

THE INTERNATIONAL JOURNAL OF BUSINESS & MANAGEMENT

A Study: Future of Carbon Markets in India

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Abstract:

Climate change is a global environmental problem and can manifest itself in gradual shifts in temperature, precipitation and a rise in sea level. The changes in temperature have been associated with increasing concentration of atmospheric carbon dioxide (CO₂) and other greenhouse gases in the atmosphere. Developing carbon credit market that motivates true reductions in carbon emissions must address all carbon pools and their GHG emission.

Study of future of carbon markets, carbon credit price fluctuations and how carbon credits are traded on Chicago climate exchange (CCX) to reduce GHG emissions is the topic of paramount importance. The research focuses on the future trends of carbon markets, growth of carbon market both allowance- based as well as project- based markets. We have tried to analyze three flexible mechanisms under Kyoto protocol that enable developed countries with quantified emission limitations and reduction commitments to acquire greenhouse gas reduction credits, how trading is going on Chicago climate exchange so that members of the exchange can earn Carbon Financial Instrument (CFI) contracts for any reductions that they are able to achieve below their defined reduction amount.

The future of global carbon markets is finely poised as recession threatens the political will to shoulder costs but New Zealand, Australia and Japan follow Europe with their own cap and trade schemes. Strong carbon markets depend on tough climate change goals is now under discussion in international talks to replace the Kyoto Protocol from 2013. Clear visibility is therefore limited to a four-year horizon, in a market tipped to exceed \$100 billion in 2008. “(Comparing) the financial crisis and the post-2012 uncertainty, the uncertainty is a ten times bigger problem,” said Alex Wyatt, director of Emissions Zero, a project developer that advises Chinese companies on securing carbon finance under the Kyoto Protocol.

The Various factors such as global warming, Kyoto Protocol- the UNFCCC framework on carbon markets, carbon market classification and mechanism, carbon credit price fluctuations, factors determining carbon pricing and future of carbon markets are the topics studied under.

Keywords: Carbon Markets, Carbon Credits, Kyoto Protocol, Global Warming

1. Introduction

The dramatic imagery of global warming frightens people. Melting of the glaciers, freak storms and stranded polar bears, the mascots of climate change, shows how quickly and drastically greenhouse gas (GHG) emissions are disturbing/ changing our planet. Such graphic examples, combined with the rising price of energy, force people to reduce consumption and lower their personal shares of global emissions. However behind the emotional front of climate change, there lay a developing framework of economic solution to the problem. There exists 2 major market-based options and politicians around the world have largely settled on carbon trading over its rival and chosen the method to regulate GHG emissions.

One of the main greenhouse gases is carbon dioxide (CO₂). As trees grow they take in CO₂ from the air. When the wood or a tree dies the CO₂ is returned back to the air. Forest clearance and wood burning is increasing the latter half of the process, adding to the CO₂ in the atmosphere. Deforestation however is now out of control. For example in the year 1987 an area of the Amazon rain forest the size of Britain was burned, adding 500 million tons of CO₂ to the atmosphere. Loss of the forests also means that there are fewer trees to absorb CO₂. About 50% CO₂ contributes to the greenhouse effect. The other greenhouse gases are chlorofluorocarbons (CFCs), nitrous oxide (N₂O) and methane

Global warming is the increase in the average temperature of the earth's near-surface air and oceans since the mid-20th century. There are many cause of Global Warming. Causes are divided into two groups, man-made and natural causes. Natural causes are causes that are created by nature. One of the natural causes is release of methane gas from arctic tundra and wetlands. Methane is considered to be a greenhouse gas. A greenhouse gas is a gas that traps heat in the earth's atmosphere. Other natural cause is that the earth goes through a cycle of climate change. Climate change usually lasts for about 40,000 years. Man-made probably do the most damage. One of the biggest man-made problems is pollution. Burning fossil fuels is one such thing that causes lot of pollution. Fossil fuels are fuels made up of organic matter like coal, or oil. When these fossil fuels are burned they release a greenhouse gas called CO₂. Mining coal and oil also allows methane to escape.

Since CO₂ contributes to global warming, the increase in population makes the problem worse because we breathe out CO₂. Also, the trees that convert our CO₂ to oxygen are being demolished because we're using the land that we cut the trees down from as

property for our homes and buildings. Hence we are not replacing the trees, so we are constantly taking advantage of our natural resources and giving nothing back in return.

