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Carbon Emission Trading: An Insight into Future Power Scenario

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ABSTRACT: The abrupt change in climatic conditions is one of the major threats prevailing in today's world. The excessive discharge of toxic gases, pollution of ecological endowments is blatant illustrations of reckless human behavior in pursuit of insatiable economic desires thus hampering the balance in the environment. It is high time we make efforts to minimize the negative imprints we left on our mother earth and compensate for the damages dealt to the nature.In today's scenario, a large portion of money is being utilized to reverse the ill effects of Global Warming so Green Environmentalist aims to promote policy and business that works in favour of the environment. As a result, Kyoto Protocol was organized in 1997 to make a stringent plan of action for environment protection. A large number of environmentalists and economists devised a mechanism whereby incorporating Carbon (main Greenhouse Gas) reduction endeavors with economic motives of enterprises to encourage a sustainable effort for a better environment. This led to the formation of a new economic commodity called **"Carbon Credits"** which can be actively traded all over the world thereby creating a global **"Carbon Market"**. The protocol allocated pre-decided emission limits across the ratified countries various countries which needed to regulate carbon emissions from various industries and commercial units operating within them.
The objective of this paper is to discuss the basic ideas and significance of **"Carbon Credit"**. It also emphasizes on the techniques used to save the environment. Furthermore, the paper converses upon the business opportunities in the global emission in Indian context.

KEYWORDS: Carbon Credits, Carbon Market, Carbon Emission Trading, Kyoto Protocol, Clean Development Mechanism, Joint Implementation, CERs.

I.INTRODUCTION

Pivotal to the unanticipated darkening of sky is the ruthless discharge of carbon dioxide into the atmosphere in the past few years. The unhindered discharge of carbon dioxide in voluminous amounts manifests today in the form of global warming. The addends to this include the systematic clearing of forests to make way for more factories and various other civil structures. Due to the disruption of the natural carbon cycle, earth's carbon 'sinks'are either diminishing or already saturated.

The global economic growth is pouring higher carbon emissions which must be managed until it's too late. The surge in disposable information has culminated in the form of increased pressure on the governmental and non- governmental entities to set forth mechanisms in order to reduce the amount of GHGs in the atmosphere.

Carbon Emission Trading is a form of trading that primarily aims at the carbon emissions calculated in tonnes of carbon equivalent or tCO_2e and is a major constituent of emission trading. This form of trading permit is what countries employ in order to oblige to the Kyoto Protocol; namely an attempt to mitigate the imminent climate change.

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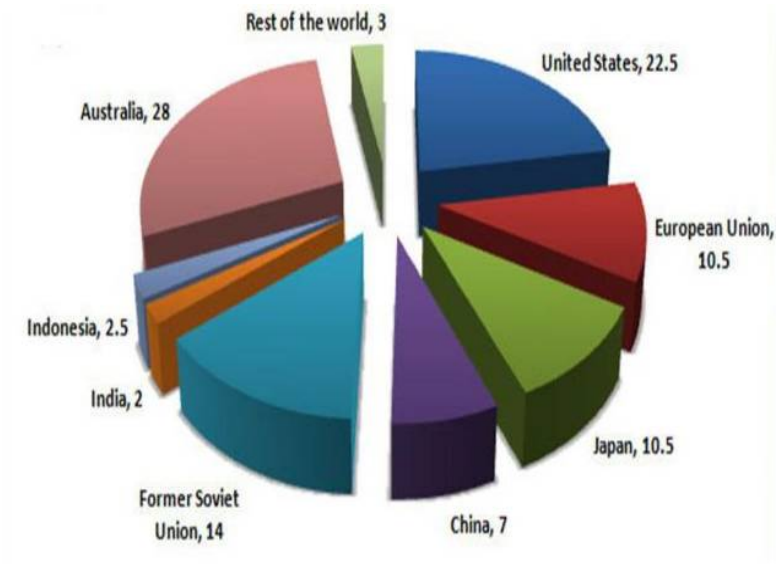

Figure 1: Carbon Emission % in few important business nations

II.UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE (UNFCCC) AND KYOTO PROTOCOL

The 1992 United Nations Framework Convention on Climate Change (UNFCCC) manifests itself in the form of an international treaty called the **"Kyoto Protocol"** that raised the concept of 'sustainable development' obliging the participant nations to decease Greenhouse Gas Emissions (GHG). The following are the main emphasis of this accord:

(a) Global Warming is an indisputable reality; and
(b) Central to the causes of Global Warming is the unanticipated spike in the volume of CO_2 emissions into the atmosphere.

