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Carbon Credit Capital: Indian Commodity Market 2020

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Abstract: The carbon market is one of the fastest growing industries. This upward trajectory is set to influence the global as well as Indian financial commodity market. Global financial institutions like World Bank and the IMF project the size of the carbon economy to reach over $2,000 billion per annum by 2020. This paper highlights how a permit system called 'carbon credit' monitors risks in commerce as well as environment sector, with control over green-house-gases emissions (GHG's). It further discusses this notion as a prospective financial solution for the future of trade exchange. Carbon Credit Capital works on the development of new methodologies for carbon emission reductions, measurements and monitoring. One carbon credit is equivalent to the right to emit one tonne of carbon dioxide (CO2). A comprehensive carbon management in the corporate world is later discussed in the light of the challenges it poses for the future economy. Its systemic role in regulation of industrial investment, methodology, infrastructure as well as tradeable financial assets is evaluated critically.

Key words: Capital · Carbon credit · Energy · Greenhouse emissions · Market

INTRODUCTION

A low carbon economy is one where businesses deliver their products and services by ensuring the reduction of their carbon emissions. Carbon credit trading is an innovative method of controlling emissions using the free market. This emerging distinctive feature in the commodity market covers a wide range of sectors and not just the traditional sector of environmental energy generation (Flores, 2010) [1]. Low carbon technologies (LCTs) are equipment and infrastructure that enable energy efficiency or alternative energy production and use, leading to a reduction of carbon emissions, directly or indirectly (Whitehouse et al., 2011). An Environment Survey (2009) by EEF was conducted across manufacturing companies in the UK. It found that manufacturers are adopting a range of environmental strategies mainly around recycling, reduction of business waste and energy efficiency improvements ('Measuring Performance: Environment survey, 2009). With the advent and spread of carbon assets, there has been a rapid development of financial markets and transactions related to the role of carbon funds (Ramírez & González, 2011) [2]. These environmental strategies facilitate cost savings. In the last decade, the commodity sector has witnessed a tumultuous scenario. However, independent of the financial markets, carbon values are expected to improve. The growth in this fastest growing industry globally is on an upward trajectory. Figure 1 depicts that global financial institutions like World Bank and the IMF project the size of the carbon economy to reach over $2,000 billion per annum by 2020 ('Navigating the carbon economy', 2013). The quantity of carbon credits produced is going to increase at a massive rate, compounding each year with new sectors expected to be included in the mainstream. The onus therefore is on organisations to build and consolidate their capabilities in order to leverage from the increase in value and quantity of carbon credits over the coming years and subsequent increase in the valuation and cash flow involved in the carbon economy.

Review of Literature

The Need & Background of Carbon Economy: In modern times the burning of fossil fuels like coal, oil and natural gas – in which carbon has been stored for millions of years – combined with accelerated land clearance has led to dramatic environmental changes. There has been a shortage of electricity, water, oil etc., there by adding to

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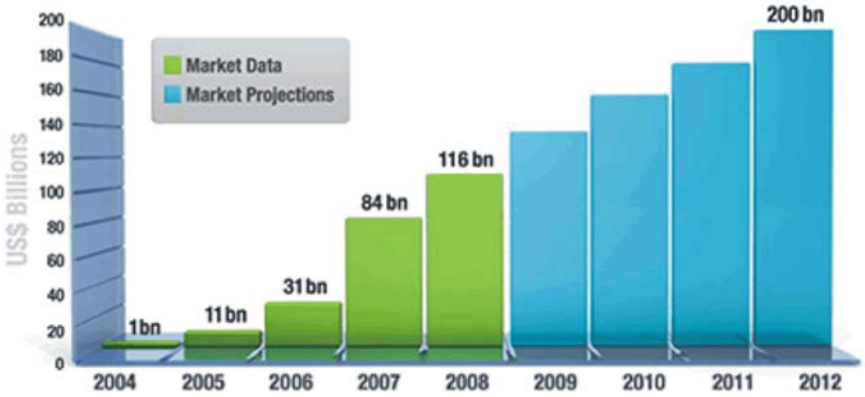

Fig. 1: Carbon Market (2004-2012)