2. Kyoto Protocol

The concept of carbon credits came into existence as a result of increasing awareness of the need for controlling emissions. Kyoto Protocol, an international agreement between 169 countries. The Kyoto Protocol is a protocol to the United Nations Framework Convention on Climate Change (UNFCCC or FCCC), an international environmental treaty produced at the United Nations Conference on Environment and Development (UNCED), informally known as the Earth Summit, held in Rio de Janeiro, Brazil, from 3–14 June 1992. The treaty is intended to achieve "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system." The Kyoto Protocol establishes legally binding commitments for the reduction of four greenhouse gases (carbon dioxide, methane, nitrous oxide, sulfur hexafluoride), and two groups of gases (hydro fluorocarbons and per fluorocarbons) produced by "Annex I" (industrialized) nations, as well as general commitments for all member countries. Under Kyoto, industrialized countries agreed to reduce their collective GHG emissions by 5.2% compared to the year 1990. National limitations range from 8% reductions for the European Union and some others to 7% for the United States, 6% for Japan, and 0% for Russia. The treaty permitted GHG emission increases of 8% for Australia and 10% for Iceland.

Kyoto includes defined "flexible mechanisms" such as Emissions Trading, the Clean Development Mechanism and Joint Implementation to allow Annex I economies to meet their greenhouse gas (GHG) emission limitations by purchasing GHG emission reductions credits from elsewhere, through financial exchanges, projects that reduce emissions in Annex II economies, from other Annex I countries, or from Annex I countries with excess allowances.

The Intergovernmental Panel on Climate Change (IPCC) has predicted an average global rise in temperature of 1.4°C (2.5°F) to 5.8°C (10.4°F) between 1990 and 2100. Proponents also note that Kyoto it is a first step to meet the UNFCCC will be modified until the objective is met, as required by UNFCCC. The treaty was negotiated in Kyoto, Japan in December 1997, opened for signature on 16 March 1998, and closed on 15 March 1999. The agreement came into force on 16 February 2005 following ratification by Russia on 18 November 2004. As of 14 January 2009, a total of 183 countries and 1 regional economic integration organization have ratified the agreement (representing over 63.7% of emissions from Annex I countries).

3. Carbon Trading A Tool To Limit Greenhouse Gases (Ghg)

Carbon trading, also called emissions trading, is a market-based tool used to limit GHG. The carbon market trades emissions under cap-and-trade schemes or with credits that pay for or offset GHG reductions. Cap-and-trade schemes are the most popular way to regulate carbon dioxide (CO₂) and other emissions. Scheme's governing body begins by setting up a cap on allowable emissions. Then it distributes or auctions off emissions allowances that total the cap. Member firms that do not have enough allowances to cover their emissions must either make reductions or buy another firm's spare credits. Members with extra allowances can sell them or bank them for future use. Cap-and-trade schemes can be either mandatory or voluntary. A successful cap-and-trade scheme relies on a strict but feasible cap that decreases emissions. In case the cap is set too high, excess of emissions will enter the atmosphere and the scheme will have no effect on the environment. If the cap is set too low, allowances are scarce and overpriced. Some cap and trade schemes have safety valves to keep the value of allowances within a certain range. In case the price of allowances gets too high, the scheme's governing body will release additional credits to stabilize the price. The price of allowances is usually a function of supply and demand.

Burning of fossil fuels is a major source of greenhouse gas (industrial) emissions, for power, cement, steel, textile, and fertilizer industries. Major greenhouse gases emitted by these industries are carbon dioxide, methane, nitrous oxide, hydro fluorocarbons (HFCs), etc., which all increase the atmosphere's ability to trap infrared energy and thus affect the climate.

4. GHG Emissions

The Sun, which is the Earth's only external form of heat it emits solar radiation mainly in the form of shortwave visible and ultraviolet (UV) energy. As this radiation travels toward the Earth, 25% of it is absorbed by the atmosphere and 25% is reflected by the clouds back into space. The remaining radiation travels unimpeded to the Earth and heats the surface. The Earth then releases a lot of energy it has received from the Sun back to space. However Earth is much cooler than the Sun, hence the energy re-emitted from the Earth's surface is much weaker, in the form of invisible long wave infrared (IR) radiation, sometimes called heat. Greenhouse gases like water vapour, carbon dioxide, methane and nitrous oxide trap the infrared radiation released by the Earth's surface. Atmosphere acts like the glass in a greenhouse, allowing much of the shortwave solar radiation to travel through unimpeded, but trapping a lot of the long wave heat energy trying to escape back to space. The process makes the temperature rise in the atmosphere just as it does in the greenhouse. It is the Earth's natural greenhouse effect and keeps the Earth 33°C warmer than it would be without an atmosphere, at an average 15°C. In contrast, the moon, which has no atmosphere, has an average surface temperature of -18°C.