The third iteration of Conference of the Parties (COP) under the UNFCCC in Kyoto, Japan aiming at limiting the emission of GHGs to control Global Warming gave concluded with an agreement called "Kyoto Protocol". The name **"Kyoto"** descends from ***"Kyoto, Japan"*** which was the place of adoption of the treaty on December 11, 1997. The treaty saw the light of the day with its enforcement on 16th of February, 2005 with 192 Nations as the parties that eventually yielded to it.

The principal objective of this international treaty is to curb Global Warming by controlling the emission of Greenhouse Gases. It obliges the developed Countries to come together with the developing Countries and work together for a common cause.

Numerous negotiations took place in the UNFCCC as a result Paris agreement fostered in 2015.

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Figure 2: World Map displaying the States committed to Greenhouse Gas (GHG) limitations in the first Kyoto Protocol period:

- Annex I Parties who have agreed to reduce their GHG emissions below their individual base year levels
- Annex I Parties who have agreed to cap their GHG emissions at their base year levels
- Non-Annex I Parties who are not obligated by caps or Annex I Parties with an emissions cap that allows their emissions to expand above their base year levels or countries that have not ratified the Kyoto Protocol

Annex I Parties:
The developed nations like United States of America, United Kingdom, Japan, New Zealand, Canada, Australia, Austria, Spain, France, Germany, etc. agreed to shrink their GHG emissions to target levels below their base year (1990) emission levels. A total of 43 industrialized countries are currently listed under this category.

Annex II Parties:
Annex II parties are a sub-group of Annex I parties. These are the countries which have agreed to restrain their carbon emissions from growing any further. This category includes those developed nations which cannot reduce their emissions are bound to buy emission credits from developing nations providing them technical and financial support in return. United States of America, Japan, New Zealand, Canada, Spain, and other 19 countries are registered under Annex II parties.

Non-Annex I Parties:
It includes developing nations like India, Sri Lanka, Afghanistan, China, Brazil, Iran, Kenya, Malaysia, Kuwait, Pakistan, Philippines, Saudi Arabia, Singapore, South Africa, United Arab Emirates, etc.
These countries are free from any restrictions as of now but directed to maximize the use of renewable energy resources.

The European Union has agreed to reduce their Carbon emissions to about 6.7% whereas France is steadfast to 0% increase in its Carbon emissions. However, some countries like Spain, Greece, Ireland and Sweden have not indicated any assurance.

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The key notions of Kyoto Protocol are:

- It binds the Annex I Countries to commit to idea of reduction in the carbon emissions.
- Apart from controlling their own emissions, the Annex I Parties are obligatory to prepare and implement policies and measures for the Annex II and III Parties.
- It tries to minimize the adverse impact and promotes the use of better technologies in the developing Nations.
- The Protocol ensures the integrity of the protocol by accounting, reporting and reviewing.

An individual Compliance Board is established to administer compliance with the commitments under the protocol.

III.FLEXIBILITY MECHANISMS FOR EMISSION REDUCTION

The Kyoto Protocol defines three flexibility mechanisms which are required by the Annex I Countries. These are:

- International Emission Trading (IET),
- Clean Development Mechanism (CDM), and
- Joint Implementation (JT).

a) International Emission Trading (IET)

The nations with commitments under the Kyoto Protocol are obliged to reduce or limit their emissions. IET deals with the trading of these targets expressed as level of allowed emissions or "assigned amounts" (Assigned amount units, AAUs or allowances for short). It sets the quantitative restriction on the emissions. In simple words, it allows countries (developing) that have emission units to spare to sell to the countries (developed) that are over their specified target limits. Therefore, a "carbon market" is created where 'carbon' is tracked and treated as any other commodity.

