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Environmental carbon trading scenario in India: A Global issue of 21 st Century: A Review

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Abstract

The Climate change and environmental conservation is the main issues of this century. India is the second largest in population, fourth largest in energy consumption and third largest in green house producer and burns ten folds fuel wood as compare to United State. To control these emissions on the global scale the environmental carbon trading practices are done on the basis of the carbon credits earned. In India the Coal fired power generation is the biggest polluter and the biggest opportunity for emission reduction and hence can be the biggest carbon credits producers. Presently, next to china India is generating the highest number of carbon credits in the world. In comparison to the developed nations the carbon emission level in India is much less. This provides enough opportunities for its industries to produce carbon units and harness benefits out of its trading. India's average annual CERs (Certified Emission Reduction) stand at 12.6% or 11.5 million which can goes up to 25 %. Hence India has a large potential to earn carbon credits and in this context the carbon consultancy service has a greater part to play and is going to add a new dimension to the environmental and financial services arena.

Keywords: Carbon credits, certified Emission, Green house producer, environmental carbon trading.

1 INTRODUCTION

India is the largest growing economies in South Asia, supporting a population of around 1.2 billion and experiencing a steep rise in energy demand. India's growing population and economic development put enormous strain on environment. Environmental degradation and climate change is one of the greatest challenges of 21st century. According to data collection and environment assessment studies of World Bank experts, between 1995 through 2010, India has made one of the fastest progresses in the world, in addressing its environmental issues and improving its environmental quality [1], [2].

1.1 Major Environmental issues in India

Air pollution, poor management of waste, growing water scarcity, falling groundwater tables, water pollution, preservation and quality of forests, biodiversity loss, and land/soil degradation are some of the major environmental issues India faces today [3]. India's population and economic growth adds pressure to environmental issues and its resources. These problems play important role in deciding the India's environmental conditions which has its large population depending on the productivity of primary resources and whose economic growth relies heavily on industrial growth. India being the world's largest consumer of fuel wood,

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agricultural waste and biomass for energy purposes, ranked third in greenhouse gas emission in the world and burns tenfold more fuel wood every year than the United State. The Carbon Dioxide Information Analysis Centre (CDIAC), USA, estimates the total fossil-fuel CO2 emission from India is 189 TgC in 1990, 324 TgC in 2000, 385 TgC in 2005 and 508 TgC in 2009, and the annual rate of increase as – 7 % per year during 2005 – 2009. [4]. The carbon di oxide and the other green house gases can bring severe ramification to the entire global environment. As the green house gases mix uniformly in the atmosphere, which makes it possible to reduce carbon emission at any point on Earth and have the same effect. So the location of the originator of the emission does not really matter from an environmental point of view. Lately this issue has been given a serious analytical thought amidst growing concern among nations all over the world including India to reduce green house gas emission levels. The major green house gases are carbon dioxide, methane, chlorofluoro carbon, nitrogen oxide etc. With 17 percent of world population, India contributed some 5 percent of human – sourced carbon dioxide emission, compared to china's 24 percent share. On per capita basis, India emitted about 1.4 tons of carbon dioxide per person, in comparison to the world average of 5.3 tons per person [5]. If we compare these emissions of GHGs for 2005 with the other parts of the world, we found India ranked third in that series [6]. In the table 1 the first column figure is the country's or region's emissions as a percentage of the global total. The second column figure is the country's/region's per-capita emissions, in units of tons of GHG per-capita:

TABLE 1: PER CAPITA EMISSION OF GREEN HOUSE GAS EMISSION.

Country	Emission %	Per Capita Emission
China	17	5.8
United states	16	24.1
European Union	11	10.6
Indonesia	6	12.9
India	5	2.1
Russia	5	14.9
Brazil	4	10
Japan	3	10.6
Canada	2	23.2
Mexico	2	6.4

1.2 Global practices to reduce the emission

Formally the first world climate conference 1979 recognized climate change as a serious problem. A number of intergovernmental conferences focusing on climate change were held in 1980s and early 1990s.