During the last 200 years mankind has been releasing extra quantities of greenhouse gases which are trapping more heat in the atmosphere. Over the same time period the climate of the Earth has warmed, and many scientists now accept that there is a direct link between the man-made enhancement of the greenhouse effect and global warming.

Thus "greenhouse effect" refers to the temperature regulation effect that certain atmospheric gases have on the earth. "Global warming" or climate change can occur when the blanket of GHGs gets thicker. As the atmospheric concentrations of GHGs increase, the greenhouse blanket gets thicker. Implementation of Chicago Climate Exchange will help build and test the

institutions and skills needed to cost-effectively manage greenhouse gases. The six types of GHGs covered under global warming policies and in trading programs are:

- Carbon dioxide (CO₂)
- Methane (CH₄)
- Nitrous oxide (N₂O)
- Sulfur hexafluoride (SF₆)
- Perfluorocarbons (PFCs)
- Hydrofluorocarbons (HFCs)

5. Factors Affecting Global Warming

Earth intercepts the radiation from the sun and it is this energy that derives our weather and climate. Of this energy, one third of it is reflected back into space and the rest is absorbed by different parts of the climate system, such as the oceans, ice, atmosphere, land, and various forms of life. Earth then sends its energy out into space in the form of long waves of radiation. The energy is again absorbed and remitted through a process known as the Greenhouse effect, and the rest is lost to space.

The earth must maintain balance between the outgoing radiation as well as the incoming solar energy always. In case there is any change in the factors that affect this process of incoming and outgoing energy, the earth's climate will change and affect many aspects of the environment. There are different factors, both natural and human, that threaten this fragile balance.

5.1. Natural Factors Affecting Climate Change

- **Changes in the Solar Output:** Amount of energy radiating from the earth's sun is not constant.
- **Changes in the Earth's Orbit:** Slow variations in the Earth's orbit around the sun change where and when energy is received on earth. This further affects the amount of energy that is absorbed and reflected.
- **The Greenhouse Effect:** When energy from the sun enters the Earth's atmosphere, about a third of the energy is reflected back to space. Of the remaining, the atmosphere absorbs some, but most of it is absorbed by the surfaces of the earth. Earth however emits energy at a very longer wavelength. A part of this energy escapes to space but some is absorbed again and remitted by clouds and the greenhouse gases such as carbon dioxide, methane, water vapor and nitrous oxide. This helps to warm the surface and the troposphere (lowest layer of the atmosphere), keeping it 33°C warmer than it would be otherwise be.
- **Aerosols:** These are fine particles and droplets that are small enough to remain suspended in the atmosphere for considerable periods of time. They both absorb and reflect incoming solar radiation, changing the quantity and type of aerosols in the atmosphere affects the amount of solar energy reflected or absorbed.

5.2. Human Factors Affecting Climate Change

- **Enhancing the Greenhouse Effect:** Naturally occurring greenhouse gases, keep the Earth warm enough to support life. Scientific studies however have shown that a variety of human activities release greenhouse gases. This includes the burning of fossil fuels for producing electrical energy, heating, transportation etc. By increasing their concentrations and by adding new greenhouse gases humankind is capable of raising the average global temperature.
- **Land Use Change:** As humans replace forests with agricultural lands, natural vegetation with asphalt or concrete, they alter the way the Earth's surface reflects sunlight and releases heat. All these changes affect the regional evaporation, runoff and rainfall patterns. Land use and the changes in the way it is used effect the global carbon cycle, reduce the world's forests expand the cropped land area, and cause tropical deforestation.
- **Atmospheric aerosols:** Humans are adding large quantities of fine particles (aerosols) to the atmosphere, both from agriculture as well as industrial activities. However most of these aerosols are soon removed by gravity and rainfall hence they still affect the radiation balance in the atmosphere. This effect whether adds to or offsets any warming trend depends on the quantity and nature of the particles as well as the nature of the land or ocean surface below. The regional effects, however, can be significant.
- **Burning of Fossil Fuels for Energy:** As humanity burns the organic matter from past geologic periods (or the forests of today) to power the engines and economies of modern society, we are re-injecting our fossil carbon legacy into the atmosphere at incredibly accelerated rate. Carbon dioxide is dumped into the atmosphere at a faster rate than it can be absorbed by the oceans or living things in the biosphere. The carbon dioxide buildup is a principal controlling factor of the climate change.