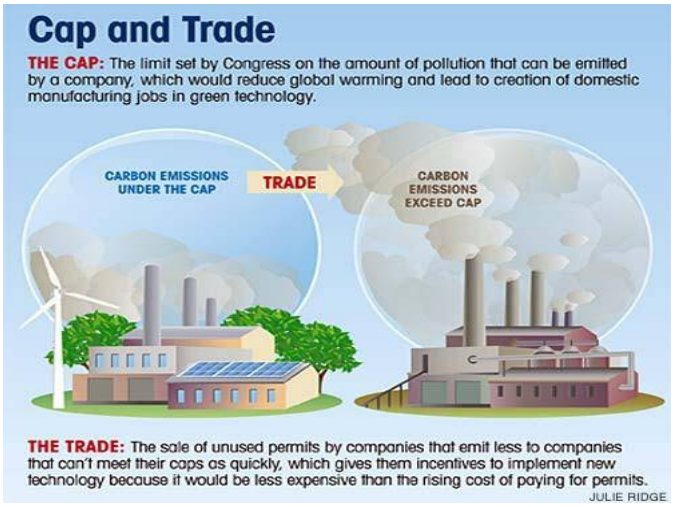

Figure 3: International Emission trading

b) Clean Development mechanism (CDM)

CDM and JI on the contrary are the project based mechanisms which generate carbon emissions from projects. CDM encourages the production of emission reductions in non-Annex-I Parties i.e. developing Nations whereas JI does the same for the Annex-I Parties.The reductions produced are subtracted from the reference emissions which are predicted to occur in the absence of such projects. These projects are then rewarded against the reference with credits for producing emission cuts.

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It is mandatory for the commercial entities to reduce their emissions to a prescribed level or to buy sufficient amount of carbon credits to meet their demands rather than paying charge for emissions (referred to as Carbon tax).

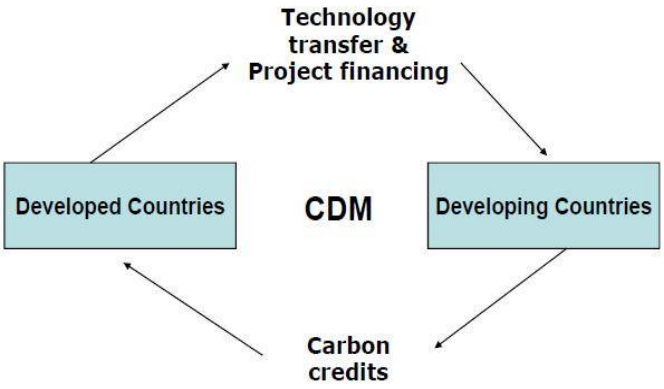

Figure 4: Schematic diagram showing Clean Development Mechanism

Under this mechanism, any eligible company in the developing nation can tie up with the company in the developed nation to garner novel technologies emitting lesser emissions and saving energy. But there exists a fixed share of carbon credits which the developed nation can acquire from a developing nation which will be talked about later in this article.

c) Joint Implementation (JI)

This mechanism is defined in Article 6 of the Kyoto Protocol in which any Annex I nation binding their GHG emissions can invest in an emission reduction project in any other Annex I country so as to reduce emissions domestically. Unlike CDM, JI has caused fewer concerns of false emission reductions, as JI projects take place in a country which has commitment to reduce emissions under Kyoto Protocol. In this manner, countries can reduce their costs of fulfilling their Kyoto targets by investing in projects available locally where emission credits may be available at cheaper rates.

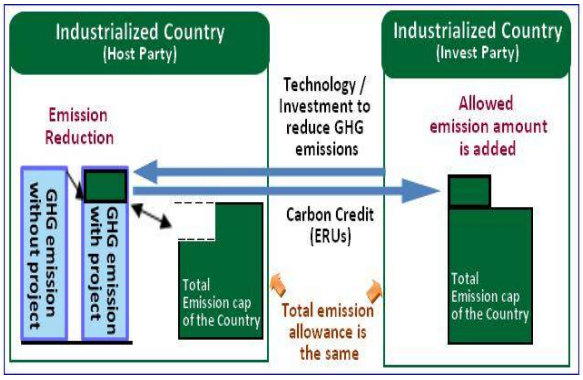

Figure 5: Schematic diagram describing Joint Implementation

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IV.WHAT ARE CARBON CREDITS?

A Carbon Credit is a tradable certificate or license representing the right to discharge one tonne of carbon dioxide or any other Greenhouse Gases. One Carbon Credit allows up to one tonne of carbon dioxide or any Greenhouse Gases to be discharged in air.

