without equity in burden sharing, the likelihood of a global deal on climate is unlikely.

India committed to reduce the intensity of its carbon emissions by 20 to 25 percent by 2020 from 2005 levels, meeting a deadline for developing countries to set voluntary carbon-curbing actions.

India has consistently maintained that per-capita emission principle is the basis for an equitable burden sharing. Prime Minister Manmohan Singh made an international commitment that India's per capita emission would never exceed that of the developed countries. At present, India's per-capita emission is at 1.2 to 1.4 MT. The per-capita emission approach does present some problems. It helps countries leverage on their large populations, as is the case with India and China, Government of India has shown an approach to set up all the institutional setups (like Designated National Authority – DNA) to facilitate maximum participation of Indian industries to get the benefits of CDM.

Some project status in India is as follows: CDM projects registered at the CDM executive board are 506 in number, 1,492 CDM projects are at or after the validation stage; 1,592 CDM projects have been approved by India. Any CDM project before getting started it is necessary to undergo the CDM project cycle as mentioned above. Presently India has the largest number of projects. Energy Infratech Private Limited (EIPL) is getting involved in to these projects to get the benefit of CDM. The list of Indian companies who are getting benefits of clean development mechanism seems to be endless, the latest addition being the Raigarh-based Jindal Steel and Power Limited (JSPL). Tata power too got its first CDM project registered just recently.

The Delhi Metro Rail Corporation (DMRC) has become the first railway project in the world to earn carbon credit. United Nations has registered our metro under the Clean Development Mechanism (CDM), which enables it to claim carbon credits. Under this project, DMRC will earn Certified Emission Reductions (CERs). The entire project was carried out with the support of Japan Carbon Finance which provided almost \$95,000.

.Grasim industries are one of the major producers of cement in India. By the year 2006, the company began earning Rs. 17 cr through carbon credits. After he started tasting success, Maheshwari claimed proudly, “Give us your waste & we can convert it into gold”. By March

2007, over 1000 companies had registered for CDM projects across the globe. Of these, 32.86% were from India.

1.8 Findings

- 1) Awareness level of carbon trading among manufacturer in India is low.
- 2) Increased population, urbanization, development of infrastructure emission of Green House Gases (GHG)
- 3) The contribution of GHG gases are 51% in India.
- 4) The major contribution i.e. 51% of CO₂ emissions from Power sector
- 5) India is expected to have significant growth of emissions over the next 20 years in the world.
- 6) The Clean Development Mechanism (CDM), allows a country with an emission reduction commitment to implement an emission-reduction project in developing countries.
- 7) India committed to reduce the intensity of its carbon emissions by 20 to 25 percent by 2020
- 8) India is actively participating in clean development mechanism (CDM) activity (about 300 projects with 34 million certified emission reduction (CERs) registered per year).
- 9) Government of India has shown an approach to set up all the institutional setups (like Designated National Authority – DNA) to facilitate maximum participation of Indian industries to get the benefits of CDM.
- 10) Aids and support given by local and global authorities for strengthening the economy and societal health.

1.9 Limitation

- 1) Lacking in national level information regarding the topic.
- 2) Lacking in availability of primary data at global level..
- 3) Unable to conduct the research for primary data because of wide universe.
- 4) Incompatibility in using the suggested method by industries, which can be affect existing production & market and investment in carbon trading.

1.10 Further Research/Scope of Research

The research is useful to understand the real deal of green technology and stressed how difficult the challenge ahead was because India's problem is carbon unawareness. India's carbon market is growing faster than even information technology, bio technology and BPO sectors as 850 projects with an investment of a whopping Rs 65,000 crore are in pipeline. The revenue from 200 projects is estimated at \$2 billion till 2012, according to Prodipto Ghosh, member of

the Prime Minister's Council on Climate Change. Dun & Bradstreet, said that India is actively participating in clean development mechanisms (CDM) activity (about 300 projects with 34 million certified emission reduction (CERs) registered per year). India has emerged as a world leader in reduction of greenhouse gases by adopting CDM in the past few years. The number of Indian projects in the fields of biomass, cogeneration, and hydropower and wind power eligible for getting carbon credits now stands at 225 with a potential of 225 million CERs. The idea of conserving the environment is gathering pace and such global concerns are being heeded and the corrective measures are being accepted and implemented; CDM rises to give new hope to the world of a cleaner and greener earth for the future. And opportunity to earn foreign money, increase employability as trading partner.

1.11 Conclusions

Analyze one major threat commonly faced by both industries & humanity across the world- the bane of global warming. Most of the manufacturing industries would have to reengineer their processes to reduce environment pollution & contribute towards finding a solution to the threat of global warming. Governments in most countries are coming up with the policy of 'polluters pay', thereby increasing cost to such organization.

The average global temperature has increased over the past 50 years.

Power plants which work on coal burning technology and automobiles working on petroleum fuels cause huge emission of carbon dioxide into the atmospheres. Factories also emit large amount of GHG gases.

Stopping the emission of a ton of carbon dioxide would fetch one point, whereas by stopping the emission of a ton of sulphur hexafluoride, one can gain 23900 points. Countries which are required to reduce their greenhouse gas emission under the Kyoto protocol can purchase credits for reduction in greenhouse gas emission from other countries. Now, the business world has before it an opportunity to cover the threat of global warming into a profit earning venture. The industrialized countries have decided to reduce their greenhouse gas emission by buying the Carbon Emission Reductions (CERs) from developing countries. Indian companies should develop Clean Development Mechanism earning carbon credits for the country by reducing the emission of greenhouse gases. In particular, it is possible to do this by taking up renewable energy projects such as those based on wind, biomass, biogases, geothermal & tidal power.

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