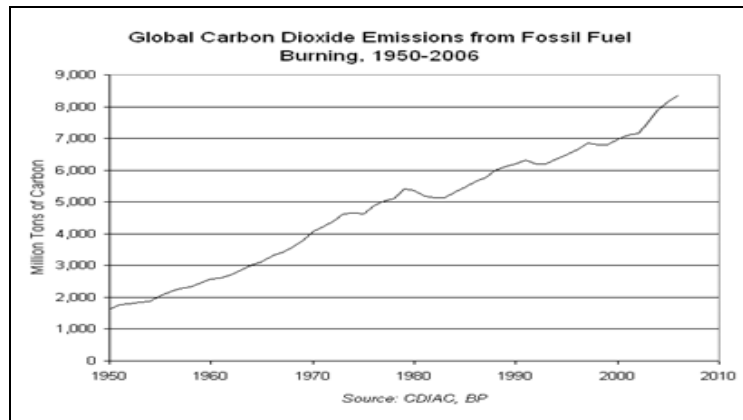


Figure 1: Showing Carbon Dioxide Emission From Fossil Fuels, 1950-2010
 Source: http://www.earth-policy.org/Indicators/CO2/2008_data.htm

The above figure shows global carbon dioxide emission from fossil fuel burning 1950-2010. In the year 1950 carbon emission was nearly around 1,600 (million tons of carbon) which rose to around 8,400 (million tons of carbon) in the year 2006. Hence in the coming years there is likely to be a rise in the global carbon dioxide emission as can be proved with help of above figure.

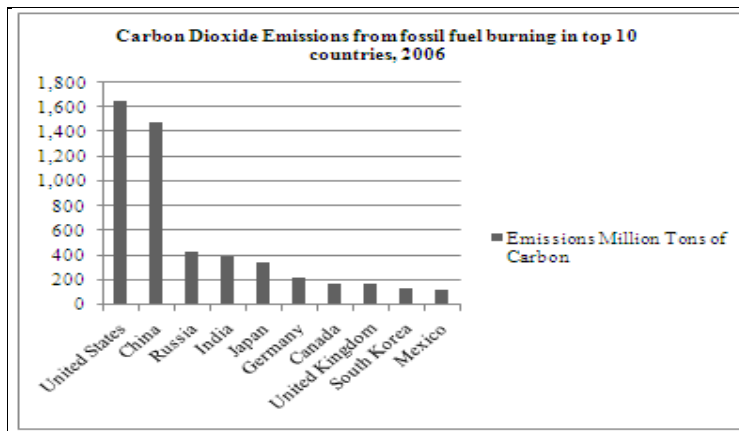


Figure 2: Carbon Dioxide Emission From Fossil Fuels Burning In Top 10 Countries, 2006
 Source: http://www.earth-policy.org/Indicators/CO2/2008_data.htm

The figure above shows Carbon Dioxide Emissions made by top 10 countries from fossil fuels burning, 2006. Emission made by top 10 countries are United States- 1,656 (million tons of carbon), China- 1,480 (million tons of carbon), Russia- 437 (million tons of carbon), India- 391 (million tons of carbon), Japan – 342 (million tons of carbon), Germany - 221(million tons of carbon), Canada- 177 (million tons of carbon), South Korea – 130 (million tons of carbon), United Kingdom – 171 (million tons of carbon), and Mexico- 123 (million tons of carbon). Hence all these countries have contributed a lot towards global warming.

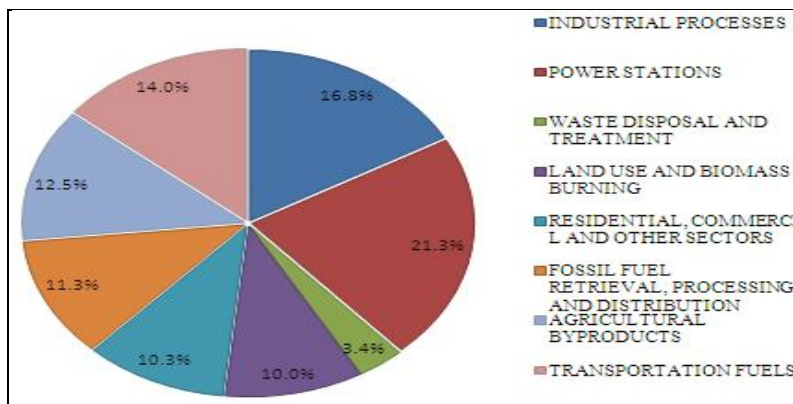


Figure 3: Annual Greenhouse Gas Emissions By Various Sectors
 Source: http://en.wikipedia.org/wiki/User:Dragons_flight/Images

The above figure shows annual greenhouse emission made by various sectors. Power stations- 21.3%, waste disposal and treatment-3.4%, land use and biomass burning-10.0%, residential, commercial and other sectors- 10.3%, fossil fuel retrieval, processing and distribution- 11.3%, agricultural byproducts- 12.5%, transportation fuels- 14.0% and industrial processes- 16.8%. All these sectors have led to global warming.