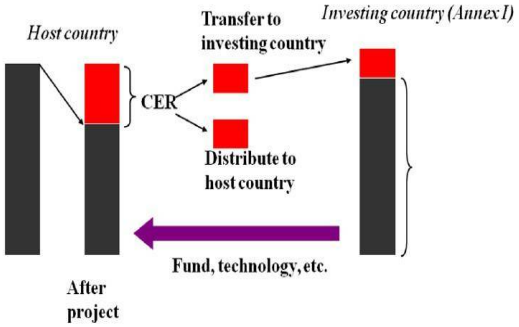

Figure 6: Diagrammatical representations of working of CERs

Carbon Credit creates market for droppingGreenhouse emissions by providing an economic worth to the cost of infesting the air. Kyoto Protocol has set limit on the emission of GHGs emitting in countries. everycountry has its own limit on releasing carbon emission. If any country jumps its limit, then it has to buy Carbon Credits from those countries whose amount of emitting GHGs is below the quota set by UNFCCC.

Developing countries like India, Brazil mostly sell their Carbon Credits to developed countries like U.S.A, U.K. etc. These credits are usually bought and sold at international market. The Multi- Commodity Exchange of India(MCX) will soon become the third exchange in the world to trade Carbon Credits. developedcountries can also provide clean electricity by introducing latest renewable technologies in the form of solar, wind to developing countries and get Carbon Credits in return. There are no complex procedures for this system which increases the system stable and more successful. Asian countries like India, China are biggest sellers whereas western countries are going to be largest buyer of Carbon Credits.

Carbon trading is done when a certain limit on carbon emission is breached. Companies making regenerative steps in reducing carbon emissions are rewarded by UNFCCC while those who are responsible for polluting are penalized. Those who knew about its profits are investing in new technologies. This sale and purchase of Carbon Credits helps to limit the unchecked discharges of Greenhouse Gases across the world. The major take away is that production of GHGs is vehemently disincentivised while production of Green Energy is positively affected. Let us assume that a British company is running a plant in the United Kingdomand it is emitting more Gases than the quota set up by UNFCCC. It can tie up with say, India or China under the Clean Development Mechanism. It can buy Carbon Credit by making Indian or Chinese plant eco-friendlier with the help of technology transfer. It can also tie up with any other company in the open market. In future, the threat of global warming can be effectively controlled by this system.

V.CARBON EMISSION TRADING ININDIA

India foresees its energy future in non-conventional resources like solar, wind, tidal etc. So as a late beginner, India is at a favourable position for it has a relatively elastic time span to skew its energy production balance towards Green Energy Projects and, therefore,Carbon Credit Trade will be balanced in favour of India. Carbon emission of India is generally below the quota set by UNFCCC and, therefore, it is in a position to sell Carbon Credits. “Carbon Trading” refers to the means of generating income through sale of Carbon Credits. It is estimated that India will gain at least $5 billion to $10 billion from carbon trading (□22,500 crores to□45,000 crores) over an interval of time. Also India is one

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of the largest beneficiaries of the total world carbon trade through the Clean Development Mechanism (CDM) claiming about 31 per cent. India's carbon market is one of the fastest budding markets in the world and has already produced around 30 million Carbon Credits,the second highest conducted volumes in the world. The carbon trading market in India is developing even more rapidly than information technology, bio technology and BPO sectors. Nearly 850 projects with an investment of 650,000 million are in the pipeline**.**

Under UNFCCC, the polluters cannot purchase 100 per cent of the Carbon Credits which they are required to cut. Out of 100 per cent, they have to make 75 per cent locally by various methods in their own Country. They can purchase only 25 per cent of Carbon Credits from developing Countries. As December gets closer, it is possible that government might tamper with these norms a little if the targets could not be achieved. If these norms are changed, prices can go through a modification. But, as of now, there is a very transparent mechanism in which the rules for the next five years have been fixed.

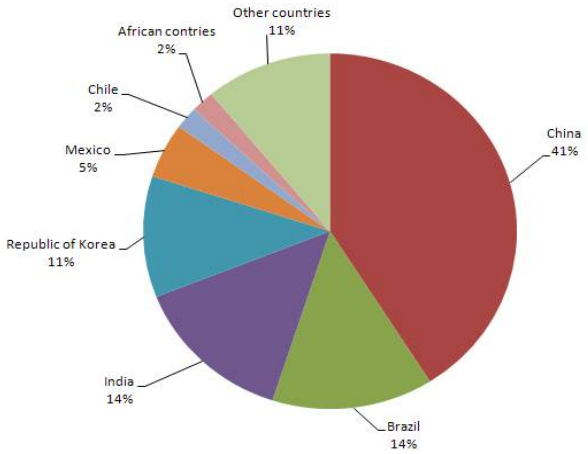

Figure 7: CDM CERs distribution by country

Examples of Carbon Trading in India

a) Jindal Vijaynagar Steel, Maharashtra

In India, Jindal Vijaynagar Steel has recently stated that by the next ten years, it will be ready to sell $225 million worth of Carbon Credits. This was made possible since their steel plant uses the CorexFurnace Technology which stops 15 million tonnes of carbon from being discharged into the air.

