# Asian Journal of Scientific Research

ISSN 1992-1454

science alert
http://www.scialert.net

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an open access publisher
http://ansinet.com

Asian Journal of Scientific Research 7 (3): 405-411, 2014
ISSN 1992-1454 / DOI: 10.3923/ajsr.2014.405.411


# Carbon Trading and Green House Gas Emission-An Analysis

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## ABSTRACT

Greenhouse gases, $CO_2$ Dioxide Carbon; $CH_4$ Methane, Nitrous Oxide $N_2O$, HFCs Hydro fluorocarbons; Perfluorocabonos and PFCs and $SF_6$ Sulfur Hexafluoride cause global warming. Since $CO_2$ is the dominant greenhouse gas, these are generally referred to as Carbon gas. In order to save the world from global warming, United Nations Framework Convention on Climate Change (UNFCCC) was adopted in 1992 and Kyoto Protocol was signed in 1997 as a follow up measure, which came into force from 2005. Kyoto Protocol fixed ceilings on the emission of green house gases (GHGs) by the developed countries. These countries have set limits to GHG emissions by their own industries and others. The European Union Emissions Trading Scheme (EUETS) is the main pillar of the European Union in meeting its commitments under the Kyoto Protocol. Three market based mechanisms have been designed to encourage the reduction of green house emissions, which are (1) Clean Development Mechanism (CDM), (2) Joint Implementation (JI), (3) International Emission Trading (IET). The developed countries which are bound to reduce their emissions can discharge their commitments by purchasing the Carbon Emission Reduction entitlements (CERs) from the other countries which have implemented green house gas reduction projects. The CERs or carbon credits are traded in the international and Indian commodity exchanges at market determined prices. In India, Multi Commodity Exchange (MCX) has become the first Asian exchange to trade in carbon credits. It has been reported that about 300 Indian companies are already trading in carbon credits in MCX. This study analyses the factors which can affect carbon trading and hence, the future green house gas emission.

**Key words:** Carbon trading, green house gas emission, kyoto protocol, CERs

## INTRODUCTION

The human population has advanced in economic development with new products and changed styles of living. $CO_2$ was around 280 ppm in the atmosphere during the early period of industrial revolution which reached 365 ppm over the decade from 1990. Presently it is estimated to be more than 400 ppm in the atmosphere.

Nations have competed with each other in exporting to the other nations using new and cheaper methods of production, both in industry and agriculture. The mode of transportation has dramatically changed with the advent of automobiles, trains and air travel. Every human being generates heat by burning fuel or consumption of electricity. No part of human life moves without electricity, the production of which is generally done by consuming coal or other fossil fuels. There is large scale deforestation to accommodate the growing population in every country. Most chemical processes emit green house gases (Kasim *et al*., 2007; Li and Teng, 2007). All these activities generate what are called green house gases (GHGs). The GHGs are $CO_2$ (Dioxide Carbon), $CH_4$ (Methane), Nitrous Oxide ($N_2O$), Hydro fluorocarbons (HFCs), Perfluorocabonos (PFCs) and $SF_6$ (Sulfur Hexafluoride). These six gases are recognized as green house gases in the Kyoto Protocol. The major sources of these green house gases can be summarized in Table 1.

Table 1: Sources of emission of greenhouse gases

| Greenhouse gases | Common emission sources |
|---|---|
| Carbon dioxide | Combustion of fossil fuels |
| Methane | Animal, agriculture and municipal wastes, rice cultivation |
| $N_2O$ | Combustion processes, chemical industry |
| HFCs | Refrigerants |
| PFCs | Semiconductor industry |
| $SF_6$ | Electrical insulation |

Of these gases, since carbon dioxide is predominant, these gases in general are called Carbon gas. Global warming occurs because of the emission of green house gases, which leads to multiplicity of issues for the human race.