6. Effects of Global Warming

The effects of global warming are of major concern both for the environment as well as for the human life. Scenarios studied by the Intergovernmental Panel on Climate Change (IPCC) predict that global warming will continue and get worse much faster than was expected even in their report. Reports of IPCC attribute many specific natural phenomena to human causes. Glaciers are retreating as the surface temperature increases. Glaciers are very important for the survival of some communities. The runoff from the glaciers in the warmer summer months helps to fill dams, and reservoirs which are used for irrigation and drinking. With less cold waters running in to rivers fish that depend on colder water such as Salmon will not be able to reproduce. Sea ice is disintegrating. Polar bears use sea ice to breed, raise their young, hunt and travel. With less ice, some polar bears are turning to cannibalism. Studies suggest that if the trend continues, polar bears may become extinct within the century. With extreme flooding and drought comes a favorable condition for mosquitoes. Diseases such as malaria, Dengue Fever and West Nile virus are on the increase in Asia, East Africa and Latin America. Predictions for secondary and regional effects include weather events, tropical diseases, changes in the timing of seasonal patterns in ecosystems, and drastic economic impact. This have led to political activism advocating proposals to mitigate, or adapt to it. It is notable that many of the effects of global warming are non-linear in nature, with potential for dramatic positive feedback effects. This further means that the climate may enter a critical state where small changes can trigger runaway or abrupt climate change. Reengineering has been suggested as a means of interrupting or reversing these effects.

7. How To Control/Remove Global Warming?

Many efforts are being made by various nations to cut down the rate of global warming. The Framework Convention on Climate Change (1992) and the Kyoto Protocol (1997) represent the first steps taken by the international community to protect the Earth's climate from dangerous man-made interference. Currently, nations have agreed to reduce greenhouse gas emissions by an average of about 5% from 1990 levels by the period 2008 to 2012. The UK, through its Climate Change Program me, has committed itself to a 12.5% cut in greenhouse gas emissions. Additional commitments for further greenhouse gas emission reduction will need to be negotiated during the early part of the 21st century, if levels of greenhouse gas concentrations in the atmosphere are to be stabilized at reasonable levels. Existing and future targets can be achieved by embracing the concept of sustainable development - development today that does not compromise the development needs of future generations. In practical terms, this means using resources, particularly fossil-fuel-derived energy, more efficiently, re-using and recycling products where possible, and developing renewable forms of energy which are inexhaustible and do not pollute the atmosphere.

However it is not easy to attach any particular events to global warming, but studies have proved the fact that human activities are increasing the earth's temperature. Even though most predictions focus on the epoch up to 2100, even if no further greenhouse gases were discharged after this date, global warming and sea level would be likely to go on to rise for more than a millennium, since carbon dioxide has a long average atmospheric life span.

8. Carbon Credits

Carbon credits are a key component of national and international emissions trading schemes that have been implemented to mitigate global warming. They provide a way to reduce greenhouse effect emissions on an industrial scale by capping total annual emissions and letting the market assign a monetary value to any shortfall through trading. Credits can be exchanged between businesses or bought and sold in international markets at the prevailing market price. To finance carbon reduction schemes credits can be used between trading partners and around the world. Many companies are there that sell carbon credits to commercial and individual customers who are interested in lowering their carbon footprint on a voluntary basis. The quality of the credits is based in part on the validation process and sophistication of the fund or development company that acted as the sponsor to the carbon project. It is reflected in their price; voluntary units typically have less value than the units sold through the rigorously-validated Clean Development Mechanism (CDM). The Kyoto Protocol provides for three flexible mechanisms that enable countries or in developed countries to acquire greenhouse gas reduction credits.