Table 1: Global Warming Potential of different Green House Gases

S.No.	Green House Gas (GHG)	Global Warming Potential (GWP)
1.	Carbon Dioxide (CO2)	1
2.	Methane (CH4)	21
3.	Nitrous Oxide (N2O)	310
4.	Hydofluoro Carbons (HFCs)	140-1170
5.	Perfluoro Carbons (PFCs)	6500-9200
6.	Sulphur Hexafluoride (SF6)	23900

their price and the pressure to increase production and exploiting the natural resources. Today, only 3% of our electricity is renewably produced (wind, geothermal, solar, hydroelectricity and nuclear) in India whereas over 70% is produced through a non-renewable source like coal, as per the Annual Energy Statistics report by National Statistics Organization, Govt. of India (2013). Concentrations of greenhouse gases in the atmosphere have risen dramatically leading to an enhanced greenhouse effect which will result in very rapid warming of the world's climate (Table 1). One of the primary solutions for climate change being thought by global warming alarmists is the purchase and sale of carbon credits. Vegetation and forestation absorbes about one-third of human-induced emissions. Thus efforts in expanding the green cover could be an initial step towards creating a carbon conscious atmosphere.

The concept of carbon credits came into existence as a result of increasing awareness of the need for pollution control. Carbon credits were one of the outcomes of the Kyoto Protocol, an international agreement between 169 countries. The Kyoto Protocol was created by United Nations Framework Convention on Climate Change (UNFCCC) held in Japan and adopted for use in 1997 ('What are carbon credits?', 2013; Zeng & Zhang, 2011)[3]. This international treaty is intended to form a global effort to reduce the levels of man-made greenhouse gas emissions (GHG) that are leading to global warming. The Kyoto Protocol created legally binding C02 emission targets for industrialised nations. However it was only in 2005 that this treaty became applicable at a universal platform. The Kyoto Protocol envisages reduction of Green House Gases by 5.2% in the first commitment period from 2008-12 (Dadoo, 2008) [4], for six harmful gases that are mentioned in Table 1. The emission targets for member countries are mentioned in Table 2. Thus the carbon economy was created, underpinned by the dual facts that: (1) Organisations in industrialised countries must report and cap their emissions in order to meet targets; and (2) Carbon credits could be created, invested in, transferred and sold globally. These targets to regulate GHG emissions are met by mechanisms like Emissions Trading, Clean Development Mechanism and Joint Implementation. The very phrase "Kyoto Protocol" has become synonymous with the idea of saving the planet from the global meltdown [5].

Based on a large number of carbon dioxide measurements and model calculations, it has been observed that in 2011, China accounted for 28 percent of all global emissions, making it the largest emitter in the world (Figure 2). China was followed by the USA (16 percent), the European Union (11 percent) and India (7 percent). In 2011, emissions by China and India increased by 9.9 percent and 7.5 percent respectively. In contrast, the USA reduced its CO_2 emissions by1.8 percent, the European Union even managed a reduction

Table 2: Country-wise Carbon Emission Targets under Kyoto Protocol (2008-12)

S.No.	Country	Target (1900 - 2008/2012)
1.	EU15 - Bulgaria, Czech Republic, Estonia, Latvia, Liechtenstein, Lithuania, Monaco, Romania, Slovakia, Slovenia, Switzerland	-8%
2.	United States	-7%
3.	Canada, Hungary, Japan, Poland	-6%
4.	Croatia	-5%
5.	New Zealand, Russian Federation, Ukraine	0
6.	Norway	1%
7.	Australia	8%
8.	Iceland	10%

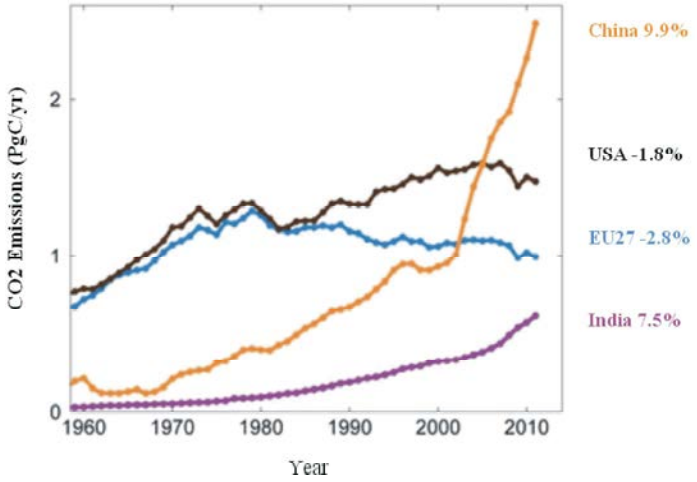

Fig. 2: Region-wise CO2 Growth Rates from 2010-2011 (Source: Le Quéré *et al*., 2012)

of 2.8 percent and Germany's emissions have fallen by an average of 1 percent per year since 2000. However, on a global scale, a total of 35.6 billion tons of carbon dioxide – representing a new all-time high – have entered the atmosphere this year ('Global carbon dioxide emissions reach new record high, 2012) [6-10].