Appreciating the criticality of the issue, at the United Nations Conference on Environment and Development (UNCED) in Rio, the Convention on Climate Change was agreed in 1992. The 186 countries have joined the Convention to take appropriate measures to prevent green house gas emission and global warming. In order to operationalize the goals of the Convention, these countries have entered into a protocol at Kyoto in 1997. This protocol is known as Kyoto Protocol. The most important aspect of the Protocol is that the 39 developed countries have legally committed to reduce their green house emission by an average of about 5% by 2012, taking the year 1990 as the base period for the purpose. The European Union Emissions Trading Scheme (EUETS) has been designed by the European Union for the purpose of meeting its Kyoto Protocol obligations.

The Kyoto Protocol has created three mechanisms for the purpose of reducing green house emissions. They are Clean Development Mechanism (CDM), Joint Implementation (JI) and International Emission Trading (IET). The last two are applicable to the developed countries who have agreed to reduce their emissions and the first is applicable to countries, usually the developing countries, that have no binding commitment to reduce their gas emissions.

## GREEN HOUSE GAS EMISSION CONTROL MECHANISMS

As mentioned earlier, there are three mechanisms recognized under the Kyoto Protocol to reduce green house gas emission. Under International Emission Trading, the developed countries having emission reduction targets, can purchase carbon credits from the open market at the prevailing market price from the other developed countries which have exceeded their emission reduction targets or have surplus carbon credit from other approved schemes. Under Joint Implementation, what happens is that a developed country, whose cost of green house gas reduction project is high, can set up the project in other developed countries where the cost of such project is low and earn the carbon credit to offset against its emission obligations. Under Clean Development Mechanism, a developed country takes up the green house gas emission reduction project in another developing country, where the set up cost of such project is very low and shares the carbon credit with the host developing country. The carbon credit thus received can be adjusted by the developed country against its reduction commitment under Kyoto Protocol. The carbon credit is issued by way of what are called Certified Emission Reductions (CERs, called as carbons credits). One unit of CER thus issued covers one metric ton of $CO_2$ or its equivalent. These CERs can be traded in the international commodity markets like the shares of companies are traded in stock exchanges. The developed countries who have emission reduction obligations can offset their obligations by buying carbon credits from these open markets.

Projects which are eligible to get CERs under the Clean Development Mechanism are classified as Energy Efficiency Projects, Transport, Methane Recovery, Industrial Process Change, Cogeneration and Agricultural Sector. These projects shall aim for, (1) Promotion of local environmental sustainability, (2) Assistance in the development of working conditions and net generation of employment, (3) Promotion of income distribution, (4) Assistance in development and technology training and (5) Cooperation with regional integration and linkages with other sectors. Clean Development Mechanism also motivates countries to improve energy efficiency and the promotion of renewable energy and cogeneration of energy.

The important projects so far registered by the Clean Development Mechanism include hydropower dams, wind turbines, biomass power plants, capturing methane from coal mines and changes to industrial processes.