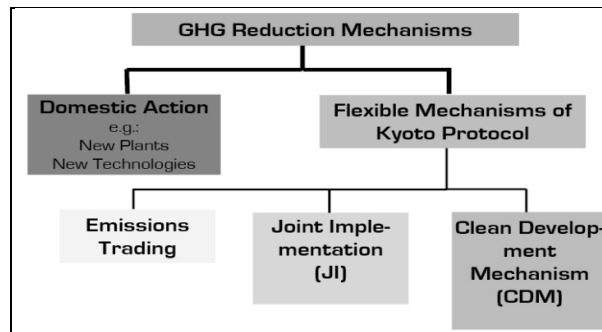


Figure 4: Showing GHG Reduction Mechanisms

Source: GFA Invest

- **Emissions Trading (ET)** - In case of emission trading countries can trade in the international carbon credit market to cover their shortfall in allowances. Countries having surplus credits can sell them to countries with capped emission commitments under the Kyoto Protocol.
- **Joint Implementation (JI)** - In this a developed country with relatively high costs of domestic greenhouse reduction would set up a project in another developed country.
- **Clean Development Mechanism (CDM)** - In this a developed country can 'sponsor' a greenhouse gas reduction project in a developing country where the cost of greenhouse gas reduction project activities have been much lower, however the atmospheric effect is globally equivalent. Credits would be given to the developed country for meeting its emission reduction targets; however developing country would receive the capital investment and clean technology or beneficial change in land use.

These carbon projects can be created by a National Government or by an operator within the country. The carbon markets are a prominent part of the response to climate change and have an opportunity to demonstrate that they can be a credible and central tool for future climate mitigation.

9. Introduction To Carbon Markets

Carbon markets are primarily aimed at dealing with the problem of increasing concentrations of greenhouse gases in the atmosphere due to human activities. Carbon markets can also be attributed to technological and industry development as well as a new area for employment growth. Carbon markets are seen by policy makers and economists as the most efficient policy measure available for reducing greenhouse emissions. Carbon markets operate through the use of tradable certificates, much like a stock exchange with each certificate (credit) symbolizing a unit of exchange such as a megawatt-hour of renewable energy or tons of carbon dioxide.

10. Carbon Credit

Carbon credits are a key component of National and International emissions trading. They also provide a way to reduce greenhouse effect emissions on an industrial scale by capping total annual emissions and letting the market assign a monetary value to any shortfall through trading. Credits can be further exchanged between businesses or bought and sold in international markets at the prevailing market price. Credits can also be used to finance carbon reduction schemes between trading partners and around the world. Also there are many companies that sell carbon credits to commercial and individual customers who are interested in lowering their carbon footprint on a voluntary basis. Carbon offsetters purchase the credits from an investment fund or a carbon development company that has aggregated the credits from individual projects. Quality of the credits is based in part on the validation process and sophistication of the fund or development company that acted as the sponsor to the carbon project. It is reflected in their price; voluntary units typically have less value than the units sold through the rigorously-validated Clean Development Mechanism Emissions trading involve the exchange of emissions certificates. Operators of large energy production plants or energy-intensive industrial companies are assigned a predetermined number of emissions certificates by their governments. These initial certificates are free, and authorize the companies to emit a specific amount of CO₂. If a company exceeds its allowance it must buy in additional certificates. When a company reduces its emissions, it can sell its excess certificates for profit. Companies face penalties when they do not acquire enough certificates to balance out the CO₂ they have emitted. In addition to the emissions certificates allocated by the state, companies can also make use of other "flexible mechanisms". If they invest in emissions reduction projects in other countries, for example, they receive additional emissions allowances, which are the equivalent of emissions certificates. These can also be traded. The use of these market mechanisms ensures that the reductions in emissions are made where the costs of reduction are lowest. Thus, for all companies involved, an emission trading makes both ecological and economic sense.

11. Need For Carbon Credit

Carbon credit came into existence as a result of increasing awareness on the need for the pollution control. It further took the formal form after the international agreement between 141 countries popularly known as, Kyoto Protocol. The Carbon Credits are the certificates awarded to countries that are successful in reducing the emissions that cause global warming. The Kyoto Protocol

aims to reduce the greenhouse gas emission by 5.2% below the 1990 levels by 2012. Major contributors of Greenhouse Gas emissions are cement, steel textiles and fertilizer manufactures. The Kyoto Protocol provides for three mechanisms that enable developed countries with quantified emission limitation and reduction commitments to acquire greenhouse gas reduction credits. These mechanisms are:

12. Clean Development Mechanism (CDM)

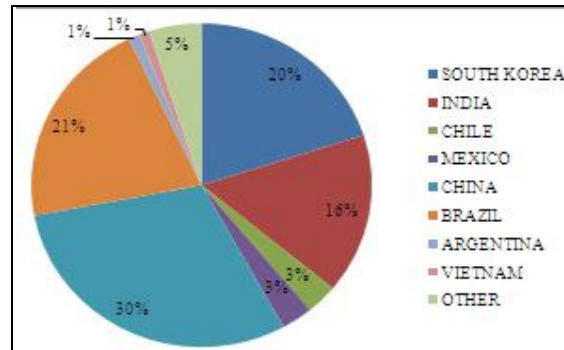


Figure 5: Carbon Credit Generated From CDM Projects By Host Countries
Source: <http://www.newint.org/features/2006/07/01/carbon-offsets-facts/>

The above figure shows carbon credit generated from CDM projects by host country is equal to one tone of CO₂.