A number of factors bolster the demand for LCT:

- Consumers and businesses are recognizing the case for action.
- Energy security is a primary concern for governments.
- LCT represents an opportunity for growth and job creation.
- Carbon emissions mitigation is supporting the emergence of carbon reduction targets and of carbon markets.
- Carbon markets are increasing cost pressure on carbon intensive industries.
- Technological advances and innovation have led to significant cost efficiencies.

The Carbon Credit Phenomena: Carbon credits impact global emissions by reducing the amount of Green House Gas (GHGs) emissions in the atmosphere. Carbon credits are a tradable permit scheme. It is a simple, non-compulsory way to counteract the greenhouse gasses that contribute to climate change and global warming. Carbon credits create a market for reducing greenhouse emissions by giving a monetary value to the cost of polluting the air. The Carbon Credit is a new currency of the aware industrial world. For trading purposes, one carbon credit is equivalent to one tonne of carbon dioxide either removed from the atmosphere or saved from being emitted ('What are carbon credits?', 2013). Carbon credits are also called emission permit. Carbon credits are certificates awarded to countries that are successful in reducing emissions of greenhouse gases. These credits need to be authentic, scientifically based and verified. Carbon credits help lower the costs of renewable and low carbon technologies as well as assisting in the technology transfer to developing countries. The companies are then legally obliged to produce no more emissions than they are allowed. If a company comes in

Fig. 3: Three stage process of the carbon market

under target, it can sell its excess allowance as "carbon credits" to other firms that have overshot their targets. But if it exceeds its target, it has to pay a penalty and then go to the market to buy credits to make up the difference. For example, a company that produces electricity through a non-renewable carbon emitting source is liable to paying a penalty or buying carbon credits from an external source. On the other hand, using a clean renewable resource not only makes a firm eligible to sell the electricity, but also earn carbon credits from not burning fossil fuels, so long as the emission reductions are certified by a certifying agency [11-16].

Carbon market participants include project sponsors, project developers, aggregators, brokers, verifiers and buyers ('The carbon credit market', 2012). This 3 stage process (Figure 3) involves the following entities:

Generation: The owners of land or a business are responsible for all aspects of the delivery of the carbon offset. Carbon credits can be created from two broad types of techniques. The first is 'Sequestration' i.e. the capturing or retaining of carbon dioxide from the atmosphere by planting new trees as trees sequester and store CO2. This incorporates creating carbon offsets by activities like methane capture from landfills or livestock, destruction of potent greenhouse gases such as halocarbons and carbon sequestration projects (such as reforestation) that absorb carbon dioxide from the atmosphere. The second includes the use of 'Renewable energy' i.e. displacing fossil fuels by a clean and efficient energy. This may include installations of solar, small hydro, geothermal and biomass energy.

Standardization: All carbon projects are certified, verified and registered, ensuring that actual emission reductions take place before the credits are issued, thus providing a secure and transparent environment for carbon trading. Verifiers may conduct field based carbon measurements or perform remote audits of entity reports, verifying that registry or standard measurement protocols have been followed during the development of the project and implementation of monitoring, mitigation and verification. Once a carbon project is issued with credits, an electronic registry is generated for issuing, holding and transferring carbon credits. Through a unique serial number they can be tracked through their entire life-cycle.

Buying & Selling: Brokers sort potential investment opportunities for buyers and create portfolios scalable for large investor demand. Buying carbon credits is a retail action. Credits can be exchanged between businesses or bought and sold in international markets at the prevailing market price. Buyers in the voluntary market fall into three primary categories: retail, industrial and investment. Ultimately, the majority of transacted offsets are reported to a GHG registry or exchange, where they are retired to mitigate an entity's GHG emissions.