## REVIEW OF LITERATURE

Cavalcanti (2012), elaborately discusses about the Clean Development Mechanism and how the Brazilian swine farms can take carbon credit by using biogas digesters which generate thermal and electrical energy. Mondal and Sachdev (2013) stated that India is in an advantageous position to reap the benefits arising out of the carbon credit mechanism, though India ranks second, only next to China in Clean Development Mechanism. They also brief about the leading CDM projects operating in India. Prabhakant and Tiwari (2008) give a detailed account of the Solar Energy Park in IIT, New Delhi, quantify the amount of carbon credit from the project and estimate the return on capital. Reddy and Suvikram (2012) narrate the process involved in the Clean Development Mechanism, the types of projects permitted by CDM and the concerns faced in the successful implementation of CDM projects. Arif (2012) states that India could earn an estimated Rs. 8900 crores annually from the carbon credits generated with the implementation of the suggested changes in bio-gas plants even if in 20% of rural India it is done. Show and Lee (2008), stated the methane recovery could be increased to a greater extent through the use of anaerobic granulation system for the treatment of waste water and green house gas emission can be reduced in a bigger way. Gupta (2011) describes the business opportunities available because of the global green gas emission norms and how India could seize those opportunities. Williams *et al.* (2005) in their article discussed about the demand and supply factors for the carbon market and how the price of carbon is affected by the various forces in the market. According to Birla *et al.* (2012), India could end up with a carbon trading volume of US$ 100 billion by 2010. They also explain the three mechanisms worked out by the Kyoto Protocol for the conservation of energy and the reduction of green house gas emission, namely, International Emission Trading (IET), Joint Implementation (JI) and Clean Development Mechanism (CDM). National Solid Waste Association of India in its News Letter (NSWAI, 2007) states that three kinds of processes, physical, bio-chemical and thermal are available to reduce the solid waste generated by the municipalities. The News Letter gives examples for these three kinds of processes as, pelletisation, aerobic composting and anaerobic digestion and incineration and gasification respectively. Dhingra and Dhingra (2010) made a survey of small and medium enterprises in Parsakhera and Bareiley, India and find that most of the units are aware of the problems arising out of green house gas emission and state that these firms practice water harvesting, planting trees etc to preserve the ecosystem. Haya (2008) deals with issues like fake carbon credit and others connected with the Clean Development Mechanism. Arjunwadhar *et al.* (2008) discussed how the small scale foundry units can save energy and claim

carbon credit benefits and suggest that because the upfront costs for registering CDM projects are higher, bundling, or bringing the units together for the purpose of claiming the carbon benefits could be considered.

## MARKET FOR CARBON TRADING

The industries polluting the air are made to bear the cost by assigning a market value to the carbon credits which they buy from the open market. The projects approved by Clean Development Mechanism generate Certified Emission Reductions (CERs). CERs are given after the due diligence process by the Executive Board of the Clean Development Mechanism only for the approved projects. The emission reduction projects are cheaper to be established at the developing countries. At the same time, the developed countries are under the legally committed obligation under Kyoto Protocol to reduce the green house gas emissions. Thus the developing countries are in a position to sell their carbon credits and there is need for the developed countries to buy the carbon credits to satisfy their obligations. As a result, the carbon credits (CERs) are traded in the market through commodity exchanges. One such commodity exchange which trades in Carbon is Chicago Climate Exchange, founded in 2003. Buyers can purchase carbon credits in these markets as it suits to them, may be according to their financial investment capacity, requirement for emission reduction, responsibility for the environment or just for the purpose of future trading anticipating attractive returns. The key sellers of carbon credit in the international market are China, India and Brazil. The biggest buyers of carbon were Japan, United Kingdom and Netherlands. The green house gas emission is balanced globally through carbon trading and the developed countries are allowed to continue with their existing production facilities until an alternative is found out for the reduction of their own emissions.

The price of carbon in the market is determined by its demand and supply factors. The demand comes from companies which require carbon credits to fulfill their commitments and also from the financial investors expecting to make profit in the future price movements based on expected demand and expected supply. The supply of carbon credit comes from projects executed under CDM. In theory, according to the law of demand, if at any particular point of time, the volume of demand is more than the volume of supply in the market, the carbon price increases in the market and vice versa, assuming that the factors other than price and the volume of carbon remain constant. But the dynamics of price movement in the market is not that simple, for example, changes can occur in technology, government policy, information asymmetry, changes in weather and energy prices. Also, vested interests and speculators disrupt the natural play of the market forces of demand and supply. All these and other factors make carbon pricing in the market complex.

Carbon market price has been fluctuating widely. The price of carbon has fallen to Euro 2.8 level per ton during April 2013 from the earlier levels of Euros 30 or 40 per ton.

## CARBON TRADING-THE INDIAN SCENARIO

Compulsory green gas reduction obligation under the Kyoto Protocol does not apply to India. The Planning Commission of India in its Report on National Action Plan on Climate Change for operationalizing Clean Development Mechanism stated that India's emission of green house gases during 1990 approximated about 3% of the global emission. India has set up the Designated National Authority to operationalize the CDM. With India leading as the second global player in the carbon market, next to China, it can benefit sizably from the Clean Development Mechanism.