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 I) to implement an emission-reduction project in developing countries.

Developed countries can implement projects that reduce emissions or remove carbon from the atmosphere in other developing countries in the lieu of CERs (Certified Emission Reductions). CERs can be used to meet the emission targets. Protocol stresses that such projects are to assist the developing countries host parties in achieving sustainable development. The protocol further refrains developed countries from using CERs generated out of nuclear facilities to meet the targets.

13. Joint Implementation (JI)

The mechanism known as "joint implementation," defined in Article 6 of the Kyoto Protocol, allows a country with an emission reduction or limitation commitment under the Kyoto Protocol (Annex I) to earn emission reduction units (ERUs) from an emission-reduction or emission removal project in another Annex I Party, each equivalent to one tone of CO₂, which can be counted towards meeting its Kyoto target.

Developed countries can implement projects that reduce emissions or remove carbon from the atmosphere in other developed countries in lieu of ERUs (Emission Reduction Units). ERUs can be used to meet the targets of emission reduction. Approval must be there of JI projects of all parties involved and must lead to emission reductions or removals that are additional to any that would have occurred without the project. ERUs can only be issued from 2008 onwards, although JI projects can be started from year 2000 onwards.

Joint implementation provides parties a flexible and cost-efficient means of fulfilling a part of their Kyoto commitments, while the host Party benefits from foreign investment and technology transfer.

14. Emission Trading (ET)

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.

An emission trading is an administrative approach used to control pollution by providing economic incentives for achieving reductions in the emissions of pollutants. It is sometimes called cap and trade. A central authority (usually a government or international body) sets a limit or cap on the amount of a pollutant that can be emitted. Emission permits are issued to companies or other groups and are required to hold an equivalent number of allowances (or credits) which represent the right to emit a specific amount. Total amount of credits and allowances cannot exceed the cap on limiting total emissions to that level. Companies that want to increase their emission allowance must buy credits from those who pollute less. Transfer of allowances is referred to as a trade. The buyer in effect is paying a charge for polluting, while the seller is being rewarded for having reduced emissions by more than was needed.

15. Buying Of Carbon Credits Can Reduce Emissions

Carbon credits create a market for reducing greenhouse emissions by giving a monetary value to the cost of polluting the air. Emissions become an internal cost of doing business and are visible on the balance sheet alongside liabilities or assets. For example a business that owns a factory putting out 1, 00,000 tons of greenhouse gas emissions in a year. The government that enacts a law that limits the emissions that the business can produce. The factory is given a quota of 80,000 tons per year. Factory reduces either its emissions to 80,000 tons or is required to purchase carbon credits to offset the excess. After costing up

alternatives the business may decide that it is uneconomical or infeasible to invest in new machinery, instead it may choose to buy carbon credits on the open market from organizations that have been approved as being able to sell legitimate carbon credits.

- One seller might be a company that will offset emissions by planting a number of trees for every carbon credit you buy from them under an approved CDM project. Although factory continues to emit gases, it would pay another group to go out and plant trees which will draw 20,000 tons of back the carbon dioxide from the atmosphere each year.
- Another seller may have already invested in new low-emission machinery and have a surplus of allowances as a result. Factory could make up for emissions by buying 20,000 tons of allowances from them. The cost of the seller's new machinery would be subsidized by the sale of allowances. Both the buyer and the seller would submit accounts for their emissions to prove that their allowances were met correctly.

16. Market Classifications

There are two types of markets where trading of carbon credits takes place.

17. ECX (European Climate Exchange)

The European Climate Exchange (ECX) is a leading market place where trading of carbon dioxide (CO₂) emission takes place in Europe and internationally. ECX currently trade two types of carbon credits:

- **EU Allowances (EUAs)** - They are the climate credit which are used in the European Union Emission Trading Scheme (EU ETS). EU allowances are issued by the EU member states into Member State Registry accounts. In January 2005 the European Union Greenhouse Gas Emission Trading Scheme (EU ETS) commenced operation as the largest Greenhouse Gas emission trading scheme world-wide.
- **Certified Emissions Reduction (CERs)** – Certified emission reductions are the climate credit issued by clean development mechanism (CDM) Executive Board for emission reductions achieved by CDM projects and verified under the rules of Kyoto Protocol. CERs are either long-term (ICER) or temporary (tCER), depending on their benefit. Both the types of CER can be purchased from the primary market (purchased from original party that makes the reduction) or secondary market (resold from a marketplace)