In December 2012, The Doha Amendement to Kyoto Protocol' was adopted. New emission reduction targets were set for the second commitment period of 2013-2020 at 18% as compared to 1990 levels. A revised list of greenhouse gases was also released.

An example of one such single point of contact is the Chicago Climate Exchange (CCX). Established in 2003, it is one of North America's only voluntary and legally binding greenhouse gas (GHG) reduction and trading systems. The companies under CCX commit to reduce their aggregate emissions by 6% by 2010, as proposed by EU. Currently, the exchange has more than 200 members, ranging from corporations like Ford and Motorola; to municipalities such as Oakland and Chicago; to educational institutions such as Tufts University and the University of Minnesota; to farmers and their organizations such as the National Farmers Union and the Iowa Farm Bureau (Green Chip Review, 2013).

The carbon market can be divided into two: the voluntary market and the regulatory (compliance) market ('What is carbon credit', 2013). In the compliance market, carbon credits are generated by projects that operate under one of the United Nations Framework Convention on Climate Change (UNFCCC) approved mechanisms such as the Clean Development Mechanism (CDM). Credits generated under this mechanism are known as Certified Emissions Reductions (CERs) in which GHG

compliance "cap-and-trade" programs place an overall limit on emissions allowed from a specified set entities and issue tradable emission allowances (or rights to emit). In the voluntary market, carbon credits are generated by projects that are accredited to independent international standards such as the Verified Carbon Standard (VCS). These credits are known as Verified Emission Reductions (VERs) involve voluntary sales and purchases of carbon credits where transactions are not part of a GHG compliance "cap-and-trade" program. Voluntary markets are also referred to as the "over-the-counter" market where buyers and sellers engage directly, through a broker [16].

Google is an example of a carbon neutral company since 2007 that has a three-way approach to becoming a greener company: they optimise their energy efficiency, maximise their renewable energy sources and offset their residual emissions. Puma is another leading example of a firm that showed the sustainable initiative of its first Environmental Profit and Loss Account (EP&L) in 2010 that reported the group's total environmental impact for key areas of greenhouse gas emissions. The EP&L valued PUMA's water, land air and waste pollution generated by its operations at _145 million for 2010. This innovative approach to evaluating its environmental impacts has encouraged PUMA to improve its energy use and innovate to develop more sustainable products. The group is also engaging in carbon neutral supply chain and helping its suppliers become carbon neutral (Case Studies, 2013).

Role in the Financial World: According to a recent New York Times article (Green Chip Review, 2013), carbon trading is one of the fastest-growing financial service and could grow to $1 trillion within a decade. Every year, humans generate about 38 billion tons of carbon dioxide. This number will continue to grow, as developing nations demand more energy that will likely be produced by coal and other carbon heavy sources of fuel. Long-term oil and gas prices are expected to increase as the growth of identified global reserves slows. As more applications are produced, the unit price of the LCT will fall due to improvements in processes and other economies of scale. As many LCT products have not yet reached maturity, their cost learning curves are likely to decrease rapidly over the next 10 years. Right now, with an abundance of carbon credits available, their price is relatively low. With the second phase of the program (2008-2012) the amount of available credits are gradually decreasing and more stringent targets are being exercised. As more international governments start to regulate their country's emissions, the demand for available carbon credits will skyrocket. The price of carbon credits is set to explode in the future and so will be the employment opportunity in the installation and construction of low carbon technologies. With this expected increase in demand and cost in the carbon economy, tapping on this growing phenomena could be one of the wisest investment moves in the first half of this century.

A significant shift in venture capital investment towards clean technology is underway to build LCT infrastructure. The value of transactions in LCT procurement range from small individual investments to large project finance. With more people adopting LCT despite the high costs, the amount of capital invested soared to a record high of $42bn in Europe in 2008. Despite the global recession, the amount of capital going into LCT procurement capital fell by only five per cent in 2009 compared to 2008, suggesting that the appetite for LCT equipment and infrastructure is not diminished by economic cycles. Several factors could contribute the future increase in the cost of carbon credit capital. These are CO2 emissions, crude oil prices, coal prices, European Union Allowances (EUAs) prices, policy issues, demand-supply mismatch, foreign exchange fluctuations and global economic growth (Shah & Jariwala, 2009).