India has registered 505 projects out of a total of 2194 CDM projects as on May 7 2010. India ranks second to China in terms of the volume of the CERs. The volume that has been traded in India during 2012 has been estimated at about 323,000 CERs. Bachat Lamp Yojna is the world's largest carbon credit project being implemented in India under the Clean Development Mechanism. The project envisages replacing 400 million incandescent light bulbs with CFL bulbs, saving energy. The CFL bulbs will be sold to the households at a cheaper price of Rs. 15 against the normal cost of Rs. 100 per CFL bulb under a finance scheme. It is estimated that Bachat Lamp Yojna will reduce 40 million tons of carbon gas emission annually.

Certified Emission Reductions (CERs) are considered as intangible assets falling within the Accounting Standard AS-26 issued by the Institute of Chartered Accountants of India. They are considered as movable goods and are taxable under the Value Added Tax Act (VAT) of the appropriate state in India.

Carbon credit in India is traded on NCDEX MCX as a futures contract. In a futures contract, the price and volume of carbon are fixed at the time of entering into the contract but the delivery is agreed to be given or taken on a future agreed date. The carbon contracts in MCX can be traded only by Indians. The carbon futures contracts expire every December and carbon delivery has to be given as per the contract. The traders in the NCDEX get price signals for the next five years for the carbon credit contracts. The majority of the traders in the Exchange are financial investors anticipating to make gains out of future price movements. The carbon selling companies have to be those setting up new technologies and complying with the norms specified by UNFCCC.

## ISSUES IN CARBON TRADING

Carbon Trading, though launched with an ideal objective to control green house gas emissions, faces many issues to be resolved. First of all, United States, which emits more than 25% of the green house gases, does not agree on many of the policy matters with other countries for the reduction of the carbon emission.

Many limitations in Clean Development Mechanism, which authorizes the issue of CERs, have been experienced. The procedures regarding validation, registration and issue of CERs are lengthy so, it is reported that it takes about 18 to 24 months to obtain CERs from a project under Clean Development Mechanism. Currently the price of carbon in the international markets is at a low level due to expiry of the commitment period agreed under Kyoto Protocol. The system, it is reported, has drained the precious financial resources of the developed countries because of high carbon price levels in the past. Using the loopholes in the CDM approval process, many projects which would have any way been undertaken have been approved. Also many fake projects which do not add to the reduction of green house gas emission have got the approval under the Clean Development Mechanism. This has resulted in the carbon brokers, consultants and project developers getting rich at the cost of the tax payers. Another big news is that CDM approvals were sanctioned to projects which were already executed and running at the time of giving approval. As a result, no green house gas reduction occurs but the money is spent, helping neither the developed countries nor the developing countries in their effort to enhancing the green technology. It is not unusual that many of the carbon conferences and work shops discuss about forgery and frauds in carbon projects. Another drawback that has been reported is that China gets approvals for big dams under the CDM process, but the down stream industries to use the hydro energy come up after a long period of time and there is no immediate green house gas emission benefit.

## CONCLUSION

The objective of the Clean Development Mechanism and carbon trading is laudable. However, the limitations experienced in the implementation of the mechanism need thorough inquiry and the necessary remedial action is taken up without much loss of time. It is important that the existing and historic data on emission of the projects is audited thoroughly before the CDM approvals are granted.

Price of carbon fell to the level of Euro 2.8 per ton during April 2013 from the remunerative price levels of Euros 30 or 40 per ton. It has been reported that on a single day in April, 2013 the carbon prices have been driven down by 40%. George Monbiot of The Guardian says that if markets are left to the market forces, where profit motive is the regulator, nothing is safe. In the alternative to the carbon trading mechanism, governments can think of a tax system for green house gas emission also.

Policy regulations require tightening so that the volatility in the carbon prices in the market is smoothened. The price stability of carbon and sound rules for the approval of CDM projects are necessities which would encourage long term investments in green energy technologies.

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