Most often, climate change mitigation scenarios involve reduction in the concentration of the greenhouse gases, either by reducing their sources or by increasing their sinks [7]. ICCA (The International Council for Chemical Association) has developed a set of eight policy principle to help guide global

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climate discussion.

The ICCA has set eight principles for reducing worldwide green house gas emission.

1. Develop a global framework to accelerate green house gas reduction, avoid market distortions and minimize carbon leakage. The movement of industrial production and green house gas emission from one nation to another is known as Carbon Leakage.
2. Focus on the largest, most effective and lowest cost abatement opportunities.
3. Push for energy efficiency is to improve the energy efficiency to reduce the greenhouse gas emission. A recent study found that for every unit of green house gases emitted directly or indirectly by the chemical industry, the industry enables more than two units emission saving via products and technologies provided to other industries and consumers.
4. Support the development and Implementation of new technology.
5. Support the development of the most efficient and sustainable use of available feedstock's and energy.
6. Provide incentive for faster action by rewarding 'early movers that proactively reduce their carbon emission.
7. Push for the most efficient and sustainable disposal, recovery and recycling options.
8. Develop technology cooperation to support abatement in developing countries

If, Industry, policy makers and other stakeholders take step to facilitate emission reduction and fully utilize chemical products, the study suggests the ratio of emissions saving to emission could increase to more than 4 to 1 by 2030. Many countries, both developing and developed, are aiming to use cleaner technologies [1]. The national and international policies to reduce the GHG emission aims for emission reduction, increased use of renewable energy and increased energy efficiency.

1.3 Kyoto protocol

To combat climate change The Kyoto Protocol is the main current international agreement, which came into force on 16 February 2005.The Kyoto Protocol is an amendment to the United Nations Framework Convention on Climate Change (UNFCCC). Countries that have ratified this protocol have committed to reduce their emission of carbon dioxide and five other green house gases, or engage in emission trading if they maintain or increase emissions of these gases.

The five principal concepts of the Kyoto Protocol are

1. The main feature of the protocol lies in establishing commitments for the reduction of green house gases that are legally binding for Annex I Parties. Commitments for the Annex I Parties [9], [10].
2. Implementation. In order to meet the objectives of the Protocol, Annex I Parties

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are required to prepare policies and measures for the reduction of greenhouse gases in their respective countries. In addition, they are required to increase the absorption of these gases and utilize all mechanisms available, such as joint implementation, the clean development mechanism and emissions trading, in order to be rewarded with credits that would allow more greenhouse gas emissions at home.

3. Minimizing Impacts on Developing Countries by establishing an adaptation fund for climate change.
4. Accounting, Reporting and Review in order to ensure the integrity of the Protocol.
5. Compliance. Establishing a Compliance Committee to enforce compliance with the commitments under the Protocol.

The carbon dioxide emission concentration has large uncertainties due to emission from deforestation and per country emission of other green house gases. The small concentration differences between the different countries are not significant due to other uncertainties like decay of remaining biomass, deforestation, underground fires etc.

2 Environmental carbon trading

The Environmental Carbon Trading is done on the basis of the Carbon Credits earned. The Carbon Credits are the production cost, for which, ultimately the consumer pay.

These credits are maintained in the form of Electronic certificates, like Demate share Certificates, which facilitates its trading. Two types of trading take place in carbon market- Cap and trade (or emission trading) and Offset trading (trading in project based carbon credits).

Although it is not possible to pinpoint a single founder of carbon trading, many of the theories from which it derives can be traced back to the work of economist Ronald Coase, George Stingler and later J. H. Dales- Who provided a theoretical framework on the basis of which a market based means to tackle pollution could be developed [10].