In a quantitative study conducted by Barclays-Accenture (2011), a demand-driven approach was used to estimate the adoption (procurement, investment and development) of LCT that could be achieved by 2020. Nearly 40 different types of LCT equipment and infrastructure were evaluated on their probable market size by 2020. From this pool, 15 commercially viable and capital intensive technologies were selected for detailed evaluation. Markets such as buildings, electricity distribution, electricity production, transport vehicles and transport infrastructure were particularly studied. These observations were investigated on a per country basis for all EU 25 countries. In addition, large-scale renewable power infrastructure (wind, solar, geothermal and biomass power) has been investigated on a global basis for the following countries: US, Canada, EU 25, India, China, Japan and Australia. The study found that the cost of introducing renewables (wind, solar, geothermal and biomass) across Europe, China, India, USA, Japan, Canada and Australia will require investment of 2.4trillion in procurement, resulting in emissions savings of 6.6 Gt CO 2e (Figure 4 & 5). China and the

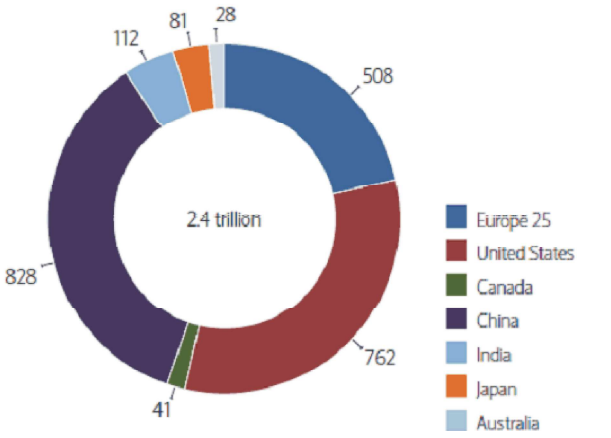

Fig. 4: Cumulative Procurement Capital 2011-2020 (_BN)

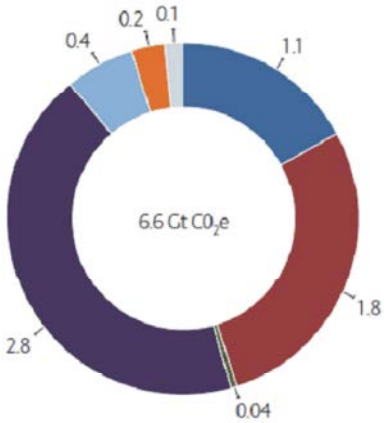

Fig. 5: Cumulative Emissions Savings 2011-2020 (GT CO2e)

United States are expected to invest more than Europe over the next 10 years. China is likely to dominate the emissions savings with a 43 per cent share, owing to its large electricity market, followed by United States and Europe. While India has similar grid intensity, its electricity market is only a quarter of China's, historical growth in electricity production is about 50 per cent to 70 per cent of China's and the expected take-up of renewable is lower. This reduces the country's potential to lower carbon emissions: India is expected to save 0.4 Gt CO 2e compared with 2.8 Gt CO 2e for China. Finally, the development, manufacturing and installation of renewables technology will require an estimated 1.7 trillion in development capital [17].

Current public policy and financial support for the low carbon economy is complex and highly nuanced. Future investors and entrepreneurs need to engage with a number of public sector bodies, which however, lack clear signals at present (Levy, 2010). There are significant barriers that are preventing capital provision at the levels required across the whole spectrum of financing sources. Three of the most significant barriers are Policy uncertainty, Restrictions on capital lending and Technology uncertainty. Future action can be can be simplified and rationalised by A cross cutting audit of current spending, establish a single point of contact for businesses, balance between public and private funding which are currently beyond the scope of this paper. Ensuring a consistent, co-ordinated and supportive regulation of these activities from across the public sector is thus an urgent need of the hour [15].