18. Future Of Carbon Markets

Some of the more optimistic estimates for the size of the voluntary market by 2010 are as high as 400 MtCO₂e. Earlier this year, U.S. analyst estimated that US demand alone for offsets under the voluntary market could almost double annually from today to 250 MtCO₂e by 2011. Considering, for example, that per capita, every American emits 20 tCO₂e annually. More than 100 million Americans have one or more credit cards. If it would be possible to reach 1% of American credit card holders a year every year for the next five years, one could imagine a customer base addition of one million customers a year. Assuming each customer offsets his or her own per capita share gives a potential demand of five million customers offsetting 50 million tons annually by 2012. Double that rate of market penetration and one could see demand for 100 million tons annually.

The growth of the voluntary markets is a welcome indicator of the appetite that ordinary individuals and companies across the world need to take personal responsibility for the problem of climate change. Also governments need to participate in the effort to spur innovation towards a low-carbon future by taking various steps to reduce their emissions.

19. Beyond The Carbon Market

There is a tendency to believe that carbon market will save the world from global warming but it would be wise not to assume that market will provide a painless, magical way to migrate climate change.

- Firstly, the market does not set the level of cap, policy makers do. It can only be a tool to help achieve that target.
- Second, policy makers need to set targets and support mechanisms that meet challenges. They have responsibility of taking into account the risks of climate change, especially on the poorest, as well as the opportunity of expanding clean development choices to meet the basic needs and aspirations worldwide, of many without access to clean water or electricity.
- Thirdly, the integrity of a market rests on the clarity and simplicity of its rules, the transparency of information and on institutions that guard against fraud and manipulation.
- Fourth, it is not fair to expect “cap-and-trade” or emissions trading to work in all sectors. Housing and transport are sectors that do not lend themselves easily to an elegant emissions cap-and-trade approach.
- Fifth, a solution to urgent problem of the climate change problem will require sustained effort by all of us. Policy has a role, in the same way as does individual action by each of us. Further it will also require applying market based principles to the likely need for society, especially its most vulnerable members to adapt to climate change.

20. Is There A Post 2012 Market?

Preliminary findings from IETA's recent Market Sentiment Survey indicate that more than 90% of respondents believe that the GHG Market is an established instrument that will continue post 2012. In addition, more than 65% of those surveyed anticipated that a global market will be established in the next 10 years.

The recent EU announcement regarding its climate and energy policy for 2012-2020 and beyond appears to be taken seriously by the business community. Developments in the EU, USA, Canada and Australia have helped kick off a modest post-2012

market in abatement domestically; however there is much ambiguity about the extent to which CDM and JI will play a role in compliance.

Since there is still some uncertainty at play about details of each of these post-2012 regimes, there is some risk that origination of new carbon projects tapers off. This should not imply however a weakening of prices for CERs and ERUs in the short run as there still is some strong residual demand before 2012 to be met. Further, if the emerging North American regimes encourage early action and banking of CERs, this could stimulate further demand. The uncertainty about demand post-2012 may justify a lower price – given the uncertain compliance value of the credits that may be generated.

21. Beyond 2012- Issues And Options

If the carbon market is to play a significant role in helping to achieve the deeper reductions from current emission paths required over next 20 years. Decision-makers will need to consider how best to broaden and deepen the reach of the market. Experience to date and our understanding of the nature and limitations of emission trading and project-based mechanisms suggest that several key issues will need to be addressed.

- Countries have the need to consider how to better engage developing countries in the carbon market in a way that supports the transfer of low-carbon technology and investments in sustainable energy and other sectors. One or more multilateral financial organizations are exploring the possibility of establishing a post-2012 facility.
- The uncertain cost of emissions abatement presents a barrier to both broader participation and deeper reductions. Options to manage cost uncertainty without compromising long-term emission reduction goals.
- Domestic policies such as domestic emission trading systems or crediting mechanisms are needed to enhance the participation of the private sector in the international carbon market. These domestic systems or schemes also determine the extent of coverage of the carbon market and the number of sources that face a common price signal.
- In order for the carbon market to impact investment decisions, there must be some assurance that there will be a value for emission reductions beyond the year 2012. As the value of the commodity traded in the international carbon market is entirely based on policies adopted by governments, the market requires a clear signal on the longevity of the limitation and reduction targets by policymakers.

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