Over the last few years several instruments, mechanisms and markets have emerged for carbon trading. Two types of carbon market exist- The voluntary and the Regulatory compliance markets. Voluntary market support activities to reduce emission not mandated by policymakers, including certifications to support carbon neutrality. In this market the trade of carbon credit is on a voluntary basis. As of March 2010, there are currently more than 2000 registered CDM projects in 58 Countries. The compliance market is used by companies and government that, by law, have to account for their GHG emissions. It is regulated by mandatory national, regional and international carbon reduced regimes. As of March 2010, there are currently more than 2000 registered CDM projects in 58 Countries.

There are many ways and efforts underway to reduce carbon emission and promote activities which help to store and remove carbon. This has made carbon a valuable economic commodity. Several approaches to the reduction can be intervened by respective government. Since this is a global issue the cost to countries to address this menace will differ. The cost of eliminating an additional unit of

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pollution may differ by country. It might cost country X Rs 100 to eliminate a ton of carbon, but it would probably cost Country Y differently.

To find a common unit for this commodity all GHCs are converted to CO2 equivalents. The CO2 (eq.) are traded on carbon markets. The market works on the similar way to financial markets. The currency used on these markets is carbon credits.

2.1 Steps for Carbon Trading

a. Setting a Clear Goal – Capping Emissions

The first step is to pass regulation that sets mandatory limits (or caps) on CO 2 emissions over a specific time period. The national cap determines the supply of allowances over a given period, which will affect the price signal. The cap is set to achieve a reduction in emissions to a desired level over the target horizon. Typically, this cap is broken down into targets for different sub periods, providing interim goals for emission reductions along a path towards the long-term target.

b. Assigning Responsibility – Allocating Allowances

National regulations specify which individual firms are covered by the cap –whether private companies, public sector installations, or both. Each firm is given its own cap consistent with an aggregate reduction in CO2 emissions. The firms are then allocated the appropriate number of carbon allowances. At the end of the period covered by the regulations, each firm must either reduce its CO2 emissions to a level at or below its individual cap, or deliver allowances equal to the excess amount of emission. Firms that fail to meet their targets are fined.

c. Facilitating Cost-Effective Emission Reductions – Trading

Once allowances are allocated, the stage is set for trading to begin. Each firm must determine the most cost-effective means to reduce (or abate) its carbon emissions. The firm may invest in improving its production processes. Or it may judge that it is cheaper to buy allowances in the carbon market sufficient to cover its excess emissions.

Suppose that Enterprise A has a level of CO2 emissions that is above its regulated cap, and has limited or uneconomic abatement opportunities. Enterprise B has a low-cost opportunity to reduce CO2 emissions and can therefore sell its excess allowances to Enterprise A. At the end of this transaction, both parties are within their caps. Physical trading in carbon instruments takes place either on an organized exchange or over the counter, similar to other commodities. A number of carbon exchanges have emerged that trade spot, forward, and option contracts in carbon.

d. Ensuring Accountability – Monitoring and Reporting

As with any market, a cap-and-trade market may not develop efficiently without the necessary infrastructure. Experience suggests that a successful carbon- trade system relies on the following elements:

registration of the ultimate owner of allowances or credits independent monitoring of emissions from a facility reporting of emissions to a central authority over a given period verification of the level of emissions and confirmation of reductions These components

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are critical for promoting both public and business confidence in the system, allowing the market to function properly, and minimizing uncertainty. While some of these functions may be provided by financial intermediaries, a central authority may have responsibility for some or all of the functions.

e. Ensuring Compliance – Reconciliation

At the end of the period covered by the scheme, regulators must reconcile a firm's emission against its holdings of allowances to ensure compliance. The firm must either deliver the equivalent number of allowances for its excess emissions, or pay some predetermined fine if they are short. This fine effectively sets an upper limit on prices for emissions. Without effective compliance and enforcement, the incentives will not be in place to ensure an aggregate reduction in emissions. In the case of the U.S. Acid Rain Program, compliance has been very high, with over 99 per cent of firms meeting their targets, thanks to rigorous monitoring, reporting requirements, and stringent penalties. By 2007, the Environmental Protection Agency reported that sulphur 8 dioxide emissions were 41 per cent below their 1980 levels, while emissions of nitrogen oxides were 57 per cent below their 2000 levels. Broadly carbon market can be divided into regulated and voluntary markets. These two markets can be viewed in two different ways:

Demand side: When viewed from the demand side of carbon permits, regulated market refers to countries and companies that have a mandatory cap on the amount of CO2 they can produce. Voluntary market on the other hand refers to entities taking action to meet other goals (such as corporate social responsibility, brand building, product differentiation, and even moral obligations).

Supply side: When viewed from the supply side of carbon permits, regulated market refers to carbon instruments that have been certified as compliant with a mandatory system (e.g., CDM), whereas, voluntary market refers to carbon instruments that have been developed outside any mandatory system (e.g., voluntary carbon standard).

2.2 Carbon trading practices in India

About 65 percent of India's carbon dioxide emissions in 2009 was from heating, domestic uses and power sector. About 9 percent of India's emissions were from transportation (cars, trains, two wheelers, airplanes, others). India's coal-fired, oil- fired and natural gas-fired thermal power plants are inefficient and offer significant potential for CO2 emission reduction through better technology. Compared to the average emissions from coal-fired, oil-fired and natural gas-fired thermal power plants in European Union (EU-27) countries, India's thermal power plants emit 50 to 120 percent more CO2 per kWh produced [11]. This is in significant part to inefficient thermal power plants installed in India prior to its economic liberalization in the 1990s.

Between 1990 and 2009, India's carbon dioxide emissions per GDP purchasing power parity basis have decreased by over 10 percent, a trend similar to China. Meanwhile, between 1990 and 2009, Russia's carbon dioxide emissions per GDP purchasing power parity basis have increased by 40 percent. India has one of the better records in the world, of an economy that

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is growing efficiently on CO2 emissions basis. In other words, over the last 20 years, India has reduced CO2 emissions with each unit of GDP increase [11]. Per Copenhagen Accord, India aims to further reduce emissions intensity of its growing GDP by 20 to 25 percent before 2020, with technology transfer and international cooperation. Nevertheless, it is expected, that like China, India's absolute carbon dioxide emissions will rise in years ahead, even as International Energy Agency's Annex I countries expect their absolute CO2 emissions to drop.

These pollutants are emitted in large quantities in India every day from incomplete and inefficient combustion of biomass (fuel wood, crop waste and cattle dung). A majority of Indian population lacks access to clean burning fuels, and uses biomass combustion as cooking fuel. India's poorly managed solid wastes, inadequate sewage treatment plants; water pollution and agriculture are other sources of greenhouse gas emissions [12], [13].

India has a better opportunity for its industries to produce carbon credits because India has a much less emission level as compared to other developed nations. Presently, after China India the biggest producer of CERs in the world is India. This is because of the outdated technology adopted by the energy sector industries which need an overhauling. Hence the Coal fired power generations in India are the biggest polluter and the biggest opportunity for emission reduction. The CDM projects in India include biogas, biomass, energy efficiency, waste gas and wind energy. In India most of the energy sectors are the market for CDM projects. Till date India has the second largest carbon market globally registered under CDM projects.

2.3 Indian market of carbon trading

Carbon credits have become the key element of national and international counter measures to neutralize the growth of such green house gases. The reduction in emission is supported by offering monetary value in such cases. Each CER is equivalent to one tons of carbon dioxide reduction. Such a credit can be sold in the international market at the prevailing market price. This has become an entirely new industry with great potential and opportunities for the companies (including Indian ones) and individual investors alike.