b) Handia Forest, Madhya Pradesh

It has been estimated that 95 very poor rural villages in Madhya Pradesh would mutually earn at least US$300,000 every year from carbon payments by re-establishing 10,000 hectares of degraded community forests.

c) Powerguda, Andhra Pradesh

The village in Andhra Pradesh was selling 147 tonnes equivalent of saved Carbon Credits. This came after thecompany Powergudahas made a claim of having avoided 147 metric tonne of $CO_2$from being generated. This was achieved by extracting bio-diesel from 4500 Pongamia trees in their village.

Strategies for Improvement

Anappropriate strategy backed up by experiences and correct knowledge can definitely lead to indomitable success. Companies with limited discharges will develop strategies to further decrease emissions so that they can trade more Carbon Credits in the international market and thereby improving their profits. It will ensure development of

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company's prospects in the carbon constrained economy. It will armour the companies to identify the climate risks and opportunities thereby improving revenues and corporate image profoundly. Thus, this system keeps on de-polluting the environment progressively.

Annex I countries find it easier to buy Carbon Credits to achieve their emission targets in manufacturing companies, power utilities etc. rather than further improving their established technologies. So, CDM projects which can prove to be beneficial to the developing countries like ours are:

a) Energy Efficiency Projects

- Improving the architecture and energy efficiency of buildings and structures (Green Building/LEED rating), e.g. Technopolis Building, Kolkata.
- Making use of less carbon intensive fuels instead of more carbon intensive fuels.
- Consistent up gradation, maintenance and instrumentation of various machines and equipment.

b) Transportation

- Improvement in the efficiency of vehicle engines and fuels.
- Increasing commercial/industrial energy efficiency (Renovation and Modernization of old power plants)
- Use of better fuels (like CNG, Bio-Diesel) and electricity (electric Vehicles) for transportation.
- Reduction in the use of transports by switching transportation mode (Metros in Delhi, Mumbai).
- Investing in breakthrough future technologies (like Hyperloop by Elon Musk).

c) Cogeneration

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

d) Agricultural Sector

- Improving the machinery used for irrigation.
- Methane reduction in rice cultivation.
- Reducing animal waste through bio generation.

VI.CARBON OFFSET

Carbon offset is another commercial resolution to condense Greenhouse Gas emanation, which works on an akin policy. A Carbon Offset Credit is equivalent to reduction of one metric ton of CO_2 or equivalent Greenhouse Gas in the atmosphere. It enormously helps in endorsing renewable energy options like solar energy and wind energy and in backing projects on nature conservation and reforestation using cleaner and renewable energy sources like wind and tidal energy helps to attain this vital drop.

Even individuals are also utilizing this system and are purchasing Carbon Offset to make the environment cleaner and to extent awareness about environment conservation. Purchasing Carbon Offset is forthright and can be suitably implemented on the internet through one of the several Carbons Offset provider websites. We can also reduce carbon waste by reducing the size of our landfills i.e. don't take anything that cannot be eaten or reusable. A few simple changes can really make a difference, especially if all 6.75 billion of us started to adopt them.

VII.CONCLUSION

With emergent realization among Nations to minimize Industrial GHG Pollution together with positive industrial growth, the emission trading seems to be the main area of business attraction today. The profound indulgence of developing Asian countries like India, China, etc. in Carbon Credit Market and its trading is an indication of how this

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industry is going to flourish in the years to come. Presently, carbon trading has become one of the fastest growing markets around the world. India as a developing nation is an emerging leader in designing innovative strategies and portfolios for Carbon Trading according to World Bank's evaluation. But still, Carbon Offset and Carbon Credits is comparatively a budding market for which mass awareness through widespread education is vital to deliver our imminent generations a better, healthier and a cleaner environment.

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