The Indian Scenario: Carbon credit trading provides a new source of income to the Indian industry. Many Indian reservations contain large land holdings, much of which is currently used for farming, ranching or forestry. This situation puts Indian manufacturing sector in a unique position to derive income from the sale of carbon credits which are based on carbon storage value. In addition to their economic benefits, carbon credit projects have obvious environmental benefits as well, such as promoting soil health, ecological diversity and water and air quality. India forms a part of Non-Annexure country of the Kyoto Protocol with no compulsion to abide by emission targets but has a large potential for carbon trading. Currently, the value of one CER (Carbon Emission Reduction) or Carbon Credit in Indian Rupees is about Rs. 1400. Capital investment in CDM projects has also increased from a meagre 358 crores in 2003 to 64443 crores in 2007 (Figure 6). The Indian infrastructural agencies, in general, agreed to adopt the following concepts in making Clean Development Mechanisms (CDM) projects:

- Energy Conservation
- Use of CFL and Electric Chokes
- Solar Water Heating Systems
- Efficient Street-lighting
- Efficient use of water pumps
- Energy efficient buildings
- Promotion of LEDs
- Solar Lighting/Cooking
- Afforestation

Various developmental agencies in Delhi have indulged in several carbon friendly projects that are briefly discussed below:

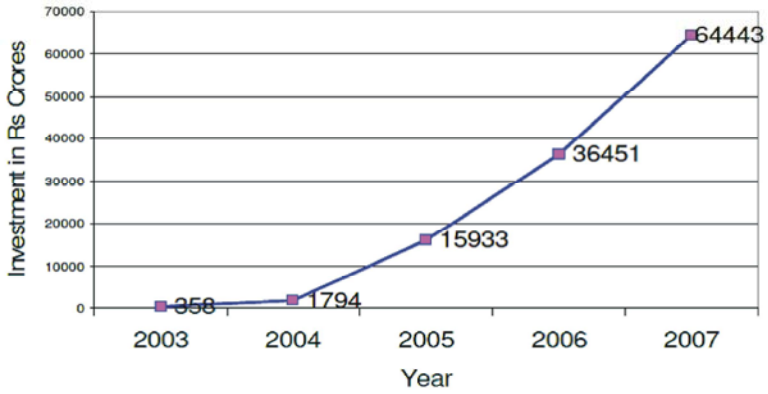

Fig. 6: Year-wise Investment in CDM projects in India

Delhi Transco Limited:

- Replacement of lighting by Compact Fluorescent Lamps (CFL) in Govt. Sector Bodies.
- Incentivizing the use of CFL by introducing market schemes. More than 5 lacs CFLs were sold in the year 2008.
- Govt. of Delhi provides rebate of Rs.6000/- to 60000 (depending upon the capacity) to domestic electricity consumers for installation of solar water heater.
- About 400 traffic signals out of 700 converted to LED based.

Environment and Forests:

- The forestry plantation project covers approx. 5000 acres in Deramandi and Bhatti Mines.
- 35 Schools & Colleges provided with Solar Water
- Heating System and 50 Schools provided with paper recycling unit and Rain water harvesting structures.
- Battery operated cars and motor bikes being given 30 % subsidy to promote clean fuel vehicles.

Delhi Metro Rail Corporation: Energy conservation through regenerative breaking system, low GHG emitting rolling stock.

Delhi Jal Board: Energy Efficiency Improvement Programme in Water supply, Wastewater treatment and Methane recovery.

Delhi International Airport: Green Building, Design to use natural lighting to a maximum extent, Energy efficient electrical and electronic appliances.

Delhi Transport Corporation: Is procuring 6000 new low floor air conditioned

Buses, which are fuel efficient, could carry more passenger per trip with lesser emission.

NTPC: Renovation and Modernization (R&M) of 210MW units, Heat Rate Improvement from 200 to 250 (kilo Calories / Kilo Watt hour) kcal/kHz by changing cycle parameters that will lead to reduction in green house gas by 2.56t CO2 p.a [16].

New Delhi Municipal Council: Use of Solar Lamps in Landscape, Use of Ozone friendly refrigerants, Energy efficient lighting and electricity chokes, Use of fly-ash bricks [17].

CONCLUSION

In the modern-day industrialized world, increasing number of companies understand the importance of addressing unavoidable emissions. A process of decarbonisation is becoming increasingly urgent in processes, resources, utilities and waste management. Businesses can benefit from the low carbon economy in two ways: diversify into new low carbon products or become more efficient in their current processes. Investors, often large companies or industries, purchase carbon credits to offset their own CO2 emissions. In addition to conserving the environment, carbon credits also provide an economic opportunity for those who develop them. This paper has attempted to closely discuss the conceptual understanding of the phenomena known as ‘carbon credit capital’ as well as consider its economic and financial implications at a global and a national level. India faces a significant challenge in

providing access to adequate, affordable and clean sources of energy. Building awareness, efficient resource structure and consistent policies is thus the need of the hour.

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