India could emerge as one of the largest beneficiaries accounting for more than 25 % of the total global carbon trade based on World Bank Report [14]. Indian companies have started generating carbon credits and carbon credit trading in India has gained a lot of momentum in recent years. India has a huge potential of gaining from Carbon trading market.

Table 2 shows enough opportunities for Indian companies to produce carbon credits and capitalize its economic benefits by trading. The growing Indian Economy and its diverse sector offer huge potential for CERs. Besides the CDM, the concept of voluntary carbon markets has been also picking up in India. Indian companies like L & T, Wipro, Asian Paints, ACC, and Tata Steel are at the forefront to reduce their carbon emission.

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TABLE 2: WORLD VS INDIAN CARBON MARKET.

Year	Global CER Transactions (mCERs)	Indian CER Transactions	Indian (in % terms)
2006	466	56	12
2007	551	33	6
2008	395	16	4
2009	200	04	2

According to Crisil Research Report, 2010, the quantum of carbon credits generated from the carbon reduction projects undertaken in India will triple over in next three years and the numbers are expected to increase from 72 million in November 2009 to 246 million by December 2012. Indian market is extremely receptive to CDM. Many companies have also already entered into the agreement of selling these credits in the International markets. Thus India has emerged as the second largest seller of carbon credits [15].

A must mention project is The Delhi Metro Rail Corporation (DMRC): It has become the first rail project in the world to earn carbon credits because of using regenerative braking system in its rolling stock. DMRC has earned the carbon credits by using regenerative braking system in its trains that reduces 30% electricity consumption.

DMRC can now claim 400,000 CERs for a 10-year crediting period beginning December 2007 when the project was registered by the UNFCCC. This translates to Rs 1.2 crore per year for 10 years. India has the highest number of CDM projects registered and supplies the second highest number of Certified Emission Reduction units. Hence, India is already a strong supplier of Carbon Credits and can improve on it.

3 Future scenario

If India can capture a 10% share of the global CDM market, annual CER revenues to the country could range from US$ 10 million to 300 million (assuming that CDM is used to meet 10-50% of the global demand for GHG emission reduction of roughly 1 billion ton CO2, and prices range from US$ 3.5-5.5 per ton of CO2). As the deadline for meeting the Kyoto Protocol targets draws nearer, prices can be expected to rise, as countries/companies save carbon credits to meet strict targets in the future. India is well ahead in establishing a full-fledged system in operationalizing CDM, through the Designated National Authority (DNA).

There is a great opportunity awaiting India in carbon trading which is estimated to go up to $100 billion by 2010. In the new regime, the country could emerge as one of the largest beneficiaries accounting for 25 per cent of the total world carbon trade, says a recent World Bank report. The countries like US, Germany, Japan and China are likely to be the biggest buyers of carbon credits which are beneficial for India to a great extent. The Indian market is extremely receptive to Clean Development Mechanism (CDM). Having cornered more than half of the global total in tradable certified emission reduction (CERs), India's dominance in carbon trading under the clean development mechanism (CDM) of the UN

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Convention on Climate Change (UNFCCC) is beginning to influence business dynamics in the country. India Inc pocketed Rs 1,500 crores in the year 2005 just by selling carbon credits to developed-country clients. Various projects would create up to 306 million tradable CERs. Analysts claim if more companies absorb clean technologies, total CERs with India could touch 500 million. Of the 391 projects sanctioned, the UNFCCC has registered 114 from India, the highest for any country. India's average annual CERs stand at 12.6% or 11.5 million.

4 Conclusion

Indian environmental conditions and the industrial practices have a huge potential of gaining from carbon trading. The Carbon accounting and its disclosure has become an important issue for the Indian companies. Public and private initiatives are urgently much required for encouraging industries and societies to understand the different facets of environmental pollution, its reduction strategies and the carbon financing in particular. Hence the India has a large potential to earn carbon credits and in this context the carbon consultancy service has a greater part to play and is going to add a new dimension to the Environmental consultancy and financial services arena.

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